ART & CYBERCULTURE

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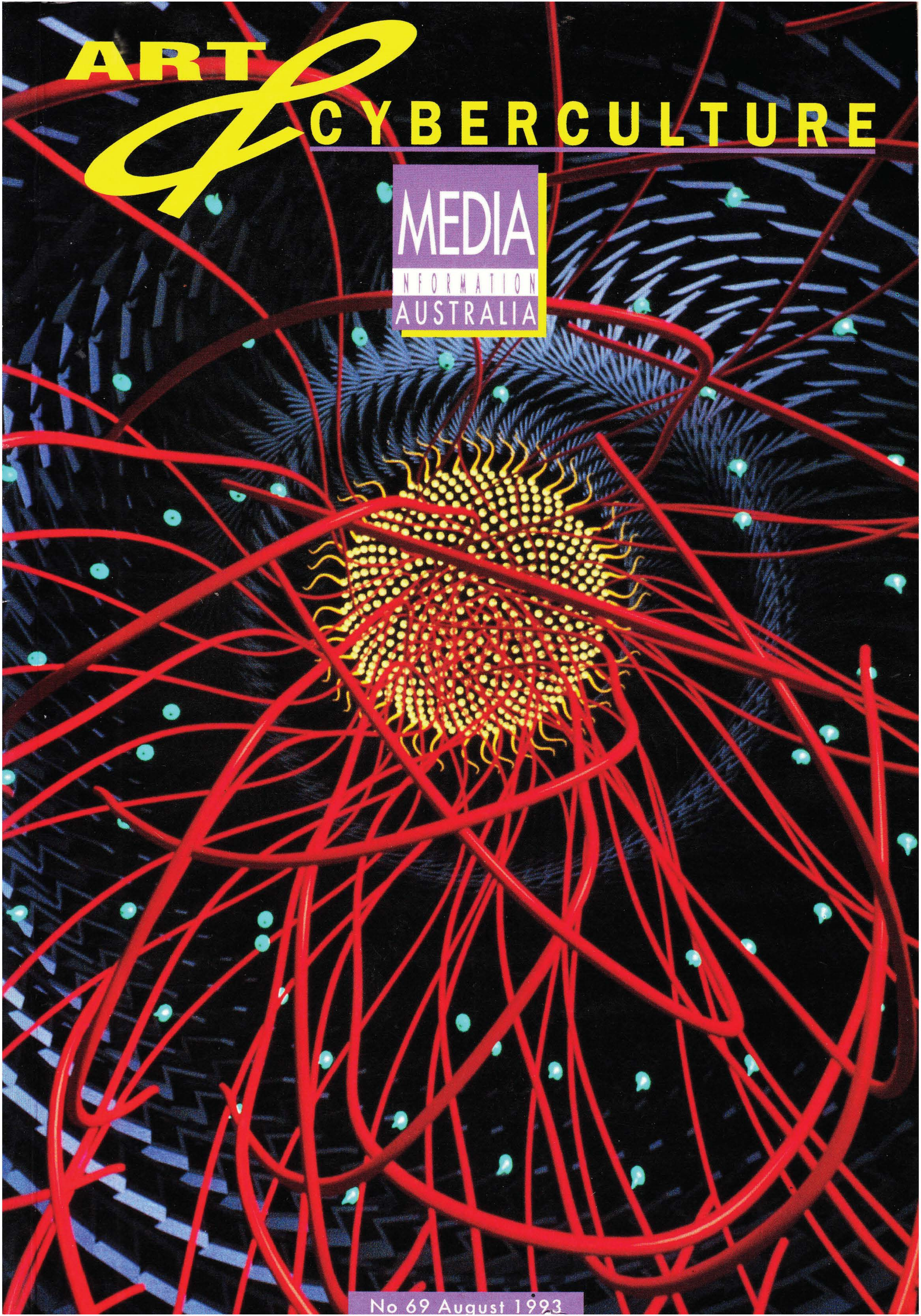

No 69 August 1993

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edited by Ross Harley

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MIA FEATURES

NOT INCLUDED

Media Information Australia is published by the
Australian Film Television & Radio School
cnr Balaclava and Epping Rds, North Ryde, NSW
(PO Box 126, North Ryde, NSW, Australia, 2113)
Tel: [+61] 02 805 6611; fax: [+61] 02 805 0963

Typography: In-house production using Aldus Pagemaker for Windows and CorelDraw.

Yearly subscription rates:
Australia and New Zealand: Business, Institution, Organisation $80; Individual $40; Student $28.

Overseas: $105.

Single Issues, $12 to individuals, $24 to institutions; plus $2.50 postage.

Subscriptions inquiries:
Phone [+61] 02 805 6454, fax [+61] 02 805 0963

Advertising rates:
$1250 full page, $750 half page. Inserts, printed (pre-folded if necessary) $250; typesetting and/or camera-ready, negotiable.

Advertising inquiries:
Phone [+61] 02 805 6571, fax [+61] 02 805 0963

Editorial inquiries:
Phone [+61] 02 805 6453, fax [+61] 02 805 0963

ISSN 0312-9616

Contributors please note:
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MIA follows the *Style Manual*, Fourth Edition, published by the Australian Government Publishing Service. A *Media Information Australia* style sheet is available from *MIA*, PO Box 126, North Ryde, NSW, Australia, 2113, fax (+612) 805 0963.

MIA is a journal of the Australian Communication Association. A subscription to ACA includes subscriptions to *MIA*, the *Australian Journal of Communication* and the *Australian Communication Review*.

MIA is indexed in *Australian Criminology Database*, *Australian Education Index*, *Australian Public Affairs Information Service*, *Communication Abstracts* and *International Index to Film and Television Periodicals*.

Printed by Pirie Printers

ART & CYBERCULTURE

is a special issue of *Media Information Australia* based on papers given at the Third International Symposium of Electronic Art (TISEA), held in Sydney in November 1992.

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ROSS HARLEY

INTRODUCTION

The articles included in this issue of *MIA* are all versions of papers presented during the Third International Symposium on Electronic Art (TISEA) which was held in Sydney on 9-12 November last year. Dedicated to the discussion and analysis of emerging forms of new media (such as computer graphics, interactive multimedia, artificial reality, digital audio, holography, and other electro-mechanical inventions), the symposium focussed on the ways in which artists and critics are responding to the globalisation of culture that tends to come with the introduction of new electronic forms.

These papers take a critical position in relation to the technological utopianism that often surrounds popular and industrial discussions of new technologies. Rather than taking the marketing strategists of the computer industry at their word, these authors pose some difficult cultural questions, inquiring as to the purpose and effect of digital technologies. What role do artists have to play in the development of 'cyberspace', the electronic realm where information, ideas, and imagination link up and circulate via digital means? Is there a culture (or many cultures) emerging in this realm; how does it operate; and what assumptions about technology and society are being made? The intersection of art and 'cyberculture' marks the point at which these authors engage with the myriad effects of these proliferating communication technologies.

Many of the most liberatory claims made on behalf of digital media centre on ideas of interactivity and empowerment. No longer held captive by supposedly 'unresponsive' and monolithic forms such as cinema and television, the viewers (it is claimed) are free to make their own decisions, to experience their own reality out of their encounter with the interactive machine. However, as many of the contributors to this issue point out, the degree to which the users of such technology are liberated from the constraints of older media is often grossly overstated, and sometimes quite misleading. According to Simon Penny's 'Virtual Bodybuilding', virtual reality (VR) is a direct continuation of the culture and ideologies established along with Cartesian dualism and Renaissance perspective, and mobilised in classic Hollywood cinema. The actual capabilities of present day VR systems do not at all live up to the fantasies depicted in recent films such as *Lawnmower Man*. Indeed, VR is itself a technological embodiment of sci-fi visions dreamed up decades ago by authors such as Ray Bradbury, as Nancy Paterson points out in 'Lust and Wanderlust'.

If interaction and VR are to become new paradigms for the production of electronic media, then their development will undoubtably continue to follow the logic of cultural forms that have existed for much longer than any of the new digital technologies. According to Mona Sarkis, interactivity is mostly a ruse for what she calls 'interpassivity'. Instead of being brought into a new productive relation with the machine, the audience/user is still manipulated, in different (though historically familiar) ways. In a similar fashion, Beverly Jones emphasises that there is and should remain a cultural continuity within computer graphics, basing her arguments on philosophical/aesthetic theories about technological origins and practices. In designing new interfaces and works for computers, artists and developers must consider the cultural baggage that they invariably carry around with them. Jennifer

Hall illustrates this well in her reflection on her work as a maker of automata for her 'Out of Body Theatre'. An entire culture has developed around the idea of VR, 'anxiously awaiting the ability to leave the reality of their own lives and go to the place where they could get away from the world called themselves'. But at what price?

Indigenous cultures are often caught in the horns of this dilemma over the question of technology. On the one hand it represents a new set of possibilities where the problems of the past don't necessarily have to be repeated in the representational forms that might be possible in the present or near future. On the other hand Western technological culture has an incredibly bad track record when it comes to respect and genuine understanding of cultures other than itself. Why should we think any differently now? Marshall Bell's article provides an opportunity to discuss some of the problems that are besetting the indigenous art industry of this country, focussing on the lack of support and dialogue that is needed if Aboriginal artists are going to seriously consider using computers and other digital technologies to create networks of resources or artworks. For the most part, Aboriginal people are not in the information loops that keep others informed of the changes in new technologies that may be of interest to them, a situation that is exacerbated by the cultural and social isolation of white from black Australia.

In asking whether an indigenously developed telepresence can accommodate newer technologies while maintaining the traditions that sustain older cultures, David Tafler and Peter d'Agostino suggest that while technology may destabilise frontiers, high technology may inevitably destroy invaluable tradition. Rejane Spitz's discussion of cross-cultural experiences in Latin America and Helen Michaelsen's reflections on the impending establishment of media art schools in Thailand further underscore the importance of cultural specificity in our supposedly global mediascape. Without a critical understanding of technology and of the culture that produces it, we are destined only to repeat the tragedies of colonialism across the 'frontiers' of cyberspace.

Utilising research in cognitive psychology and computer-mediated communication, Patricia Search argues that although 'global computer networks make it possible to quickly exchange words and images, cultural differences that reflect the psychological, historical, and social forces of individual cultures are usually lost in the translation'. Discussing her work on creative applications of hypermedia she shows how computer networking is changing the psychodynamics of communication. This is also echoed, though from quite different perspectives, in the contributions by McKenzie Wark, Cynthia Beth Rubin and Norie Neumark, who take up some of the challenges postmodernist criticism raises for any discussion on art in the age of digital reproduction. What place does the body (of work, of the user), appropriation and the fragmentation of 'vectoral' postcolonial space have in contemporary culture?

Advancing the debates that have taken place in such recent publications as Philip Hayward's anthology *Culture, Technology and Creativity*, Michael Benedict's collection *Cyberspace: First Steps*, journals such as *Leonardo, Mediamatic* and *MIA*'s recent *Digital Worlds* issue, the articles in *Art & Cyberculture* are a welcome contribution to critical discourse about the role new technologies have to play in our creative and communicative lives.

Ross Harley was the Director of the Third International Symposium on Electronic Art (TISEA) held in Sydney on 9-12 November 1992.

NANCY PATERSON

LUST & Wanderlust

SEX & TOURISM IN A VIRTUAL WORLD

Creative responses to the new technologies of virtual reality (VR) will rest with those for whom the burden of the world has become unspeakable. In the hands of the disenchanted – the artists, the intellectuals, and the philosophers – VR represents a challenge, an opportunity, but ultimately a necessary expression of experience in the electronic era. A final overture towards the reconciliation of technological utopianism with the human spirit.

Life is a travelling to the edge of knowledge – and the leap taken from that point. Boundaries are made by those who cross them. When art, literature and music no longer offer the viewer, the listener, or the reader a compelling alternative, escape, or meaningful reflection on what has traditionally been defined as the sensory world, new creative forms will be developed to take their place.

We are moving from an age of collaborative computing into an age of pervasive computing. Electronic technology represents for us the development of an external central nervous system. And inevitably, our hearts will truly beat within the machine. The symbiotic relationship with electronic technology is a very intimate one, and bears close scrutiny. In particular, the media of VR represents an undisguised extension of our needs and desires and abilities. Applications of these technologies, whether for medical imaging, computer-aided design, or interactive virtual environments, will suffer if not informed and guided by a recognition and respect for the sacred. Ritual must be incorporated into a media which threatens to be overwhelmed by the profane – linear comprehension and manipulation of pure information.

The World Travel and Tourism Council has reported that world travel generates a figure equalling 5.5% of the planet's gross national product, making tourism one of the world's largest industries. Pornography and other sex-related industries generate similar or higher revenues. The most successful application of interactive virtual reality technologies is likely to be in the sex and tourism industries, and there is an obligation to incorporate thoughtful analysis into our development of these media for these purposes. Lust and wanderlust must be reclaimed.

Our experience of the real world has become contrived. Instant sexual gratification and telecommunication technologies are both aspects of our increasing obsession with the dissolution of time and space. Aiming to overcome the mental disturbances caused by distance and time, by all forms of absence, separation, disappearance, interruption, withdrawal and loss, we have destroyed spontaneity. In making the absent symbolically present we have lost sight of that which we held dear.

Traditional tourism is increasingly dominated by virtual experiences. Investigating the possibilities for travel in the context of my trip to TISEA, I was offered, by several different travel agents, carefully packaged land-modules, incorporating the 'Aboriginal experience', the 'Great Barrier Reef experience', and the 'Outback experience'. You pay your money, you get these experiences. What has become artificial is our deliberate and programmed exploration and exploitation of the real world.

What I will call authentic experience is increasingly being replaced by vicarious experience, or experience mediated by electronic technologies. We have been learning and teaching one another to undervalue and mistrust personal experience and to prefer the realities created by and through electronic technological media such as television. In life after television, technologically induced experience is the next logical step, and pornography and tourism are the first obvious applications of simulated experience.

The thrill and adventure of escape into electronic space. Wanderlust. In real time (30 frames per second, that is) the passage of time is marked by entropy and by movement through space. And yet, time bends and stretches and stops for those who navigate physical distances. How much more elastic will it be for those who jack into the neural net? It is conceivable that travel undertaken with genuine curiousity, appreciation of adventure and for the purpose of self-discovery, may become possible once again. What has become only a remote possibility in travelling through real time, becomes a very definite if not mandatory condition in cyberspace: every traveller must create the country in which they travel.

'Why are your cheeks so starved and your face drawn? Why is despair in your heart and your face like the face of one who has made a long journey; yes, why is your face burned with heat and cold, and why do you come here wandering over the pasture in search of the wind?' (Sanderson 1975, 103). These are the questions asked of Gilgamesh at every stage of his journey in the first work of travel literature, *The Epic of Gilgamesh* (transcribed 1900 BC). Unlike contemporary travellers, the ancients saw travel either as a suffering/ penance or as a means to acquire experience and knowledge. Anthropologists find the metaphor of human travel or passage used to describe the structure of life, and the meaning of death.

Tourism today inspires irony, not metaphors. Today, travel is associated with freedom, independence and pleasure. And yet, for all the value which we attribute to travel, it is tourism which we generally experience. Sociologist Valene Smith defines a tourist as 'a temporarily leisured person who voluntarily visits a place away from home for the purpose of experiencing a change' (Smith 1977, 2). There is a certain desperation obvious in the planning and endurance of a holiday. Very often the goal and purpose is to see as many different things in as short a time as possible. Claude Levi-Strauss sees this attitude as the end of meaningful travel:

> Journeys, those magic caskets full of dreamlike promises, will never again yield up their treasures untarnished. A proliferating and overexcited civilization has broken the silence of the seas once and for all. The perfumes of the tropics and the pristine freshness of human beings have been corrupted by a busyness with dubious implications, which mortifies our desires and dooms us to acquire only contaminated memories. I can understand the mad passion for travel books and their deceptiveness. They create the illusion of something which no longer exists but still should exist (Levi-Strauss 1975, 285).

Unexplored frontiers fit for conquest within the North American continent have diminished since its 'discovery' by the Europeans 500 years ago, and its subsequent colonisation. An attempt to recreate the pioneer spirit which has dominated the history and culture of North America and to recapture the thrill of exploration and discovery, has led to enthusiastic public support of such enterprises as the US space program and Operation Desert Storm. We invest much more than capital in the development of new technologies. The technological utopianism of the 1950s is resurrected with each attempt to manipulate the dimensions of time and space which we feel bind us.

'Disneyland tells us that technology can give us more reality than nature can' (Eco 1986, 44). This is Umberto Eco's observation in *Travels in Hyper Reality*, written after several months of intensive research – in the amusement and theme parks of the southern United States. Although Eco is not reflecting on VR as we perhaps would define it, the phenomena which he describes and analyses are simulated 3-D experiences or environments, making up for what they lack in interactivity with the total theatre effect achieved by Walt Disney's 'Audio-Animatronic' technique. Populating convincingly realistic sets with robots endowed with the characteristics of the actors on which they were modeled, Disney sets the standard which VR technicians must emulate or surpass.

In Disneyland or Universal Studios in Orlando, Florida, it is possible to fulfill what marketing experts have determined is our secret and ultimate desire – to visit and live in the movies – to feel that we are part of the show. A relatively passive, well-regulated and above all safe experience is guaranteed. Comparing a Disneyworld simulation with a genuinely interactive 3-D VR experience does justice to neither. For there is fulfillment in the Magic Kingdom, just as surely as is promised in a visit to a virtual world.

Step into cyberspace and the world becomes new again. The virtual world of mathematics and physics where theories and properties occupy a space, is tangible and manipulable. The dichotomy between tourism and travel begins and ends with wanderlust, a sense of purpose beyond movement for movement's sake itself. Today, immobility is the only sin or crime. Movement and progress have become equated with prosperity, success and life itself.

As we approach the threshold of the 21st century, the foundations of political, economic and physical sciences across the globe are being rocked by a restlessness. The instinct to retreat is surfacing, a grasping backwards in terms of values and morality. Increasing dissatisfaction with scientific methodology, 'self-propelled' science (that is, the belief that science can solve any problem it creates with more science), and technological determinism (the belief that what can be done, must be done) will be weighed against the reality that, as Nicholas Negroponte of MIT's Media Lab has phrased it, 'once a new technology rolls over you, if you're not part of the steamroller, you're part of the road' (Brand 1987, 9).

Virtual reality is not new. It is not coming, it is here. It has been funded and developed by the military over the past 15 or more years. And it is finding its way into our amusement arcades in suburban malls. A strategy for dealing with this technology must start now.

Where will we go when we are unlimited by three-dimensional linear time and space, and what will we do when we get there? If I have lost you at this point, the expression 'teledildonics' will probably bring you back around. Will VR technologies contribute intimacy or a simulation of this experience to our exploration of cyberspace and our interaction with whoever we meet there?

Electronic bulletin board services (BBSs) were the first incarnation of an interactive virtual space. Revolutionary in the 1970s, they have now gained a reputation as an excellent source of pornographic (low resolution) images. In the US the anonymity of BBSs has enabled a network of pedophiles access to a virtual database of potential victims: their ages, successful techniques for manipulation, and opportunities for molestation based on previous assaults. The victims are young children – this is clearly not man/boy love but the systematic sexual abuse of children of both sexes.

There is something about the mediation of technologies which, some would say, makes us less human. Whether in reaction to a sense of loss of control to the mediating technology, or to a sense of empowerment from it, aggression is the most prevalent and troublesome response. Relationships initiated and developed in this electronic space rarely lead to real meetings. Telephone sex, at least, reintroduces the human voice into an impersonal experience.

The computer's allure has always been more than utilitarian or aesthetic. The patriarchal appreciation and acceptance of new electronic technologies have always contained an element of the erotic. For this reason it has been possible and, indeed, necessary to link the inspiring power and potential of new electronic media to women. Also, the women's movement picked up speed at about the same time as electronic technology. Popular culture's representations of the powerful woman, the bitch/goddess, have been adapted to reflect male high-tech fantasies. In her latest incarnations, whether androgynous or exceedingly voluptuous, these powerful women have technology by the balls. The influence and power they wield is evil, technological, and, of course, seductive. True to the patriarchal mythology, woman is the incarnation of danger, this time both sexual and technological.

'Teledildonics' is the logical culmination of these theories. Ignoring the close and very dangerous relationship that exists between patriarchal culture and technology, there is, as Paul Virilio puts it, a deliberate and carefully orchestrated, 'disappearance of woman in the fatality of the technical object' (Virilio 1991, 91).

In a recent interview in *Mondo 2000*, Brenda Laurel offers the scenario of a woman's group, in the context of a computer conference a few years ago:

> The girls were complaining about how much discrimination they'd suffered, and they couldn't get on the mainframe, and people turned off their password – the usual rants. And this one man, who I won't name, who's a brilliant programmer and a good friend said, 'Well maybe the reason that we were in computers was to get away from you'. That had a huge impact. Somebody finally had said it (Laurel 1992, 84).

More and more women are finding their way into the development of VR, and I believe this will have a positive impact on the applications of this technology, particularly as the general public will first 'experience' it. One company which develops virtual reality systems has done research on gender differences, in terms of what people want when they step into a virtual world. Women need a reason to be aggressive. Men only need a place. That is changing. I hope it is only a small minority who want to limit virtual worlds to interactive arcade-style video games, where virtual murder and rape are the ultimate objective. Tactile feedback systems are being developed, it is true. Eventually you will be able to put on a bodysuit and have sex in cyberspace. I'm just not sure that very many people will be interested in that application by the time it is available. So many other amazing applications are also just around the corner.

Seized upon by science fiction writers, the idea of 'virtual' reality has its roots and its key in physics, philosophy and visual art. Susanne Langer, an American philosopher of aesthetics, developed a theory of symbolism in her most famous book *Philosophy in a New Key*. In a subsequent book, *Feeling and Form*, she set out to develop a systematic, comprehensive theory of art, applicable to a wide range of media. In this book, first published in 1953, she borrowed an expression from physics in order to describe the achievement of complete artistic success. 'Virtual space', she wrote, 'is the primary illusion of all plastic art' (Langer 1953, 72).

Langer's theory proceeds to describe the virtual space that all forms of art attempt to present as the ultimate *object* of art, therefore lacking subjectivity:

> Yet its limits cannot even be said to divide it from practical space, for a boundary that divides things always connects them as well, and between the picture space and any other space there is no connection. The created virtual space is entirely self-contained and independent (Langer 1953, 72).

However, VR systems being developed today replace images and mere representations with places to be explored and objects to be manipulated. No longer required to imagine the space behind the mirror, the viewer is invited and actively engaged in the creation of the alternate reality.

The state of dreaming is, perhaps, the first and primary expression of virtual imagination. This phenomenon of creating and participating in private alternative realities takes place during REM sleep, which has been found to be an important stage for consolidation of learning. Hallucinations, visions and speaking in tongues, whether induced through drugs or other artificial stimulation of the brain, demonstrate the collision of two or more worlds, the intrusion of the 'virtual' into the 'real'.

Fiction is the literal creation of virtual worlds. Cinema is the public and collective visualisation of these worlds, and to a certain extent video, television and cinema successfully engage the viewer beyond mere suspension of belief. Whether through the intimacy of the television screen or via the effect of the projected movie in a darkened theatre, this visualisation of virtual worlds has, for many years, provided a satisfactory and effective release and relief from the everyday. Extraordinary means, however, are called for in extraordinary times.

> 'What's on this afternoon?' he asked, tiredly.
>
> She didn't look up from the script again. 'Well, this play comes on the wall-to-wall circuit in ten minutes. They mailed me my part this morning. I sent in some boxtops. They write the script with one part missing. It's a new idea. The homemaker, that's me, is the missing part. When it

> comes time for the missing lines, they all look at me out of the three walls and I say the lines. Here, for instance, the man says, "What do you think of the whole idea, Helen?" And he looks at me sitting here centre stage, see? And I say, I say...'. She pauses and runs her finger under a line on the script. '"I think that's fine!" And then they go on with the play until he says, "Do you agree to that, Helen?" and I say "I sure do!" Isn't that fun, Guy?'
>
> He stood in the hall, looking at her.
>
> 'It's sure fun' she said.
>
> 'What's the play about?'
>
> 'I just told you. There are these people named Bob and Ruth and Helen.'
>
> 'Oh.'
>
> 'It's really fun. It'll be even more fun when we can afford to have the fourth wall installed. How long you figure before we save up and get the fourth wall torn out and a fourth wall-TV put in? It's only two thousand dollars.'
>
> 'That's one-third of my yearly pay.'
>
> 'It's only two thousand dollars,' she replied. 'And I should think you'd consider me sometimes. If we had a fourth wall, why it'd be just like this room wasn't ours at all, but all kinds of exotic people's rooms. We could do without a few things.'
>
> 'We're already doing without a few things to pay for the third wall. It was put in only two months ago, remember?'
>
> 'Is that all it was?' She sat looking at him for a long moment. 'Well, good-bye, dear' (Bradbury 1953, 20).

Before the existence of the technology that would make them possible, Ray Bradbury described virtual worlds in his novel *Fahrenheit 451* as well as in his short story 'The Veldt'. As access to these technologies became more widespread, but certainly before they were publicly introduced, writers such as Philip K Dick (*Do Androids Dream of Electric Sheep* and *We Can Remember it for you Wholesale*) presented their visions regarding the potential and future of these technologies.

Hollywood, a well established indicator and manufacturer of popular culture, has recognised the possibilities of VR in the research, development and design of electronically simulated environments and experiences. An increasing number of films and television shows include some aspect of electronically mediated or simulated time/space travel. And, not surprisingly, it is the more sensational and dramatic aspects of this new technology that Hollywood has chosen to highlight.

They have adapted the texts of Philip K Dick, in movies such as *Bladerunner* and *Total Recall*, and most recently a completely rewritten Stephen King story *Lawnmower Man*. And, in their transformation of science fiction movies from futuristic prophecies and romantic adventures on the fringe of popular culture, to mainstream, violent, nihilistic techno-pulp, they have let slip two essential motivations: lust and wanderlust.

Hollywood would have us believe that sophisticated applications of VR technology are imminent. Off-the-shelf virtual environments are currently available for recreational purposes. However, until the computer graphic imagery generated can keep pace with the level of interaction and detail (the resolution of film or video) which we have been led to expect, VR environments will remain in the suburban mall, as arcade games.

Displacing no one physically, the boundaries of cyberspace are defined only by imagination and electronic intelligence. Face-to-electronic-face, we will manufacture, participate and interact with a wide range of sights, sounds and presences. What has always existed in the collective 'mind' of a culture – an understanding and acceptance of rules/truths and the role of myth – faces imminent revelation in cultures where electronic technology will make it possible to visually articulate and manipulate the spaces which are common to us all. Layer by thin, precious layer, psychoanalysis and related sciences of behaviour, extending into hermeneutics, structuralism and other theories of language, have exposed the lengths to which we extend ourselves in order to construct social and psychological representations of reality which make it possible for us to cope in the physical, sensory world. Mobile, portable technologies, capable of the digitisation, compression and instantaneous transmission of information into suitably equipped hands, have virtually conquered or destroyed two such constructs: space and time. Our ability to survive because of, or in spite of, this new structuring of dimensions, depends in part upon our ability to incorporate parallel, alternative realities, into our cultural and individual visions of 21st century life.

Perhaps the reason that fiction no longer does the trick is that our development of VR technologies is actually inspired by a craving for the real. Sensory experience in our media-saturated world has become second-hand at best. Authentic experience is increasingly replaced by vicarious experience, or experience mediated through electronic technologies. In our determination to separate and define authentic experience, perhaps we are driven to conjure or evoke it through different eyes. Is the reality which we are seeking to simulate the environment in which we exist and interact? Or are we seeking to simulate the act of 'experiencing' itself?

If this is the case, then the application of virtual reality technologies in the 'recreational' industries of pornography and tourism, can be understood as a deliberate, if unconscious, attempt to recapture the experiences of lust and wanderlust.

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MONA SARKIS

INTERACTIVITY MEANS INTERPASSIVITY

Terms such as 'interactivity', 'virtual reality', and 'cyberspace' are among the biggest buzzwords of technological progress, media and media-art. This paper challenges certain claims made in relation to the subject of 'interactivity' in media-art, and especially of the tenor and choice of words such formulations often invoke.

The predominant view holds that by programming a computer and connecting it to an interface that can receive and translate special movements in its surrounding into information that can be understood by the computer – which subsequently performs certain parts of its program according to the functions triggered by the spectator's movements – we are presented with a liberating 'interactive' work. Cybernetic 'communication' between the technical installation and its user is said to be achieved.

The emphasis here is on 'the technical installation' and 'the spectator', not on 'the programmer' of the installation and its 'user'. In my opinion there are two reasons for this particular slant. The first is not difficult: the technical deficiencies of interactivity are suppressed by the computer industry, which of course needs to sell its products and therefore build up sophisticated superstructures and PR campaigns which can advertise the products' capabilities:

> The recipient gets out of his passive role and can actively intervene. Through the dissolution of stiff structures he can zoom himself into the complexity of the performance, being able to compose it with a new spatiality and temporality (Reller 1992).

Such currently circulating catch phrases end up being adopted in a careless and uncritical manner by many 'artists' and 'philosophers':

> The interface becomes a zone of experience, a multi-dimensional encounter ... The feedback is not simply 'negative' or 'positive' ... The loop is subject to constant transformation as the elements, human and computer, change in response to each other. The two interpenetrate until the notion of control is lost and the relationship becomes encounter and involvement (Rokeby 1991).

In my view, the claim to turn away from stiffness, isolation and so on, towards flexibility and the recipient's activity is just wishful thinking. It should be quite clear that no meaningful communication – in the sense of a true exchange of ideas, thoughts, opinions, or discussion (where one interlocutor might suddenly lead the conversation into an unexpected direction due to his partner's response) – can never emerge from a programmed technology. What we get instead is a simple alternation, based on the rules set by the programmer.

This is the first reason why 'interactivity' reveals itself to be aimed at passivity. The user remains a 'user' who will not magically turn into a 'creator' (as we are constantly lead to believe) but will continue to resemble a puppet responding to the artist's/technician's programmed vision.

Why is this the case? On the one hand the user's capacity to act is reduced to button-pushing, with little comprehension of the technical relations. On the other hand our heads are stuffed with fairy tales about the holographic universe we are just about to enter through our own creation. If we mix these two aspects the result will lead to a minimisation of human activity and a monumentalisation of technological effects.

In traditional arts, now labelled 'doctrinaire' and 'anti-social', the recipient at least moved on the familiar level of verbal and mental communication – even if the artist's vision was not totally clear, the viewer could intellectually join in the discussion. If there is anything to join now (besides joystick-pushing), it is a discussion about emotions. But as is well enough known, emotional bombardment without any intellectual foundation will do little to rectify the present situation. The user should really be provided with the technical know-how and thus with the competence to see through and to judge the interactive work. Unfortunately this is rarely the case with most audiences, who are easily swayed by demagogically presented nebulous theories. Hence the user is the first victim in this sneaky passivity-seeking interactivity-campaign.

Communication also has a lot to do with the unsaid. The way people look, gestures, or the expression in a voice can sometimes tell much more than what is actually said. How shall the unsaid be brought into a system based on well-defined input, on data?

To do this requires genuine artificial intelligence, which presently does not exist. So why do so many artists and theorists enthusiastically share the industry's songs of praise? Simply in order to join the new wave, to be considered avant-garde and hence to be enthusiastically sponsored by the industry? It would be soothing if the motives were of such a superficial nature. The second factor that contributes to the aforementioned falsification is not only much harder to crystallise, but must also be taken much more seriously. It lies in mankind's long-lasting desire for 'self-surrender'. In other words, the big song and dance around technology is just one side of a coin whose flipside is to do with making oneself small. This tendency towards the decomposition of the self can be seen in linguistic terms along with 'the programmer', 'the maker' and so on, which are being completely abstracted through impersonal formulations as 'the interactive installation', which reflects the desire to avoid any mention of the producing subject.

Indeed, many artists declare themselves to be against the image of the lone originator, as this is considered to be the equivalent of a unidirectional transmission of messages – dominant, inaccessible and forced upon the recipient. Instead they vote for an artist who 'works in an industrial-like, anonymous process of production, with the technical and conceptual help of co-workers' (Weibel 1989).

The logical short-circuit herein is obvious: whether the transmission of a message is unidirectional, boring, demagogic or 'open' has nothing to do with the process of production (whether alone or in collaboration) nor with the means (computer or no computer). If this were true, mankind would have finally found the recipe for quality artwork! So as not to be completely misunderstood: I do not doubt that good art can be produced by anonymous collectives; nor do I doubt that the cult built around the nineteenth century category of artist-as-genius is just an idea like the many others mankind has brought up at one time and disposed of at another.

This guarantees neither 'narrow' nor 'open' mindedness, neither good nor bad art. But I am nonetheless very suspicious of the hypocritical longing for unselfishness which is implicit in certain catch-phrases: 'Through computers we have finally reached a democratic art, an equal exchange of thoughts!'. What does such unselfishness actually mean? It is actually nothing but the desire to get rid of oneself!

Historically speaking, this principle is not so new. For example, the creators of those great masterpieces, the Gothic cathedrals, also attached great importance to their anonymous status. They did so in order to leave the full glory to God, to whom they delivered themselves, which of course implies not only a loss of freedom and autonomy but also of responsibility. Getting rid of one's self is a declaration of irresponsibility and dependence. Nowadays it seems the full glory will be left to the machines (along with our selves).

Let me give as an example the following project entitled 'Breathe' by the German media-artist Ulrike Gabriel: an oxygen-mask (or similar device) functions as the interface, and is connected to a high-tech Silicon Graphics computer capable of performing real-time calculations and 'animation'. Each time a spectator breathes, the computer converts the frequency of the breathing into abstract 'graphs', which are instantaneously projected onto huge screens surrounding the spectator. The graphics are not fed into the computer beforehand, but are generated in real-time. There is therefore a certain element of chance introduced, as the programming artist does not provide the exact shape and form of the computed images. In a way, it is a higher level of interactive programming, but it still does not bring the computer or the spectator into a more equal and active partnership. Because the computer is unable to react to anything outside of its program, what is the job of the spectator? It is literally to breathe life into the machine.

Next to heartbeat, breathing is the most essential human function – one cannot live without moving one's lungs. To take this essential motion as the trigger for the technological performance is like handing human life over to the machine. On top of this, the user is enclosed in a cramped, dark space where the slightest breathing is immediately answered by an surrounding bombardment of huge projections and sounds. Considering the proportions of the installation (narrow cabinet, huge projection walls) and considering the manner in which the artist praises the ability of the technology to create and organise things almost autonomously, it becomes clear that the second victim of passivity-inducing 'interactivity' is actually the artist/maker. However, the difference here is that the retreat from the action of the user happens deliberately.

The user is told to be creative, in order to make the whole conception more grand – a trick that tempts/forces them into this emotional nirvana. I do not suspect the artists and theorists are even aware of it. My impression is that they honestly believe in it all, which is even worse! I have never met a media-artist who is genuinely interested in the audience's health and happiness. What they are interested in is their own mania. Frankly, this seems sick to me. It seems like an ardent desire, almost a mania for getting lost in self-produced intoxications, whose home-made character is disguised and repressed with an incredibly vehement determination.

Thus we end up finally in hallelujah-songs such as:

> The diffuse, parallel nature of the interaction and the intensity of the interactive feedback loop can produce a state that is almost shamanistic. The self expands (and loses itself) to fill the installation environment and by implication the world (Rokeby 1991).
>
> Gadgeteering, the symbiosis of human and computer brings the liberation from the philosophical affront of freedom (Bolz 1991).

Here lies the crux of the matter. From the second quote we can see why Gothic masterpieces and computer art cannot be put on the same level, even though a parallel can be drawn in the basic attitude of the subject towards itself. The philosophical affront to freedom had not yet started in the Gothic. Therefore it is actually wrong to speak of a basic attitude of the subject towards itself in the Gothic universe, as there was none. It is exactly this 'innocence' that makes the pieces so convincing and credible. Beyond that, they were created for God. Today we face a deeper level of fetishism, since the tool of creation itself is adopted as the alpha and omega.

How else should the effort to hide the computer as an apparatus and to unfold it as an incarnation of transparency and transcendence be read?

> If it is the project of our time to make the invisible visible ... then we have to realise the necessity of making the presently very visible computer invisible. The computer as a thing, as machine is too near to us, too dominant ... Instead of regarding the computer-interface as a membrane, separating the computer as a thing on its own from us, we ought to understand it as a door into dataspace ... a synaptic interval in the symbiosis human-computer (Ascott 1989).

The same efforts are to be found in the computer industry – for example in certain company's attempts to sell multimedia CD-players not as computers, but as supplement to their hi-fi and video systems. Their intention is quite obviously to place the fancier aspect of 'interactive' TV in the foreground and mask its sobering character as 'thing'.

But while the industry's deceptions are due to pragmatic reasons, the artists, sincerely believing in their own formulations, deceive their audience and themselves. According to

Nietzsche, 'whoever degrades himself wants to be raised'. The willingness to let oneself disintegrate into 'natural forces' (whose self-production is denied), is nothing but a tricky way to both hide and feel powerful in the shadow of a protecting authority.

It would seem that what is active about 'interactivity' is finally the human activation of all possibilities from all angles in order to push activity away from oneself to someone/ something else, and towards interpassivity.

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SIMON PENNY

Virtual BODYBUILDING

Like any other technology, virtual reality is embedded in a cultural history which lends a world view to its entire enterprise. I will argue that this world view is (not unexpectedly) male-gendered, patriarchal and Christian. In the first part of this paper I will examine the cultural context of virtual reality, before discussing some of the issues that might arise as virtual reality embeds itself into Western culture. I would like to suggest that virtual reality is culturally specific to the Graeco-Roman tradition, and is quite different to a virtual reality that might arise in a non-Western culture, if such a thing is possible.

Virtual reality in its cultural context

Self-proclaimed 'cyber-visionary' Jaron Lanier has announced that 'virtual reality is the culmination of culture'. This is a somewhat self-serving judgement given that he is a major developer and commodifier of the technology (as founder of the influential virtual reality research company, VPL). But my concern here is more with the cultural specificity of his remark. The abhorrence of the body is inherent in Christian doctrine, which has served as the basis of Western philosophy until last century. Alluquere Rosanne Stone has recently observed that in the Greek New Testament, the word *endyo* (meaning 'to put on Christ' in the sense of *putting on* an overcoat) is often used in the context of narratives about Christian conversion (quoted in Dyson & Kahn 1991).

This condition of 'putting on' is very similar to the condition of being in virtual reality. Such a suggestion strengthens the assertion that the cultural history of virtual reality is as old as Western culture itself. William Gibson's cyberpunks proclaimed that 'the body is meat', but neglected to notice just how similar their position was to that of Saint Augustine.

The developers of virtual reality have (unwittingly?) inherited a humanistic world view (an attitude to life *and* a way of making pictures) which places the eye of the viewer in a position of command – a privileged viewpoint on the world, an automation of the power dynamics of Renaissance perspective. Asian imagery offers us alternative ways of looking and of constructing pictures; medieval European imagery offers another. Television offers a third, with its multiple viewpoints and rapid cuts *which dissolve the body*. This present historical examination implicitly asks the following question: What if virtual reality had developed along pictorial principles other than those established by Renaissance humanism? Could we feel we could inhabit its space at all? In other words, how much is any so-called virtual reality dependent upon culturally acquired knowledge in order to be decipherable? Western perspective, or any system of pictorial representation, is in no sense innate, but is a convention that must be learned (often arduously). Numerous experiments in visual perception performed on non-Western people attest to the cultural specificity of our particular way of pictorially representing space, distance, relative scale etc. Reports that New Guinea highlanders were unable to 'see' or identify their own image in polaroid photographs similarly demonstrate the point that vision is profoundly influenced by learning.

What if virtual reality was developed in a culture with a different attitude to the body? In a recent article on Indian dance, the author relates:

> The sense of space was wholly different ... no long runs or soaring leaps or efforts to transform the stage into a boundless arena, a kind of metaphysical everywhere ... but content within the realm of the body, comfortable with dimension and gravity, all ease, all centred (Wetzsteon 1992, 95).

The teacher of this dance technique described the attitude towards the body: 'no sense of elevation or extension ... body self contained ... inwardness, inwardness ... *In Hinduism, there is no beyond'* [my emphasis] (Wetzsteon 1992, 95).

Compare this attitude to that inherent in virtual reality. In the real world, the sense of touch requires immediate physical contact with the object, but the eye does not. Virtual reality arms the eye, it gives the eye a hand of its own, propelled (or so it appears) by the gaze itself. The authoritative viewpoint afforded by Renaissance pictorial space is actively empowered: action at a distance. *The entire body is propelled by scopic desire.*

It should be noted in passing that I am discussing virtual reality here *as if it exists*. At the time of writing, virtual reality in the civilian domain is a rudimentary technology, as anyone who has worn a pair of eyephones will attest. That the technology is advancing rapidly is perhaps less interesting than the fact that nearly all commentators discuss it as if it was a fully realised technology. There is a desire for virtual reality in our culture that one can quite fairly characterise as a *yearning*.

Virtual reality has lingered prenatally in *Star Trek*'s Sci-Fi Holodeck for a generation or two, but now it is actually being born. It will slip frictionlessly into our lives because our culture has prepared us for it. I have suggested elsewhere (Penny 1992) that every significant development of media technology since the Renaissance has been employed to create theatres of simulation. This idea was not lost on Andre Bazin, who noted mid-century, that:

> The guiding myth ... inspiring the invention of cinema, is the accomplishment of that which dominated in a more or less vague fashion all the techniques of mechanical reproduction of reality in the nineteenth century, from photography to the phonograph, namely an integral realism, a recreation of the world in its own image, an image unburdened by the freedom of interpretation of the artist or the irreversibility of time (Bazin 1967, 21).

This 'readiness' for virtual reality has been prepared most recently by Disneyland, Hollywood, liposuction and Nintendo. Perhaps most significantly, we have come to accept that the body may be customised at will like some kind of hot-rod. This culture customises its bodies like it customises its cars. *The body is only a representation*, an external appearance, and may be adjusted to suit the taste of the owner. The absolute malleability of the virtual body is different only in degree. During early April 1992, daytime TV host Jeraldo Rivera had liposuction live on TV in front of a studio audience. Gobs of yellow fat were sucked from his buttocks and injected into his lips and around his eyes. Our attitude to the surgical customising of the flesh ('body sculpting') and to the design of the virtual body both assume and reinforce Cartesian duality by maintaining the idea of the body as pure representation. Thus virtual reality is an easy step. The body is already a representation.

How real is virtual reality? The cultural underpinnings are already in place to lubricate the general acceptance of the idea that virtual reality adequately represents 'reality'. The interchangeability of visual consumption and 'experience' (which we are encouraged to believe via television) has certainly coloured expectations of the virtual environment.

Virtual reality may be considered as a kind of 'instrumentation' of the body. For example, to wear a watch is to be 'instrumented'. When I wear a watch I am linked to a large but virtual organising grid. I can know by looking at my watch whether an office on the other side of town is closed for lunch, or whether my mother on the other side of the planet is still asleep. I can prepare my trajectory to arrive at the dentist within minutes of my appointment time. In the sense that a large social system is coordinated according to one grid system, a system which I can predict and plan with reference to it, is a virtual world of sorts.

The modern notion of how the automobile functions has informed the shape of virtual reality. Iggy Pop defined this condition in his song 'The Passenger': 'he travels under glass ... all of it is yours and mine ... so let's ride and ride and ride and ride and ride'. It is a very limited kind of interactivity: I can travel and observe, but I cannot act. Nor can the environment act upon me. A white man driving through Chicago ghettos in a plush rental car on a hot Saturday evening with the air conditioning and the stereo on, with tinted windows and the doors automatically locked, is in virtual reality. The paradigm of stealth, of virtual reality is informed by this notion of motor car use. It is a paradigm of the powerful gaze, of monitoring while remaining undetected. It is infra-red night vision, a military intelligence model. (Why should we be surprised about that!)

We are taught to believe that we can 'experience' the countryside from inside an air-conditioned car travelling at 100 kmh. This 'belief' prepares us for the virtual reality condition. Virtual reality is as real as a picture of a toothache. It is a reality in which you can walk through walls with impunity, a reality which has no odour, and in which temperature is not very real. But to construct more and more complex and expensive interfaces for this 'reality' is to miss the point. Yet these are the kind of obsessive projects that characterise the activities of engineers in the realm of cultural production. The current debate over the 'bandwidth' of reality which is occurring in virtual reality and computer graphics circles is folly. Our preparation for virtual reality is cultural. We will accept virtual reality as a representational scheme, no matter what its verisimilitude, in the same way that we accept a map of a city or the pieces on a chess board.

Virtual reality offers a paradoxical condition with respect to our familiar art forms because it is simultaneously a picture and a bodily experience. It is a cultural experience to be consumed, at a distance as it were, by the eye. A gulf of space and time separate the viewer and the viewed, with no potential for active interplay. At the same time, it is as immediate and physically engulfing as a game of squash. This simultaneous occupation of the symbolic and the physiological realms is particularly fascinating. What kind of cultural practice can we imagine for this radically new (non)site?

The virtual body in the virtual world

What does it mean to inhabit a virtual body, and to experience a virtual environment within such a body? I want to explore the perceptual experience of inhabiting the virtual body, and to discuss the nature of cognition in such a state.

Whilst wearing eyephones and earphones, the visual and auditory world is shut out and replaced by another. This leaves one part of what we might call the sensorial body in the corporeal world, and the other in the virtual world. Can this 'body without organs' cope with such fragmentation? The mind seems to willingly close down sensory channels at odds with other more dominant channels. Problems seem to appear when the closed-down channels are reactivated. 'Simulator sickness' arises from disconnected sensory modalities. Sitting still in a flight simulator (where the image material presents the visual experience of rolling or flying) requires the mind to give preference to the visual input and to ignore the kinaesthetic information being sent from the semi-circular canals. This the mind happily does, but it takes at least 24 hours for the sense of balance to re-connect. During that time people tend to fall over a lot. As a result, the US navy prohibits the piloting of a plane within 24 hours of being in a flight simulator.

To avoid this 'split body' condition, one must simulate all sensory input in a coordinated way. We might call this 'total body representation'. It is instructive to examine what this implies. If, in virtual reality, I am confronted with a cast iron chair, a typist's chair and a lounge, I must not only be able to sit, but the sensation of texture must change. I must also be physically supported by some system. This implies a full 'force-feedback' suit which does not impede or weigh down the wearer.[1] This is clearly not feasible.

In order for a fully simulated representation of the body to be complete, the realm of the kinaesthetic and proprioceptive senses must be catered for. The internal bodily senses must be 'represented'. How can we electronically simulate the sense of a distended stomach? Sense of taste and smell are also absent from the simulated world of virtual reality. When can I eat virtual food and excrete virtual shit? Clearly no amount of external gadgetry will facilitate total body representation. For better or worse, *direct neural jacks* seem to loom on the horizon, and this technology will radically change the terms of this discussion.

The virtual reality condition that we are thus discussing is the limited case of a simulated interactive stereoscopic visual (and occasionally auditory) environment, in which the body is represented purely in visual terms. The prospect of a partial but coordinated and articulated representation of the body raises the question of the repercussions (both psychological and cultural) of a *double body*. Virtual reality replaces the body with two partial bodies: the corporeal body and an (incomplete) electronic 'body image'. In terms of the rhetoric there is no question as to which is in the ascendant. This is a kind of sensory apartheid. Virtual reality leaves the meat body on the chair. It is a confirmation of, rather than a liberation from, Cartesian dualism. Virtual reality is thus about dislocation and disassociation. Simulator sickness testifies to this dislocation — it is the first virtual illness. The body representation of virtual reality fragments the corporeal body, which becomes *a powerful eye mounted on a fractured body*.

One does not take one's body into virtual reality, one leaves it at the door. Virtual reality reinforces the Cartesian duality, replacing the experiential body with a body image, a creation of mind (as all objects in virtual reality are a product of mind). As such it is a clear continuation of the rationalist dream of the disembodied mind, part of the long Western tradition which denies the body. St Augustine is the patron saint of cyberpunks.

That virtual reality is incomplete is clear at even a cursory inspection. As a representation, virtual reality is currently an abstraction. The question is not to do with how abstract a representation the mind/body will accept as 'real'. It seems more pertinent to ask what constitutes a continuous interactive representation. What arrangement of images and interactive cues cohere in a system with syntactic order? This question is made more complex due to the confounding malleability of the mind (which William Bricken refers to as 'cognitive remodelling'). The mind, it seems, is very willing to restructure itself in order to compensate for or adapt to, a changing 'reality'.

There is a peculiar cognitive feedback loop here: virtual reality, standing in for 'reality', begins to shape the way the mind describes its experience to itself. The current state of the virtual reality image is extremely simple, built as it is from several thousand polygons. Even so, William Bricken reports that as one interacts with a virtual world, one comes to accept the polygonal representations. It becomes as valid a world as the 'real'. Virtual reality people refer to this as 'cognitive plasticity' (Rheingold 1992). Thomas Furness relates that if you spend a lot of time in virtual reality, you begin to dream in polygons! Jaron Lanier's oft-quoted adage that 'reality is what is on the other side of the senses' is validated by these reports.

The virtual reality representation is ultimately as schematic as that of a map or a chess board. These are schematic representations which are culturally learned, to which we bring meaning and from which we draw meaning. One of the techniques of virtual world design, as in other computer interface design, is to utilise familiar symbols and terminology to indicate to the user that the computer system has been modelled on a familiar 'real world' system (eg the folders and trashcan of the Macintosh interface). The learning curve is less steep because relationships to symbols are already formed. No virtual reality can exist outside of a cultural construct.

Designer body

As all objects in a virtual world are constructed, so is the body-image itself. In 'designer reality', the shape and style of the body you take into virtual reality is an open choice. One can design a body with numerous limbs (say a giant lobster) and by attaching additional sensors to the knees and elbows to control the extra limbs, one can comfortably inhabit a body with double the regular complement of limbs. The mind maps onto this new body almost effortlessly. That is, you begin to instruct your left knee to move, fully knowing that it is in fact the third foot down on the left side. In the case of the giant lobster, Lanier reports that it takes only 2-3 minutes to remap arbitrarily placed sensors as controllers for extra limbs, ie: sensors on a chin or a knee. These astonishing reports suggest that the mind can quite quickly draw a new 'internal body representation' to allow control of the new body – effectively pulling the grey matter out of one skull and dropping it into another. This effect seems to be at odds with the traditional notion of the neurological homunculus inscribed on the brain. The arbitrary body suggests a way of understanding virtual body articulation as 'hyper-marionettry', with the homunculus functioning as a temporary map or I/O program, as opposed to 'hard-wired' circuitry.

Use of the term virtual body is often very loose and should be clarified. When we discuss the body, it seems to be in two quite different perceptual roles. We can discuss the body as a thing which is perceived, and understood to be the physical manifestation identified with the 'self'. In virtual reality this perception is purely visual and is crudely fashioned. We can also discuss the body as the thing that does the perceiving of other things outside the body. In virtual reality this perceiving is specifically visual and auditory.

Randy Walser and Eric Gullichsen have recently been quoted as saying that in cyberspace there is no need to move about in a body like the one you possess in physical reality. As you conduct more of your life and affairs in cyberspace, your conditioned notion of a unique and immutable body will give way to a far more liberated notion of 'body' as something quite disposable and, generally, limiting. You will find that some bodies work best in some conditions while others work best in others (Rheingold 1992).

This is a confusion, there is no need for a body at all in virtual reality except for narcissistic or gaming purposes. All one requires is an indication of the location of your virtual reality effectors with respect to your virtual viewpoint. As the entire physical body is represented in virtual reality by a larger and larger array of interface points, the potential diversity of one's image in virtual reality will become more limited. The variety is possible now only because you can put any shape between the image of the glove and the virtual viewpoint. Walser and Gullichsen continue: 'The ability to radically and compellingly change one's body image is bound to have a deep psychological effect, calling into question just what you consider yourself to be' (Rheingold 1992). Indeed!

From neurological research and virtual reality experimentation emerges the suggestion that our sense of self, our sense of place in the world, remains consistent and continuous purely because external reality has a certain continuity to it; that we have no internal continuous self image; that self image is volatile and only a stable 'reality' enforces a stable self image. What then are the effects of long term immersion in virtual reality, of adopting alternative bodies, and what are the effects of 'paddling' (in, out, in, out) of a variety of bodies in a variety of worlds? Could the Walser and Gullichsen experience induce a kind of schizophrenia?

The conflation of representation with kinaesthetics

One of the claims made of virtual reality is that it constitutes a liberation from the mind-body duality. It is often argued that virtual reality achieves this by side-stepping the process of translation into, and out of, symbolic representation. Lanier calls this 'post-symbolic communication'. This claim is, in my view, questionable. Lanier argues that 'the way you talk to your body doesn't use symbols' (Druckrey 1992). Fair enough. But what is then suggested to be a logical corollary does not necessarily follow: 'you can make a cup that someone else can pick up ... without ever having to use a picture or the word "cup" ... you create the experiential object "cup" rather than the symbolic object' (Druckrey 1992).

But it is not that simple. The cup in virtual reality *is* a representation – it is a stereographic image. You cannot drink out of it. But the movements of my arm to pick up the cup, and the correlation of my proprioceptive perception of my arm moving with the image of a hand moving towards the cup, *are* bodily experiences.

Handing someone a virtual cup, resolves the mind/body duality, *not* because the virtual cup bypasses the symbolic, but because the wilful action 'passing the cup' is made. Motor action occurs as a result of will; the real arm moves the representation of the cup; the arm is moving both within virtual reality and without; the realm of representation and physiology are conflated. This is the paradoxical condition of virtual reality.

William Bricken maintains that all the operations of symbolic logic can be performed in virtual reality without recourse to symbolic languages, that logic is equivalent to inference in visual programming. Set theory, number theory, and algebra can all be represented as objects in space, these systems of objects constitute mathematically rigorous systems. Binary logic can be represented as open and shut doors, and knot theory as fish swimming upstream over dams. 'All computation is algebraic pattern matching and substitution (proven)' (Bricken 1991).

There is clearly a paradigm shift in the virtual reality experience, but it *does not* bypass the symbolic and replace it with an experience that is indistinguishable from corporeal experience. The virtual reality representation is an interactive stereographic representation, an automation of pictorial representation. The appellation 'virtual reality' is unfortunate, as it makes the same sort of untenable claims for the technology that the term artificial intelligence did for that discipline. I would prefer to discuss virtual reality as a special augmented case of visual representation, such that the object is simultaneously a representation and an experiential phenomenon. Virtual reality directly 'interfaces' kinaesthetically with the body, bypassing textual and oral language. But it remains a pictorial representation and is thus subject to critical analysis. What is required is a new critique, a way of thinking about the meeting point between the immediate physiological reality of the body as lived-in, and culturally-specific conventions of representation.

Conclusion

The ideas that have constructed virtual reality are not new but have deep roots in our culture. It is therefore important to bring a cultural critique to the realm of virtual reality. Historically, technological development projects have been considered by their developers as being discontinuous with the world of everyday experience. Virtual realities must not be considered in this way, nor should the developers of these environments be encouraged to think in such a way. It is the fabric of everyday culture that lends and confines meaning in these virtual worlds. The developers and their worlds are immersed in, and informed by, the contemporary culture which is itself informed by cultural history.

Endnotes

1. Force-feedback is the term used for technologies that effect the illusion that virtual objects have some physical mass.

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Sections of this paper have been reproduced from a paper presented by the author at the Ideologies of Technologies Symposium organised by Timothy Druckrey and Gretchen Bender at the DIA Foundation, New York, 1992. It will be part of a forthcoming anthology of the same name to be published by Bay Press.

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BEVERLY JONES

Cultural MAINTENANCE & Change

> 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, ie, 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.
>
> M Heidegger in *The Question Concerning Technology*

In two prior papers I have emphasised cultural continuity within computer graphics, based in aesthetic theories and technological origins and practices (Jones 1989, 31-38; 1990, 21-30). Viewing cultural maintenance and change as interactive and concurrent, this paper addresses areas of knowledge and belief in which computer imagery and cultural change come together. I will attend primarily to the ways in which computer graphics (as *techne*) reveal or bring forth (*poiesis*) a new view of truth (*aletheia*). As Martin 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' (Heidegger 1977).

Heideggerian breakdowns, deconstructionist boundaries and implications of connectivity implied in recent computer models of complex phenomenon are used to examine simultaneous continuity and change in culture and high technology. Electronic imagery is examined without separating technological, artistic and popular uses of the imagery to reveal larger cultural patterns.

I have assumed that humans embed their world views in all symbolic and material culture including art and technology. In light of this assumption I have examined four world views that have shaped and are shaped by contemporary symbolic and material culture:

- premodern,
- modern,
- late modern or postmodern, and
- a new paradigm suggested by contemporary computer models of complex phenomenon.

In spite of the terminology used, these world views are not to be regarded as chronologically ordered. Rather they continue and co-exist in the present. They influence and are influenced by electronic art and scientific models.

Cultural change

Computer technology originated conceptually and technically in the period of transition within modernism, postmodernism and the contemporary. Consequently computer-generated artistic and scientific imagery reveal characteristics associated with these world views and the transitions marking their differences. Computer input and output moved from complete reliance on alphanumeric symbols to greater emphasis on graphic representations. Even alphanumeric textual symbols became represented as bitmapped graphics.

During the last decade computer graphics have become ubiquitous. Originally available only in large mainframe computer environments in government and corporate research institutions, computer graphics are now evident in computing environments

Simultaneously Existing World Views

Premodern

Mystical world:
- Known through ritual, meditation, spiritual practice
- Purpose: communion with mystical world

Human as spiritual entity in harmony with larger cosmos/deity/world design
Cosmic continuum of time & space/cyclical or pulsing time
European seasonal cyclical festivals
Indian cycles of creation and destructions
Graphic symbols: cycle, spiral, wave

Modern

Rational predictable clockwork world:
- Known through observation and logic
- Purpose: description, generalisation, prediction and control

Mechanistic human as separate discrete entity, generalisation, averages, statistical prediction sought
Emphasis on universality
Linear sequential time
Cartesian grid of time and space (myth of progress)

Late Modern or Postmodern

Relativistic world:
- Known through observation of the breakdowns of the modern paradigm
- Purpose: liberalisation from the universalised world view and concomitant human consequences

Human unique, alienated, no generalisation or universality possible across humanity
fractured and reassembled grid of time and space
Electronic pastiche

New Paradigm

Integral World:
- Complex, non-linear, self organising, self regulating
- Known through observation and systemic models and simulations
- Purpose: generation of organic process-oriented view of natural world with human as integral part

Human phenomena may be modelled but not predicted
Simultaneous unity and diversity
- Studies in cognitive sciences, biology, weather & origins of universe reveal similar forms
- Butterfly effect: small variation yields large effect

Time and space no longer separate (unified field)
Computer graphics of dynamic complex systems
- Simultaneously regular and unpredictable

across the globe, including the microcomputing environments of daily life (ie home, business, education, medicine, and government).

Computer graphics are employed to create new forms of human machine interface designs, as symbolic representations to facilitate navigation through databases, expert systems, hypermedia systems and other forms of information systems. With this shift in symbolic representation some aspects of information form, content, and design have become emphasised. Others have been de-emphasised. Within virtual reality environments a further shift in symbolic representation is gradually occurring. These environments are being altered to include more audio, kinaesthetic and tactile representations.

Here I want to trace shifts in world views, from modernism through postmodernism to the new paradigm of connectivity. Examples from various aspects of culture including scientific, artistic and popular electronic imagery will be presented to illustrate these shifts.

Cognitive science models of mind and development of neural net computer architecture are illustrations of recent theory and computer models of complex, dynamic, self organising phenomena. Models of these phenomena provide an impetus to a new world view characterised by connectivity. This view has stimulated a new approach to research. This approach is beyond both the prediction-control model of modernism and the relativistic model of postmodernism.

Shapes of time, change and ways of knowing

Modernism broke with the cyclical or pulsing time of Ancient Europe and Indian mythology and instituted regular linear, progressive, incremental time. The mystical world, known through ritual, meditation, and spiritual practice, was replaced by a clockwork world known through observation and logic. The clock and calendar used to assist in ritual practices contributed to the development of the modern world view. The purpose of knowledge shifted from communion with a mystical unified world to description, generalisation, prediction and control of a clockwork universe. The computer was developed to support this view which is based on the model of Cartesian logic and scientific observation. However, it has pushed the edges of this view by revealing blind spots, assumptions and inadequacies.

Postmodern relativism fractured modern regularities of the grid of time and space. A combination of this fragmented view with continuing modern assumptions reigns in most disciplinary areas of studies. However, generation of an organic process-oriented view of the natural world is becoming more evident. This view emphasises humans as integral with nature. It also tends to break with the division of body, mind, and environment.

Beyond modernism

The roots and characteristics of modernism have been discussed by scholars from many disciplines. In *The Technological Society*, Jacques Ellul (1964) builds a case for the pattern of the modern world being exemplified by characteristics of mechanical technology. These are present in industrial manufacture and information-based cultural institutions such as schools, hospitals, and government. This view of technology as dehumanising has been the basis of much literature of anti-technology. The terms componentiality, replicability, uniformity, universality, objectivity and reductionism are frequently associated with this view of modernism. These terms can be associated with many aspects of modern life. Among these are:

- experimental quantitative research in the behavioural and social sciences that stress the measurable and the norm,
- art criticism based on elements and principles of design, typography as a communication technology, and
- minimum standards for production in factories and schools.

Dependence on a single conceptual design of information, hierarchical and grid-based, is a prevalent characteristic of the modern world view. This design is found in the division of disciplines in universities, classification in scientific fields such as biology, categories used in museum collections, library indexing systems and corporate personnel charts. It is the same structure that determines the structure of standard written documents (Flower 1989). It also exists in simple computer menus, organisational strategies for computer files and addressable memory in most computers. Characteristics of hierarchical classification include the assumption that all the subject space is covered equally, that all categorical divisions are equal, discrete, and mutually exclusive.

The general or larger structure of all knowledge has been presented in a grid with each disciplinary division of knowledge as separate and exclusive. This structure works very well with a subject space that is well known. It is least effective when the subject space is innovative, unfamiliar or evolving. Even so, this is the underlying structure of both Library of Congress and Dewey Decimal indexing systems. This reflects the historical roots of this knowledge structure in seventeenth-century Cartesian logic, eighteenth-century enlightenment (growth and form of classification) and the nineteenth-century conception of science (Newtonian clockwork universe). Abstraction from the immediate sensuous world to a formulated canon of perception and knowledge became the underlying legitimated intellectual mode in modern industrial society. These underlying concepts and structures combined with the privileging of sight as perceptual tool and strong belief in the power and efficacy of alphanumeric symbols marked cultural modernism. Although computer technology developed in this atmosphere, important differences with potential for change were present quite early. The use of analog sensors, analog to digital converters and digital to analog converters, randomisation, limited stochasticism, and interactivity appeared in computer input, processing and output. Another crucial difference was the underlying structure of Boolean logic as an alternative conceptual design for information systems.

Computer generated art made use of all of these differences. Examples from early computer graphics include Bonacic's interactive computer controlled sculpture, the Automatic Painting Machine of the Computer Technique Group of Japan, and Myron Kruger's early interactive environments that he labelled 'artificial realities'. Some artists integrated other computer science domains in their work. Both Ihnatowitz's interactive kinetic sculptures and Cohen's drawings, generated by his intelligent drawing machine, utilised concepts from artificial intelligence.

However, many works retained a visual similarity to modernist art works and could be described and criticised using formalist or empiricist theories of aesthetics and criticism. Lucas (1986) attempted to derive aesthetic criteria for computer generated art via the Delphi strategy. His study of prominent computer graphic artists indicated their agreement that criteria based on elements and principles of design were primary. They also agreed that computer art did not require anything beyond artistic modernism as a theory base. Even so, interactivity was mentioned several times. Interactivity is an important variant in changing the relationship of artist and audience.

In contrast to the experts in Lucas's study, some computer artists and theorists stress the discontinuity of their art with modernism. These individuals stress the ephemeral, changing, interactive, electronic aspects of art. These characteristics could be more closely linked to a reaction against modernism. In this reaction the boundaries between art and other aspects of life break down, uncertainty reigns and art as object dematerialises. Art may be dependent on intertextual reference to historically validated art objects or other art or non-art referents from popular culture.

These characteristics are associated with postmodernism. Examples of some works from the 1990 SIGGRAPH art show illustrate these characteristics. Lane Hall's 'Decaying Infrastructure' crosses the boundaries between art and other aspects of life. Vera Molner's 'Letters of My Mother' uses controlled stochasticism to convey an emotionally charged life experience. 'Robert Mapplethorpe/The Nineties' by Randy Johnson, Stephen Meyers, Ellen Sandor, Dan Sandin, Tom DiFanti, Donna Cox, Bernard Rolzmann, Patricia Spear, Paul Neumann, and Maggie Rawlings comments on a controversial art exhibit and its relations to AIDS. Troy Innocent's and Dale Nason's work 'Cyber Dada Manifesto' links itself to an earlier art movement. Richard W Maile's 'The Birth of Elvis' appropriates an historically validated art work, Botticelli's 'Birth of Venus'. This double appropriation is an intertextual comment. Venus is replaced with an image of Elvis Presley appropriated from a beach movie. The electronic image is ideally suited to a postmodern view of art and culture (*Leonardo*, 1990).

However, the underlying grid structures inherited from Renaissance perspective (Ivins, 1973) is embedded in camera, video, and computer graphic imagery. This may suggest that the postmodern remains an extension of the modern. The invocation of and stress upon relativism and context in some works, however, mark a separation from the aspects of discreteness, originality, universality and objectivity that clearly mark modernism.

Early breakdowns

Very early breakdowns in the arts are characterised by randomisation, emphasis on context or recombination of fragments. These may be seen in the various art movements. Examples include cubism, collage, dada, and surrealism in the visual arts, John Cage's use of random, naturalistic sounds and silences in music, William Burrough's cut-ups in literature and Maurice Cunningham's choreography and performance art. These early breakdowns continue to influence contemporary electronic art.

In the theoretical world of pure science and mathematics this move toward relativism and uncertainty (ie, away from the limits set by modern nineteenth-century science), had also occurred early. Einstein's theory of relativity, Heisenberg's uncertainty principle, and quantum physics marked the decline of certainty in the physical sciences. The work of Kurt Godel suggested the limits of logical systems in pure mathematics. Thoughtful writers from multiple disciplines have increasingly focused on changing patterns of human belief. Philosophers of science have written about paradigm shifts and the limits of rationality. Computer scientists have found the limits of the nineteenth-century views embedded in hardware and software conceived by technicians creating practical applications. John Von Neumann has been cited as stating:

> The sciences do not try to explain, they hardly ever try to interpret, they mainly make models. By a model is meant a mathematical construct which with the addition of certain verbal interpretations describes observed phenomena. The justification of such a mathematical construct is solely and precisely that it is expected to work (Gleick, 1987).

An earlier physicist, Sir James Jeans, has been cited many times as saying, 'We do not make mathematical models of the world because we know so much about the world, but because we know so little'. Views such as these show clearly that mathematicians, physical scientists, and computer scientists are well aware of the thinness of their models. Breaks between the theoretical and the practical and between the sciences and the arts, humanities, and social sciences have led to misunderstandings and incomplete criticisms of the aims of theoretical and applied work in computer science as well as vice versa.

Breakdowns and continuity in computer graphics

Quite early researchers utilised computer graphics to make mathematical formulae visual. John C Mott Smith's attempts to simulate the movements of subatomic particles in a force field are an example of this. His enjoyment of the visual image and his production of photographs of a nonfunctional nature have led to the inclusion of his work in the realm of computer art. This fits quite well with the dictum of modernist aesthetics that art remain separate from the utilitarian. Simulations at Lawrence Livermore Laboratories of the energy patterns of below ground atomic blasts, simulations of structural stress for engineering done at the University of Utah, and the simulation of a four-dimensional object rolling through a three-dimensional world done at Bell Labs are also examples of relatively early uses of computer graphics to represent mathematical formula. Computer graphics have been used in many fields of science, engineering and design as a metaphoric visual aid to represent conceptual models. Using computer graphic imagery without hidden line algorithms, William Fetter produced an image of the fifty-first percentile pilot of the US Airforce. This image had seven movable systems to facilitate the functional design of cockpits for the Boeing corporation. This fits well with the prevalent modern model for research in the social sciences (ie, quantitative and normative). All of these works done in the 1960s and 1970s reflect a modern perspective.

The limits of this model have become evident both in attempts to simulate human motion in computer graphics, and in attempts to construct inclusive quantitative, logical or structuralist views in the social sciences. More recently researchers in both of these areas have turned their attention to variants, uniqueness, individuality, and context. This reflects a break with modernism. The computer graphic imagery of David Zeltzer goes beyond the normative mathematical construction of human form and movement to add these elements (1985, 105-115). Later deliberately exaggerated animations not based on visual realism stressed these variants even more (Turner 1986, 79-82). These examples show the need to consider human responses to normative simulations of visual realism. These include responses that these are unrealistic as well as emotionally and visually boring. In contrast, caricature-like models (ie, unique variants not based on simulative visual realism), appear to be more successful in stimulating the desired human response. These models exaggerate human movement and expression to create identification and response in the audience. Other breakdowns of the nineteenth-century modernist paradigm of science and technology are numerous. Prominent among these is the human response to visual simulation of reality based on three-dimensional grid space and mathematical formulae for light source, intensity, surface textures, etc. Until the problems of generating good models of these were solved in computer graphics, the degree to which humans require variants from uniformity and certainty to accept a depiction as realistic had remained invisible. It is the discovery of breakdowns such as these that lead to the potential for cultural change.

A similar breakdown occurred as desktop publishing became available to those untrained in the graphic arts. When bitmapped graphic representations of text became available on microcomputers, the design conventions observed by graphic artists had not been learned by new users of this technology. Consequently many unreadable and visually disturbing fliers and corporate reports using multiple unrelated fonts and shading patterns appeared. Those creating them and viewing them knew something was wrong, but had difficulty understanding exactly what it might be. A customary knowledge structure, the formerly invisible canons of typographic design, became apparent by their absence (Lichty 1989).

Formerly separated computer applications are beginning to merge. For example, artistic packages and visual data representation packages are becoming less and less distinct. These include image generation, digitised image capture, processing, analysis, visualisation, simulation, artistic manipulations and retouching. These applications serve a wide variety of purposes in many disciplinary areas. Computer graphics are used to create and present structures representing new concepts of information design derived in the various domains of computer science. For example, these are used in cognitive science in constructing metaphoric visual models of human cognitive processes. These models show cognition as dependent on flocking patterns of neuron firing, a dynamic connective process. This associative process dependent on neural net activity was found using simple digital computers. However, in combination with connectionist computer architecture, it is providing new ways of studying human intelligence. The massive parallel computing capacity of connectionist and neural net computers is pushing the limits of the possible.

Human visual image processing is capable of simultaneously extracting large amounts of data from an image. This ability has not been sufficiently studied in areas other than cognitive science and the visual arts. Computer visualisation laboratories are experimenting with compacting large amounts of quantitative data in graphic form. This is intended to take advantage of the capabilities of human experts to process visual graphic (not alphanumeric) information. Areas formerly considered beyond the realm of reasoned understanding are yielding to human pattern finding and interpretation via computer graphic displays.

New models of reality from computer graphics

A major breakdown/boundary appears present in work on chaos and autopoietic systems. James Gleick's statement describes the surprise that this research held for scientists from many fields: 'The apparent paradox that simple systems give rise to complex behaviour. Complex systems give rise to simple behaviour. And most important, the laws of complexity hold universally, caring not at all for the details of a system's constituent atoms' (Gleick 1987). This violated the taken-for-granted attitudes that simple systems behave in simple ways, complex behaviour implies complex causes, and different systems behave differently. This research surprised and has proven relevant to neurobiologists studying the chemistry of the human neuron, engineers studying aerodynamic problems using wind tunnels, and economists analysing psychology of purchasing decisions. This research upsets the reductionist program in applied science (separating disciplines and focus on smallest units of study). Curiously, it also upset relativists in many disciplines who have based their positions on the laws of thermodynamics.

Primarily, it has been the second law of thermodynamics that has supported relativism for the nonscientist. It implies there is a necessary tendency toward disorder (ie, a postmodern perspective). Entropy must always increase in the universe and any hypothetical isolated system within it. This law had entered the taken-for-granted realities of those in the humanities and social science. It had been used to explain disintegration of societies, economic decay, breakdown of morals and manners and other decadent or postmodern variants. This was brought into question by the work in chaos theory.

This work was given visible structure on computer graphic displays. Consequently former areas of chaos could be viewed, discovered to have patterned form and conceived to have many potential applications. Researchers from many disciplines viewed the data structures and read reports of research in other fields. They reconsidered problems they had faced unsuccessfully that they felt intuitively might be solved in this way. The crucial role that the growing availability of computer graphics held for this breakdown of old conceptual views is evident in the following example of the 1970's work of Ronald Fox, a young colleague of Joseph Ford (lecturer in chaos at the Georgia Institute of Technology).

After a short time 'playing' with an Apple II computer, Fox wrote a program that allowed him to represent graphically Feigenbaum's universal laws guiding the behaviour of feedback functions. This was at a time when no self-respecting scientist would play with such a 'toy'. (It had been purchased for Fox's son.) The immediacy and structural visibility given to conceptual structures by computer graphics have made an important change in the way of thinking of researchers in many disciplines. The work in chaos and in autopoietic systems has provided a basis for a new approach to unity in diversity as a structure of knowledge of the world. It supports a new frame of reference used by biologists describing evolution and human knowledge, ecologists theorising about the earth as a self-contained self-regulating system (an *autopoietic* system), by some cognitive scientists theorising about humans as self-contained self-regulating systems, by computer scientists involved in developing neural net systems and by physicists creating a model of the evolution of the universe.

An important human activity involves seeking, creating, and symbolising patterns to represent the world. Whether the new connectionist paradigm based on technologically generated imagery is an improved aid for accomplishing this activity remains to be seen. However, it shows continuity with the premodern world in stressing the harmonious connected wholeness of the world. It breaks with both the modern reductionist perspective and postmodern relativistic fragmentation.

It is also in harmony with a view of human knowing that stresses continuity with other natural phenomena. Models of quite different phenomena exhibit striking similarities. A dramatic example of this would be the computer model of the Post Big Bang Universe that is dependent on the connection of sentient entities as the key element of evolution. This model, created by Doug Seeley and Michael Baker at the South Australian Institute of Technology, is named from the premodern Indian myth of cosmological play that rhythmically creates and destroys the universe, LILA. This joining of the ancient with the most recent is also characteristic of several artists and groups involved in contemporary electronic arts (technopagans, feminist goddess centred artists and those interested in expressing a Dionysian perspective in virtual reality environments).

There is a striking similarity between this model and the model of cognition that depicts intelligence in brain and machine as a relational function. In this model of the brain, neuronal firing patterns act as connecting entities to make sense of the world. A third piece of research that is interesting in this light is the controversial work of a sleep researcher featured on a recent public television series. He speculates that dreams are generated as a result of electrical stimulation from the pons or brain stem every 90 minutes or so during the night, and that this stimulation exercises the connectivity functions of the brain. This results in our making sense of senseless or random input, and in meaning being generated for dreams. Since mammals and some birds undergo similar phenomena during sleep this stimulates interesting speculation on the evolutionary value of human associative and alogical pattern generation. During the modern era this form of pattern generation has been generally devalued. It has remained valued primarily in the arts.

The research connected to the new connectivity paradigm stresses connectedness of mind/body, of mind and body with environment and interconnections of phenomena within the environment. In the modern model these connections and interdependent influencing would have been viewed as harkening back to a premodern 'magical' model. A concern with the magical, spiritual and shamanic characterises the work of many contemporary nonelectronic artists and theorists.

Conceptual view: philosophical and technological

Like Terry Winograd and Fernando Flores (1986) one can 'take action as primary, [and] ask how computers can play a role in the kinds of actions that make up our lives – particularly the communicative acts that create requests and commitments and that serve to link us with others'. Like them and other contemporary theorists I question the embedded 'everyday rational' attitude that is frequently associated with technological systems. Not only Winograd and Flores but Jacques Derrida (1989) cite and comment on Heidegger's important critique, *The Question Concerning Technology*. Winograd and Flores stress Heidegger's view that we always act within a situation without the possibility of disengagement. Consequently acts cannot be understood as the results of a process of representing, planning and reasoning. The readiness-to-hand of the world is revealed through our actions. 'We are always engaged in acting within a situation, without the opportunity to fully disengage ourselves and function as detached observers.' Winograd and Flores propose that a similar view characterises the work of biologist, Humberto Maturana:

> ... our ability to function as observers is generated from our functioning as structure-determined systems, shaped by structural coupling. Every organism is engaged in a pattern of activity that is triggered by changes in its medium, and that has the potential to change the structure of the organism (and hence to change its future behaviour) (Winograd & Flores 1986, 71).

Consequently, we may be viewed as *autopoietic* systems. Maturana takes the position that we may be easily led into fruitless quests for corresponding mechanisms if we believe representations are present in the nervous system (Maturana & Varela 1987). This implies a misplaced concreteness. In this he explicitly rejects the stance of objective realism, for example Putnam's early work on computability of mind (Putnam, 1975; 1980, 464-82).

Similarly Heidegger's critique questions the distinction between the knowing subject, the knower, and a separable object, the known. Heidegger sees representation as a derivative phenomenon. In his view knowledge lies in the being that situates us in the world not in a reflective representation. It is this view that has been embodied and developed in later phenomenological, existential, hermeneutic and speech-act philosophies. An even more radical position regarding knowledge of reality is proposed by Derrida (1989). In his reading of Heidegger, he stresses the importance of conceptual structures, patterns and systems of knowledge. He regards those structures eluding modern rationalism as most revealing.

Hypotheses regarding knowledge and representation are key in the design of information based technology. This form of technology serves as tools for knowledge amplification and manipulation. Our understanding of what knowledge and representation are, how they are related or how they may be used, is crucial in shaping design decisions for information based technology and consequently in the design decisions made in other domains. These include the conventional design domains of graphic design, product design and architecture as well as the more recent design domain of knowledge systems. Computer graphics plays an important role in all of these.

In *Patterns, Thinking, and Cognition* Howard Margolis (1987) takes a conservative view. This early work reflects the view that patterns derive their existence from interest plus logic thus remaining rooted in the modern. An historical view of representations of various forms of logic and their relationships to technologies of communication leads to views such as that of Walter Ong's theory of transformative technologies (Ong 1971). He maintains, for example, that the development of typography and printing led to the rise of modern logic, that is, it amplified the cultural impact of the logic of Ramus via printed texts of his lectures (Ong 1958). For the first time language could be put in the form of modern industrial design emphasising efficiency, standardisation, replicability, and componentiality. Jacques Ellul (1964) extends this view to show how human organisations and institutions have been shaped by the same factors. Consequently both symbolic and material culture may be seen as expressing the structures and logic of modernism. Like Ellul and Ong, I agree that technology may amplify or de-emphasise factors and thus shape symbolic and material culture. This, in turn, shapes the larger conceptual view of reality in a given culture and time. This concurs with the more colourful view of Holbein on design:

> Design as process, and design as product, encompass practically any aspect of life. Design can be urban design or architectural design or product design or dressmaking, but it can also be cooking or singing or making war or making love (Holbein, 200).

In short, our way-of-being in the world shapes and is shaped by design (of symbolic and material culture). The philosophical argument for the existence of God called Argument by Design could exist only in a certain culture and time. Because it is based upon the concept that the design embodied in the physical world could come only from the mind of God, it is culturally and historically bound to a premodern world. Likewise, only in the modern world did it become possible to purchase rationally constructed, published or broadcasted recipes for music, cooking, dressmaking, conducting war, or making love. However ubiquitous their publication and distribution, their origin and design remained rationally oriented, expertly designed and hierarchically controlled within the modernist industrially designed culture. Electronic information processing and distribution have the potential to alter this emphasis on hierarchical structure in simple and complex ways. Computer graphic models have emphasised some views of order and revealed the limits of others. Consequently, they alter our way-of-being in the world. A cynic might state that if order did not exist in the world we would be forced to invent it. We may be said to be constantly inventing ourselves, our symbolic relations with the world, and the form of material culture that expresses these relations.

Many research and applied domains are using computer graphics in a variety of ways without concern for the research behind the creation of computer graphics. I have chosen to join computer graphics and design (in the broadest sense) with other domains to illustrate the interplay of design of symbolic communication, patterns of knowledge structures and breakdowns of conceptual limits. This is intended to illustrate their shared ground in changing the limits of how we may view the world. In this regard I cite the work of Winograd and Flores. They critique discourse in the cognitive sciences that centres on understanding human thought, discourse and action. They state that it is determined by a 'taken-for-granted attitude shaped by the underlying assumptions of the rationalist tradition'. They further state: 'Implicit in our critique is a statement that the cognitive science research program ... will have important limitations in its scope and in its power to explain what we are and what we do'.

This limitation of truth and belief based upon a socio-historically embedded world view is also explored by Margolis (1987). He traces the difficulties of changing from Ptolemaic to Copernican astronomy. He also cites the difficulty Kepler had in giving up the perfect form of the circle for planetary orbits for the less perfect ellipse. Joseph Weizenbaum (1976) also traces the impact of technological invention upon the conceptual definitions of aspects of life. For example, he cites the invention of the microscope as shifting disease from defined as supernaturally caused (God's wrath or test of strength, a la Job) to being attributed to natural causes (germs). These examples are interesting in that they indicate breakdowns of taken-for-granted cultural constructs. The French Annales historical research group and ethnomethodological researchers in anthropology and sociology have attempted to elucidate our understanding via focus on areas of breakdown in understanding as they occur across history and across cultures (Clifford 1988). The hermeneutic philosophy of Gadamer (1976) includes the concept of a personal horizon. Both of these approaches to research draw upon his concept (Gadamer 1975) which represents a limit of the possible due to historically and socially constructed beliefs.

Breakdowns and borders

Breakdowns are described as interrupting our habitual, standard, comfortable being-in-the-world. They reveal to us the nature of our practices and equipment, making them 'present to hand' (ie, available for our examination), perhaps for the first time. New design can emerge only in the awareness that comes from breakdowns and the borders which they reveal. It is these borders that are the focus of schools of thought such as hermeneutics, post-structuralism, and deconstruction. Viewed using these philosophical contexts, contemporary computer graphic simulations of chaotic systems and strange attractors may be said to illuminate and alter the borders of our understanding.

The rationality of Descartes is embodied in the grid system underlying computer graphics. It is also present in the standard retrieval systems in many of our socially constructed information systems such as library catalogue systems and computer menu structures. However, Boolean logic underlies many electronic structures and provides a less rigidly structured view of information. The weighted or fuzzy logic of Zadeh allows logical structures of less certainty. Bayesian decision structures include statistically specified stochasticism. Within a relatively short time these conceptual structures have become part of the daily lived experience of many individuals who had experienced or studied only Aristotelian and Cartesian logic. Included among these individuals are artists, designers and users of contemporary products. Household appliances have chips with fuzzy logic embedded in their control mechanisms. Video game players of all ages experience the branching patterns of programs built upon Boolean logic and designed stochasticism. Children and executives choose from computer graphic diagrams representing models of knowledge for navigation in hypermedia information systems. These models of knowledge may be based upon design of a virtual building, a path describing a knowledge construct, a smart filter determined by user interest or others (Dede 1988). In short, the ways we describe and negotiate information has been changed by the combination and intervention of computer graphics and structures derived from research in artificial intelligence, information retrieval, and other areas of information-based technology (Fairchild, Poltrock & Furnas 1987). These conceptual structures enter and change the lived experience of more and more individuals and contribute to culture change.

Many of the very young seem quite able to negotiate these conceptual spaces with relative confidence and certainty. However, some users report disorientation and failure to make sense of *the* structure, not realising that they may choose from several potential structures. Complaints are raised such as, 'I can't find my way back to the beginning of this', which implies belief in the universality of a linear and probably hierarchical structure. Researchers in the humanities and social sciences often request, 'Can we put this in a matrix for easier understanding?'. Legitimation of prior structures is revealed by their absence. Here an area of breakdown and borders is brought forth. It reveals culture change being wrought by widespread use of a new form of communication employing information based technology.

Deconstruction and knowledge systems

These factors support the view that a plurality of cultural worlds exists in which we participate. Deconstruction focuses on illuminating the existence of the unexpected in the taken-for-granted. The embedment of prior architectures of thought in new technological or scientific or artistic forms is accepted as fundamental by deconstructionists. Focus on the frame or the border is characteristic of this school of thought.

In *Truth in Painting*, Derrida reveals the 'framing' discourse of post-Kantian aesthetic theory (1987a, 33). This 'framing' discourse has been aimed at legitimising its own existence by fixing the boundary between art and other modes of knowledge, including paradoxically, art history and theory. In this work, Derrida demystifies the notion of the aesthetic as a realm of purely disinterested values, one in which conflicts are laid to rest through the free play of harmonised faculties.

An information system that calls into question similar assumptions is Ted Nelson's Project Xanadu (1987; 1988) This system is built upon his desire to democratise not only the distribution of information, but the authoring of information. It allows any user to change any information in any way, so multiple concurrent versions exist. It also allows the tracing of all changes and variations. Although the system itself is constructed by an expert, the information included in it, and the manner of its usage leads to a form that is self-constructing and self-regulating. In essence, this system could take the author from authority and reveal taken for granted canons of design. This is the same spirit as deconstructive theorists in literature and visual artists using appropriated images from art history and popular culture. Interestingly, 'close reading' (ie, critical deconstructive viewing to reveal breakdowns and borders), demands extensive knowledge (Eco 1979). For less knowledgeable readers or viewers, all that exists is a feeling that something is not quite right; clarity and understanding are not complete. Again, invisible taken-for-granted structures are revealed by their absence. Literary deconstruction also breaks another modernist boundary related to hierarchy. For example, there is frequently a blurring of the boundaries between writer and critic. Implied in this is the end of literature in the sense of the end of any special status accorded to it.

Webs of meaning and implications

In the arts, humanities, social sciences and philosophy of science the value of plurality of views is being recognised. A 1988 conference in the sociology of science held in Bielefeld, Germany, presented a research program stressing changes in premises resulting from models based on dynamic, self-regulating, self-organising systems. These systems reflect a new perspective derived from computer generated models displayed graphically. This research program is based on the following assumptions:

1. Complexity as a genuine irreducible phenomenon. This was made evident via computer models of deterministic-recursive systems in which simple mathematical equation systems provide extremely complex behaviour.
2. Irregularity of nature is normal, not an anomaly, and forms the focus of research. Non-equilibrium processes are recognised as the source of order and the search for equilibrium is replaced by search for dynamics of process.
3. Self-regulating model of systemic closure replaces the classical system-environment model based on external control. Effects produced by the system are the causes of systemic organisation and maintenance. In sufficiently complex systems internal self-observation and self-control form the basis of cognition. Any information a system provides on its environment is a system-internal construct. The 'reference to the other' is merely a special case of 'self reference' (Krohn et al, 1990).

The importance of interactive computer graphics becomes evident in depicting simultaneous multiple relations and versions, making visual sense of chaos and multidimensional statistical structures and offering individualised choices and routes through learning materials. The privileged position of alphanumeric representation is being questioned, the grid has become insufficient as a structure in which to place knowledge. Visual electronic images have begun to take a prominent role in re-visioning knowledge construction in the arts, humanities and social sciences, as well as in the natural sciences. The boundaries between these disciplinary views of the world are becoming blurred by the transformability of digital information.

In the world of the visual arts, reconstructionists such as Suzi Gablik and artist-theorist Heide Abendroth Gottner appear to be moving in the direction of the new paradigm of connectivity. They link their perspectives to a revival of the premodern rather than to electronic imagery. They are interested in relationships of the aesthetic to social, spiritual and ecological issues and see art as playing an active role in these realms. Another group, also interested in the re-enchantment of art and its link to the spiritual, stresses the integral connected role art should play in all aspects of life. This perspective is reflected in David Ray Griffin's collection of essays, *Sacred Interconnections: Spirituality, political economy and art*. Many artists and theorists who belong to this group are concerned with the relationship of mind/body, human to human, human to nature and the underlying spiritual connections between these.

The recent work of theorist and writer Helene Cixous (1990), especially her readings of Lispector, provide an analogy in literature to the conceptual patterns described in this paper. Her work does this in several ways: at an abstract level of 'life affirming rather than negating' (parallel to discussion of the second law of thermodynamics), joining of formerly separate concerns (ie, 'aesthetic, social and corporeal'). She strives toward a mode of revealing that addresses 'nonexclusive differences so the other is other without being thought of in merely negative or propositional terms such as that of the nonself'. In this she illuminates the prejudice lying beneath normalising standards and uniformity in modernism. This view is also characteristic of contemporary social science research.

In a recent issue of *Mondo 2000* Brenda Laurel, a theorist and practitioner in the electronic arts, discusses the following topics that relate to the issues addressed in this paper:

- mind/body problem and anti-feminist bias in hacker stereotypes;
- need to build virtual reality so people (nontechnologists) can shape it from inside the experience;
- difficulty of addressing multiculturalism and cultural diversity in multimedia;
- advocates 'infinite diversity in infinite combinations';
- advocates model of 'fusion' people such as Brian Hughes and Sandy Stone who combine knowledge from social science and humanities with computer sciences;
- departs from concept of global, non-unique culture characteristic of modernism. Advocating instead individual and cultural uniqueness as contributing to whole.

Metaphors of modernity intended to model reality are mechanical, divisive and orderly. Those of the postmodern are fragmented and combined serendipitously. Metaphors influenced by the new view of simultaneous unity and diversity (ie, *autopoesis*), are biological and associative. They often involve nets or webs that join in multiple harmonious dynamic patterns.

This latter view has potential for applied as well as conceptual usage. For example, in the applied discipline of education Ralph Abraham, a mathematician, suggests the simple model of the 'daisy world' of James E Lovelock and Lynn Margulis as a teaching tool. This model allows students to understand the earth as a self-regulating system. According to Abraham, it educates them 'to be better members of the board of directors of the planet' (Gleick 1987, 279).

A concern shared by many artists, designers, educators, literary theorists such as Helene Cixous, and philosophers such as Maurice Merleau-Ponty (1962), Mark Johnson (1987), and John A Schumacher (1989) is the importance of corporeal experience, the play of the senses beyond that of sight. Schumacher goes so far as to propose that the nature of all human inquiry is based on posture. The developmental psychologist

Howard Gardner's theory of multiple intelligence also reflects this view (Gardner 1983).

Graphics beyond sight: utilising sensual corporeal information

At the University of North Carolina, whole body movement in a virtual environment assists physicians in directing a gamma-ray beam to destroy cancerous tumours. At the Human Interface Technology Lab at the University of Washington, meteorologists fly through virtual weather systems, designers sit in virtual cars and walk through unbuilt office buildings. At Autodesk Inc in Sausalito, Randal Walser states that virtual reality is an artistic media for building imaginary worlds. At this site, able bodied participants play racquet ball with disabled partners and learn to experience the sensation of flight without a plane. In nearby schools children use the technology developed by Autodesk to create virtual worlds. At NASA's Ames Research Center near Mountain View one may fly through a virtual simulation of the Valley of Marinis on Mars (Stewart 1991).

William Gibson depicts disembodied intellects of expert programmers travelling through landscapes of visual information in his cyberpunk science fiction. Current work in scientific visualisation in combination with the hardware and software of communication networks provides the grounds for the existence of this space. Combining these technologies with developing virtual reality may present new ways of knowing beyond the modern biases of power and efficacy of alphanumeric symbols and text as validated vehicle of communication. Although tactile and kinaesthetic information has been introduced to virtual reality environments they currently continue the modern bias of the privilege of sight as a perceptual tool.

The importance of this bias is revealed if we consider the role of instruments such as the microscope, telescope, cameras and videos. Postmodern critics have directed our attention to the objectification of gaze, alienation and dehumanisation involved in the design and use of these instruments. Continuities of the modern into the late or postmodern are also characteristic of computer graphics and some virtual environments. The thinness of modern reality, the mind/body separation was strongly embedded in the origins of computer technology. The discomfort many artists have felt in moving from traditional media to electronic media related to the difficulty of communicating content that involves bodily response. Most electronic art involves bodily alienation; however, an exception that comes to mind is the early work using biofeedback instrumentation. The opportunity to involve bodily response is undoubtedly one of the reasons that virtual reality is so exciting to artists.

Jaron Lanier, creator of virtual realities, claims that experience of the best virtual reality simulations heightens experience of the ordinary world. It does so by increasing our awareness of what is missing from the technologically constructed virtual world. He stresses infinite subtlety of the physical world where there is always something new to see, and something unexpected to discover. This reminds us that our human adaptability and skills of self-creation evolve, fill in or make complete any conceptual structure intended to model reality.

Conclusions

Breakdowns and boundaries as well as cultural continuities occur in similar form across many disciplinary areas. High technology, especially computers, presents an interesting subject area for discovering both breakdowns and continuities in culture change from modern through the postmodern to the new paradigm of connectivity. Surprisingly, this latter area with its links to the premodern view of a harmonious connected magical view of the world traces its origins to the use of computer graphics in the description of complex patterns of natural phenomena. These patterns had previously been considered too irregular for study. The new paradigm accepts the simultaneous irregularity and regularity of these patterns. This new view allows scientists and technologists to focus on the alogical and associative as well as the logical, as artists have.

Similar assumptions mark the work of artists and theorists involved in reconstruction, art as social and spiritual connection and expression and the work of scientists and technologists involved in cognitive science and neural net research who have come to value emotion as much as intellect for cognition (Levine & Leven 1992). Characteristics traditionally valued by artists, such as emotional expression, associative and alogical connections of information and reliance upon sensual perception, are coming to be valued in the world of technology. Combined with the concerns of reconstructionists and critics such as Cixous for life affirming connections between people, humans and nature, these views provide a possible new view that contrasts sharply with the emphasis on disembodied observation that has been characteristic of modern science. It is a sharp departure from the emphasis on objective surveillance and noninvolvement of modernism and from the relativistic fragmented view of the postmodern. For example, the modern view accepts the use of electronic technology to record and view human suffering with no physical, sensual or emotional involvement. It is this position that accepts the use of computer controlled video surveillance as integrated into smart missiles. This position also led to the development of virtual environments to simulate battle conditions. The postmodern perspective revealed the problematic nature of broadcast television and video embodying the modern perspective. Will new user/audiences join technologies of video, computer graphics and virtual reality to the new world view of connectivity to create widespread breakdown of the model of the world as objective manageable information?

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JENNIFER HALL

A COMPUTER CONTROLLED MARIONETTE for *OUT OF THE BODY THEATRE*

As long ago as 30 years, graphic researchers were well on their way to moulding what we now term virtual reality (VR). At that time we saw our first head/ceiling mounted display for interactive stereoscopic wire frame viewing, and had appropriated flight simulator technologies to develop tracking devices for human motion. Twenty years ago, some of the same pioneers gave us the invaluable 'walking algorithm': a code to describe the gait of a human walk which was then transcribed into a computer graphic stick figure. We have been working ever since to *really* make it a reality.

When I began to work in interactive gestural media twelve years ago, its limitations were instantly apparent. At that time, I could use trackers to describe human motion (and much of its complexity) but I could not see and manipulate it in real-time. This real-time interaction is critical to the concept of VR. Researchers working with these limitations knew they had to achieve a sophistication of image rendering to achieve a 1:1 relationship of action-to-motion.

Poised between the technological world of development (and the sweet taste of its promises), and my need as an artist to get some art made, my work led me away from the inherent problems associated with display and real-time action-to-motion. I became engrossed in the collection of human motion data with the expectation that eventually chips would get cheap enough and processors fast enough to develop the tracked-data file structure that could be plugged into the world of virtual reality and make it truly a reality.

In the meantime, I watched the world around me and the fever that was beginning to rise in the collective temperature of my culture. Everyone had become obsessed with virtual worlds. My students had become frantic about the possibilities of 'plugging in', 'tuning in' and 'dropping out'. An entire culture had developed, anxiously awaiting the chance to leave the reality of their own lives and go to the place where they could get away from the world called themselves. We had members of the culture lining up for temporal vacations while the VR experts were still back at the lab counting polygons.

Nevertheless popular reading material and broadcast media exploited the hype. The populace began to rely on the promises: 'The possibilities are endless!', exclaimed the technocrats. 'Unexplored creativity!', chanted the philosophers. 'I don't know what it is, but I know I want one!', chimed the people.

I must admit that this phenomenon has made me continue my work with great caution. After all, we are not vacuum cleaners, or souped-up abacuses. We are people with endless possibilities already. We *are* open systems, and machines are not. We have created these new tools (like any others we have ever made, mind you) in our own likeness – simply like us. They cannot take us anywhere we have not yet already imagined. That is the myth of virtual reality.

However, VR is part of the continuum of intellectual evolution where the value lies primarily in our ability to study our own nature. There are questions we have had to ask ourselves from the beginning of conscious time: what is reality, thinking, and perception? Can these constructs be sampled, synthesised, or even objectively perceived? Certainly each one of us is much more than the totality of our sensorial input, processing capabilities and production qualities. The questions in the abstract are interesting indeed. But this is the rub: evolving technologies are not as functional as the theory. When we become locked into the task of development, the questions asked more often than not are: 'how do we make it happen, financially?'; 'how do we get it to work, technically?'.

The gap between *virtual* and *reality* appears huge to me. On the one hand, we have the labour and genius of 'research and development', and on the other, the execution of a sophisticated application. This remains the dichotomy that reaches the very heart of the virtual reality experience.

In an attempt to side-slip uneven development of display technologies, I decided to bring my tracked data back to life through computer-aided machine applications.

Out of the Body Theatre

Historically, computer controlled human forms have been constructed for very specific applications. To date, the best funded resources have been prostheses for space travel, body replacement, and special effects within the entertainment industry. Looking at the computer controlled marionette certainly makes one think it would be well suited as a prop for another *Metropolis/RoboCop/Terminator*/put-your-favourite-sci-fi-flick-project here.

However, the marionette is a robot built in the spirit of a gestural Golem: a response to the winsomeness of human form and spirit. Her function is not to imitate human motion but, as traditional art forms do, reflect a more personal and inner self.

Furthermore, how differently might she be designed for gender? I pondered upon my collection of kitsch images of modern woman and technology. I have images of the tinkering male doctor who gently solders the shoulder of an anatomically correct blonde female (from *Galaxy Science Fiction Magazine,* September 1954), and the male scientist clad in white lab coat who enters information through a slot in the backside of a headless and hollow beauty (Rutland 1979). These are the images and the ideals which I grew up with. And now, of course, they are seen as the kitsch concoctions of a technologically uneducated era. When I thought about the 1950s, I looked around and asked myself how did I fit into the world of glittery technology and fast-paced super heroines?

Why was Wonder Woman always clad in short dresses, stockings with go-go boots, and wearing perfect hair? How could she perform her myriad duties if she had to worry about crossing her legs when she sat? What function could this sort of outfit serve? After reminiscing about the go-go boots of my own pre-teen years, I realised there really is no other reason. It is that simple: we created that female super-woman-of-the-future as the ideal of pleasure and personal servicing.

I think female robots got the same schtick as my childhood super heroines. When we think of a robot carrying certain attributes such as aesthetics or perhaps more delicate applications, its gender is thought of as female. A fine example is the wind-up automata dolls found during turn of the century Europe and North America. Enchanting, adorable, with the function of chasca. There is little reference to female automata today beyond these outdated models. The computer controlled marionette is my alternative to this cliche. *Out of the Body Theatre* are performances where the marionette is used to help construct a woman's journeys of identification into a sense of self which exists during dreams, epileptic seizures, madness, and places where the human psyche is not as defined as we might imagine it to be.

As an extension of my own self, the nature of the marionette is a reflection of the interlaced relationship of perceived body and psyche. In this way, we can think of all the things we make and do as human beings to be an extension of our selves. It is how we *see* ourselves that designates how we build our perceived reality of *world* around us. The function of our tools is to transmit our own nature onto our surrounding reality. It appears to me that my society is obsessed with acquiring exceptionally large areas to transmit this reality into.

For example, the worth of an individual is better when they own more things. Or the worth of a country is better when it consumes smaller countries. Or the white collar dream to control the stock market. Like the size of anything in Texas. This is my heritage. Americans are obsessed with the computer because it is able to propagate this image. The digital machine can assist in our aggressive and territorial nature faster that any other tool we have ever made.

As an alternative, I think of the marionette simply as an extension of myself. I do not think of it as a metaphor to empower the entire world. It is a personal relationship where I naturally internalise aspects of her in the form of kinaesthetic and perceptual habits. In this sense, she not only becomes an extension of my perception, but modifies it, thus altering the basis of my effective relationship to myself, to her, and subsequently, to the world.

I believe that if anyone takes another look at the accepted ways of thinking about automata and virtual reality, they will find much more personal ways to use it. I believe my culture needs to re-engineer our collective perspective about technology to encompass the intimate and private. *Out of the Body Theatre* is such a reflection on my own private observations of perceived reality which is not concrete or irrefutable.

Computer controlled marionette technique

Out of the Body Theatre is a network of electronic devices that, through their interconnections, service each other. A performance space is prepared with tracking devices, processors, and outputs to computer controlled lighting, projection and sound. I use the term *environmental tracking* to refer to this collection, by machine, of the physical movement of a performer. The collection is raw data read and arranged by an object-oriented computer language. It links together unlikely structures such as computers to people, people to automata, automata to video projection, and as light, back to computers.

For example, the movement of a performer across the path of a video camera would trigger the movement of the marionette by activating a pre-described motion stored in the computer. The program calls upon files stored as both words and an associated image. This is an easy way to scan and locate action files of all kinds which can be plugged into a performance. The use of a video camera and edge detection software allows the movement of the performer to be tracked. It is a simple digitiser that employs time delayed colour separations to calculate trajectory of motion.

Human motion can also be translated by optical tracking techniques and read by the marionette as a hierarchical structure made of a torso and its limbs. For instance, the fingers are children of the hand or wrist, which is a child of the elbow, which is a child of the shoulder, which is finally attached to the chest. The data is collected by special cameras, and software which is used to coordinate the larger the aspects of the performance such as lighting, projection, and sound.

The hierarchical structure chosen for the marionette has been simplified tremendously by two different techniques. First, the upper torso of the marionette is radio-controlled. This is appropriate for the delicate gestures needed for the arms and the subtle yawl, roll and pitch rotations of the neck. Altering the wave form of the signal through a small, unobtrusive computer chip enables the small on-board motors to double their radial efficiency. This eliminates excessive gearing, and in turn, keeps the weight and visual clutter on the upper torso to a minimum. The remainder of the marionette relies on joints that limit motion through wires connected to pulleys, bailers and motors. These wires enable the marionette to achieve aerial positions that, in performance, appear to defy gravity. The wires found in traditional marionettes help to retain a more intuitive feeling of body motion. The combination of radio and wire controlled joint manipulation, helps to retain this intuitive feeling of *gesture*.

In conclusion, computer control of the marionette represents a significant breakthrough in coordination of complex movement. It allows a software sequencer to handle as many of the synchronised events as required, as well as coordination of sophisticated live work between the computers, other machines, director, and performers. It is also a simple tool that helps in the unification of a concept: everything that appears so exclusive to itself within the performance arena, is indeed, all together as one.

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MARSHALL BELL

Will it take SANCTIONS AGAINST AUSTRALIA TO GET US INTO THE BLACK?

This paper is about the problems that are besetting the indigenous art industry of this country. In particular, it focuses on the lack of the support and direction that is needed to advance our art to formats that would make possible mass circulation and wider audiences. I would like to share my experiences with you, to provide an insight into our industry as a starting point from which to formulate a better future. But I must do this in our way, starting at a certain point in time and slowly working forward. Historically, this is how the *indigenous* Australian has constructed dialogue, utilising concepts of past, present and future.

Firstly then, I should introduce myself. I was born on the now defunct Charleville Aboriginal Reserve, in the deserts of south west Queensland, some six hundred miles west of Brisbane. The community was made up of local Bidgeri, Koomu, and Nguri clanspeople. It was not my ancestral homeland, but it was not far from some of both my mother's country (50 miles south of Charleville) and my father's country (the Chesterson Ranges, 80 miles to the east). I was born into third-world conditions – no running water (we had to buy it), no electricity (we used a wood stove), carbide lights, kerosene refrigerator, and no sewage (we had to shit in a tin and bury it). The house was made of corrugated iron, assorted nails, and tree trunks that were cut from the bush. For our food we ate freshwater jewfish, crayfish, swans, emus, goannas, and rabbits, amongst other foods introduced by the Europeans. The harsh conditions were matched by a harsh environment and harsh climate. Generally though, these times are remembered fondly.

My ancestry makes me a descendant of the Kamilaroi nation, Gunnedah of the Namoi River in north west New South Wales; the Koomus of the Nebine Creek to the Warrego River area, including Cunnamulla; the Koreng Gorengs of the Northern Burnett district including that section of the Great Dividing Range; the famous Jimans of the Dawson River; and the Nguris of the Chesterson Range across to the Carnarvon Gorge.

My early childhood was spent at Charleville and Mitchell. Although I started school in Darwin, most of my schooling was in Mitchell and Dalby. On leaving school, I travelled and worked in different parts of Australia – Darwin, Redfern, and the Coffs Harbour region. I have spent the last ten years in Brisbane, where I find the countryside and climate suits me admirably. In fact it is fair to say that I have a love relationship with the place.

Each of these places gave me varying experiences to draw upon. The place that has given me the most would have to be Redfern. It was here that I lived very much on the front line in the battle for Black Australia. The theme of the front line movement was 'White Australia calls us radicals, Black Australia calls us freedom fighters'.

Today I reside in the Brisbane suburb of Inala in sunny Queensland, with my wife Rosemary and two children: Samantha aged twelve and Collis aged eleven. Inala is one of those areas made up of state-owned houses. This is as close as we get to clan living today. Of the houses neighbouring us, four are occupied by Murri families. In fact, 1200 Murris live in the three suburbs that make up the area. Murri organisations employ most of the local indigenous population. These organisations include a pre-school, a neighbourhood centre, a resource centre, a family education centre, and a cultural studies centre. Amongst other off-shoots of these organisations, the area has grown an identity of its own.

I was taught to paint by my mother when I was about twelve. My mother manufactured 21st birthday and wedding cakes. It got to the stage where she was having trouble keeping up with orders – hence the need for me to become involved. Mum worked on the theory that if I could paint, then I would be able to ice and decorate cakes. The theory worked, because no one complained or even knew that I iced a lot of those cakes. The experience stood me in good stead for my own artistic career (as it did for my brother Richard's).

My entrance to the art world was delayed for a short while by my unwillingness to toe the line of Queensland Aboriginal Creations (the Queensland government's retail outlet) who insisted that artists only paint stories they had selected. They had no permission to use stories from Northern Territory and Kimberley region artists, which they stole from books (like some others I know in the culture industry). This retail outlet used to hand out barks to paint, but would not give them to anyone who was unwilling to paint these stories. I felt ill at ease painting someone else's stuff, so I painted weapons. That was eight years ago. We have since rallied support to address these problems. At the end of this paper I will outline some recommendations recently compiled by Queensland Murri artists to tackle government interference and other problems in our industry.

I began my career painting for local Brisbane indigenous artefact manufacturers. This included making and painting many, many returning boomerangs. To this day my favourite surface to work on is a nice smooth piece of wood. I used this period to consolidate my abilities so that I could paint everything to a very high standard. It is common practice for Aboriginal artists all over the country to collaborate on artworks. My local Murri arts community sees being able to paint as 'sharing the load'. One can sit and paint the same boomerangs with other painters. Each painter will pick one of the four colours used – red, black, yellow or white – and work with the others, painting a single colour design until the boomerangs are finished. Having achieved this level, I then moved toward the fine art arena, where I have worked for the last few years.

In this period my work has combined contemporary and traditional images of self-determination using painting, computer-generated layouts, dioramas with coloured lights, mixed media installations, photographic transparencies, projections and political posters. At the same time I have had to work in an administrative capacity facilitating projects to make sure we had support for those who are struggling and an audience for our art. I am certain that any advances I make in the realms of electronic art will be tempered by my ability to bring our social and political situation to the art audience – and this I cannot do alone. I would like to see many more indigenous artists have the opportunity to extend their media and achieve wider recognition. Perhaps this can happen through collaboration. Our culture has always played down the role of the individual and promoted the group. We must acknowledge group ownership of much of our art, from rock art sites to land rights stories, if our culture is to be acknowledged at all. It follows that from sharing our art we must also share technology.

These last few years have taken me through some very exciting changes, where much more of my time is spent on arts facilitation than on the practical nature of art making. My involvement in arts facilitation has lead me to look at ways to speed up the processes of art production. The one way I have been able to achieve this is in the area of electronic art. As well as the underlying cultural forces that lead me, I have a desire to challenge the preconceived parameters of indigenous Australian art. Hence I was pleased to accept the recent invitation to collaborate on a multi-media installation with Richard Bell and Michael Eather for the Ninth Biennale of Sydney (1992/93). Although I would very much like the opportunity to explore the new fields of computer-generated images, animation, laser sculptures and multi-media installation further, there are problems I see that must be overcome before pursuing these new arenas full time.

Firstly, there is a need for decent art education and training to be made available to indigenous artists. There is also an urgent need for constructive support mechanisms for professional artists to be put in place now. These support strategies must mesh with indigenous art values in a coherent manner. Art institutions will of necessity have to look at ways to remove the shackles of rigid bureaucratic institutionalisation thathave held us back. We must be allowed to experience fundamental art training on our own terms and so be allowed the opportunity to explore and experience the many art forms and mediums that are available today. These developments must take place in the true spirit of cooperation, sharing and learning from each other, if we are to fully reach our potential.

The problem with this transitional stage is that we the indigenous artists do not have access to information about what is *possible* let alone the relevant technology and expertise for *producing* electronic art. There appears to me to be a perpetration of ignorance by white Australia in withholding information and access, knowingly or unknowingly. For the moment, we seem to be stuck at this point.

This is something that Australia must come to grips with if we are to have a level playing field for the arts and culture. To contextualise this point and to understand why we are working in isolation, it is appropriate to explore what has been happening to the indigenous people over the last two hundred years. You may have heard similar stories before, so I prefer to use the history of my own ancestors, beginning at the period of invasion.

The history of this country through my eyes must surely rank as the worst mass genocide ever perpetrated on any people – including the Jews, the Irish and the Japanese of Hiroshima. There has been a program of blatant and, in more recent times, not so obvious genocide running in this country for over two hundred years. This has changed in shape and form, depending on the level of sophistication adopted by the government.

When the white man came, they made their way to my country on two fronts. The first travelled in boats to the coast of Queensland, where they then travelled inland from the east. The second group came up through the inland river systems from the south. Each was empowered with the knowledge that the doctrine of *terra nullius* was legal, and that there would be no retribution for their actions. The implementation of this dehumanised and now out-dated law would have been grounds for initiating war crime trials in justice systems anywhere else in the world. But none has ever taken place – not here in the lucky country.

The Jiman people numbered over 2,500 in 1800. In the next 100 years this once proud people were almost totally destroyed. By the mid 1800s the first wave of smallpox hit, killing half the total number of Jiman. Within twenty years a second wave of smallpox killed half the surviving Jiman people, reducing their numbers to about five or six hundred. Despite this decimation, the Jimans also hold the record for the most successful guerrilla war waged against the colonisers by this country's indigenous people at any one time.

Retribution from the white government for these activities was devastating. The native police were brought in and proceeded to massacre an estimated three hundred Jimans. At the same time a relative of the white people who were the target of the Jiman's retaliatory rage, returned from Brisbane and continued the slaughter of some two to three hundred Jimans. When I was researching my ancestry I could find only four women who made it into the 20th century. Of those only three gave birth to any children. Today, the Jimans number around four hundred. If this is evidence of how my people can survive cultural genocide, it makes me wonder what our next step is. Perhaps there is a role for electronic art in cultural practice. If the art of the future is going to be relevant at all then it certainly must take our history into consideration.

The eminent anthropologist Malvaney estimates that in 1770 Australia's population was between 700,000 and 1,000,000. In the mid 1900s the recorded indigenous population hit the low 40,000s. Today we number over 200,000. If you were wondering what became of all the indigenous Australian people, I can tell you that what happened to the Jiman happened to much of Australia, with particular ferocity in the eastern areas of Australia, where the majority of Australian people (black and white) now reside.

If we use Malvaney's figures to estimate what our indigenous population should be today, we would number in the vicinity of millions. We would have our own black government and black opposition. We would have our own black minister for the arts. The huge amount of funding today being wasted on propping up European art principles and formats for indigenous artists would have gone into making this country's indigenous culture rich and much sought after. This line of thought is often greeted with scorn by white Australia. But it does serve the useful purpose of highlighting the maltreatment and devaluation our culture has suffered. It may bring a line of racist rebukes, but it is really about making Australia face up to the responsibilities of its indigenous population. Australia has not compensated the indigenous people of this country to a just and rightful level. Instead we are forced to endure more racism, quite often resulting in shameful guilt for shameless handouts.

I have said that the genocide perpetrated upon our race has taken different forms at different times. Let me demonstrate how I perceive this has happened and is still happening today – with, I believe, deliberate and calculated attempts at disguise. These actions have a direct influence on our cultural practice, and are worth discussing when we speak of art – in the past, present and future, whether it is rock art, community art or electronic art.

Land has always been the base Aboriginal Australian people have survived on. Take this away and deny access to those areas and you remove the basis of an Aboriginal spirituality. Forcibly introduce other forms of religion while at the same time imposing moral judgment and you will have a devastated people. This has happened to us in the past, and in some parts of Australia these impositions are still being perpetrated. This was further exacerbated by setting up missions and reserves: the indigenous Queenslanders were forcibly removed from their lands and taken away to places like Taroom, Woorabinda and Cherbourg under the paternalistic policy of 'protection'. The effect of this was compounded by threats that if they used their culture (or even spoke their language) they would be sent even further afield to places like Palm Island or Hopevale. Here they were separated from their families, as well as their land, law and language. To the Aboriginals these were places not dissimilar to Nazi concentration camps. The implementation of this policy has led to the present situation where mainstream Australia and indigenous Australia are culturally poles apart, living in almost total isolation from one another.

When non-Aboriginal people are looking for, say, an indigenous Australian artist to present a lecture or a paper such as this one, they have absolutely no idea where to start or who to ask from the indigenous cultural industry. They cannot possibly know who best serves the needs of a particular agenda, nor expect someone to produce constructive information that has real relevance to the artist of today (beyond expressing their obvious desire to have an Aboriginal presence!). In an industry where large numbers of artists are unemployed, untutored and being denied opportunities, I feel it is vital to develop formats where information can be easily accessed and transferred. Is this in itself a form of electronic art?

Further illustrating this alienation and isolation is the apparent lack of indigenous cultural heroes and role models. The way it is developing, we have non-Aboriginals telling Aboriginals who their heroes should be by choosing those who fit white cultural systems. Aboriginal leaders who have the ability to be cultural heroes have never been given this status by either community. Important Queensland cultural figures from quite recently (let's say the last thirty years), such as Larry Leedie, Willie McKenzie and Arthur Peterson, are sinking further into oblivion as each day passes. If they were born three hundred years ago, these cultural heroes would have been celebrated in song, dance and art.

Do you really think I believe that technology and electronic media of today have not played a role in this cultural genocide? Here we see the sophistication of this two-hundred-year-old genocide changing its shape to accommodate new levels of self righteousness to suit its own requirements. The biggest damage being done to indigenous Australia by the electronic media is the content, or lack of it. Within the circulation of mass media information, this has the effect of stealing our children's hearts and minds. Today the heroes and icons that are being manufactured for them have not one iota of relevance to us.

The health of the indigenous Australian is another example. Why have we as a race not been warned of the problems that go with a changeover from a nomadic lifestyle to that of the present? Please do not insult my intelligence by saying that the colonisers did not know what these changes meant. This change of lifestyle, foods and eating habits, have given us a tremendous number of health problems, with many of our people not living past forty, or our children not surviving their early months. I wonder about those people who live in remote areas with little or no access to mainstream information services and centres. Are they aware that this is happening to them? If we had access to electronic media to construct our messages and stories, surely we would be commenting on these issues. Perhaps the art generated from electronic media might actually communicate to the visually literate art world and give focus to these issues.

It seems to me that the administrative work involved in facilitating projects and large-scale mixed media collaborations is just as important as painting boomerangs and canvases. The necessity of working to develop a support structure that will redress Queensland's history of deliberate suppression of indigenous culture has become apparent to me in the last two years. Investigations into this area, including a proposal for a computerised data base and image bank for indigenous artists, has resulted in the first Queensland Aboriginal and Torres Strait Islanders Visual Artists Conference held at Yarrabah Aboriginal community. From this conference came 31 recommendations and support strategies initiated by a large group of artists. They included funding, education, marketing and legal strategies. I would like to present some of those that are possibly relevant here:

- That state and federal education departments implement ATSI (Aboriginal and Torres Strait Islander) art education and support programs across all levels, eg pre-school to post-graduate studies. This would include artists in schools, artists in residencies, workshops, murals, commissions etc.
- That state and federal educational institutions implement more ATSI courses, especially arts awareness programs throughout the state in consultation with QICVA (our elected statewide artists management committee) and their respective regional communities.
- That a series of seminars take place between the relevant educational and cultural bodies to help facilitate the cultural needs of those regions.
- That ATSIC and DEET provide the necessary funds required for QICVA in their educational up-grading to appropriately advise, support and coordinate their respective regions. This includes computer courses, data basing skills, photography skills, report writing and funding submissions, knowledge of art history, art theory etc.
- That DEET relinquish to QICVA all responsibilities, including funding arrangements and screening processes, with respect to all training courses, workshops and educational activities involving Queensland Aboriginal and Torres Strait Island Arts and Crafts. This is to ensure a coordinated program of arts training is taking place in regional Queensland within the established ATSI network.
- That art educational bodies recognise Aboriginal artists with experience, expertise and qualifications on similar levels as that of a diploma and other academic levels.
- That QICVA make application to the federal government to ban the importation of cultural properties identified as those belonging to the indigenous people of this country. This would include Aboriginal art, artefacts, boomerangs, woomeras, fabric designs etc.
- That QICVA make application to the federal government for Queensland ATSI artists to have access to museum collections world-wide concerning matters of cultural heritage. This includes skeletal remains, paintings, photographs, artefacts, and other cultural properties relevant to their origins. Return of this property world-wide at the expense of the federal government.
- That current restrictions imposed on the use of traditional materials involving the cultural practice of Queensland ATSI artists be lifted. This would include: to collect a limited number of turtle shells for

art works from food gathering, emu eggs, porcupine quills, certain bird feathers etc.

- Copyright: That a simple publication and accompanying video be prepared outlining moral rights, artists rights and copyright restrictions for artists. This would be done in conjunction with QICVA, Aboriginal Artists Management Association, Queensland Artworkers Alliance and the Arts Law Centre and be widely distributed amongst artists in Queensland.
- That the state and federal governments recognise group ownership of artwork. This would include rock art, boomerang design and significant cultural property etc. This also applies to artwork on land areas where indigenous groups of people have been removed.

I believe that indigenous art and culture can now tackle all these health, social and political problems from a very different angle.

In a recent mock collage painting my brother, Richard Bell, created the ironic media headline 'South Africa Leads Call For Sanctions Against Australia'. Will it indeed take sanctions to get Australia back into the Black? Should Aboriginal people comment upon these issues in the processes of contemporary art? If so, what possibilities do the electronic media hold? Surely we can talk about our economy and our education. We are the landowners! While most Australian politicians are busy trying to save us with welfare handouts and an obsolete education system, I would like to think I am out there instilling in the indigenous people a desire to live. The only way I can achieve this is through cultural practice, and my art is central to this. Our culture, unlike that of white Australians, is the way we come to our spirituality. It is the way we come to our decisions and it is the way we arrive at our self being. We do not take our culture lightly.

Marshall Bell began his career painting Aboriginal artefacts and now combines contemporary and traditional means to present images of Aboriginal self-determination and culture. He has been involved in numerous educational workshops, conferences and commissions in support of indigenous Australian art and artists. He is currently Co-Director of the Campfire Consultancy in Brisbane.

historical references, first-hand encounters, and theoretical projections. In the search for new forms of interfacing, we refer to *STRING CYCLES*, a hypermedia work-in-progress by Peter d'Agostino. Its voice represents the nature of our discussion on the subject of orality and literacy and the nature of the techno-cultural interface. A mix of stories and descriptions, the methodology of this presentation will incorporate some trace of the methods under discussion. Here, we present a dialogue, a metalogue (Bateson 1972) on these issues.

In the small mining community of Coober Pedy in the centre of South Australia, a transplanted Croatian philosopher named Ivan Radeka maintains an underground hostel for overnight wayfarers en route along the Stuart Highway. Meeting the bus in the middle of the night, Ivan Radeka escorts his guests to their subterranean quarters. The following day, he leads a tour over scarred earth through a post-industrial wasteland of rusted machine parts and mechanical skeletons, out beyond the edge of town to the sacred mounts and the limitless expanse of an enchanted forest and an ancient sea. Later, Radeka invites his guests to a discussion of the physical-spiritual, phenomenological interface between post-apocalyptic environments, between dreams and reality, between knowledge and ignorance.

Over the more than thirty-five years he has spent living in Coober Pedy, Ivan Radeka has assembled a discourse on the conjunction of time and space that comes from Aboriginal people, from the desert, from the geology and engineering principles guiding the regional mining of opal, and from a knowledge of mathematics and physics. With a mix of humility and certainty, Ivan Radeka's philosophy posits the logic of balance in an expanding-contracting universe, the life force in the expanding-contracting lungs of a breathing individual, the threshold between energy and matter. Radeka describes a 'zero point', marking a navigational conception site where a body-world correlation may begin.

Ivan Radeka – an oral poet, a composer of tales – embodies the storyteller. His carefully calculated logic weaves together a lifetime of references for interested listeners to question, to challenge, to assimilate and discard at will. Radeka's contact with his guests blunts the electronic age described by Walter J Ong, the 'age of secondary orality'. Ivan Radeka's orality builds from his direct contact with his visitor(s) and branches according to that immediate interaction.

Analogous to the energy released from a burning object, when a human being ('no more than a compilation of dust') begins to think, that individual stretches into the fourth dimension (an awareness of time). Recognising the state of these energy-matter relations does not, however, in and of itself, represent a transcendental leap of consciousness. The temporal fulcrum of the physical universe is only the embarkation point for pursuing truth; where an infinite future meets an infinite past; where an endless landscape meets a limitless horizon, marking the zero point on the path toward enlightenment.

According to Radeka, the Aboriginal people know this better than the Europeans. Certain members of all human tribes operate in the fourth dimension, but few individuals know how to locate their zero point. The necessity of preserving certain native cultures 'telepathically' in touch with their temporal status, the necessity of preserving those tribes in the context of a larger universe, becomes clear. The task embraces a wide spectrum of concerns.

In a contracting world with an expanding human population, formulating a concept of balance and working to sustain it marks the pivotal challenge. Unfortunately, the homogenised world culture has little trace of indigenous earth-bound identity. The prognosis, usually bleak when it comes to saving the earth's environment, provides one rationale for populating the new frontier of space.

Instead of a bleak future with a homogenised and pervasive high-tech culture, maybe a new orality can be developed to connect high-tech and traditional cultures by using voice-activated computers? The proposal assumes an acceptance of the disruption in continuity associated with current post-industrial schizo-culture, as opposed to looking for a utopian restoration of the past.

> 'Dismembering may be a prelude to remembering, which is not merely restoring some past intact but setting it in

DAVID TAFLER & PETER d'AGOSTINO

THE TECHNO/*Cultural* INTERFACE

In a contracting world, real-time visual telecommunication may become a 'hologrammatic' nightmare. As high-tech applications proliferate, they threaten to accelerate the eradication 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 of social forces disrupts, fragments, and eventually destroys contingent customs and practices, particularly those predicated on earlier, now outmoded, networks of time and space.

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

The electronic age is an age of 'secondary orality', the orality of telephones, radio, and television, which depends on writing and print for its existence (Ong 1982). This notion of 'secondary orality' harbours the potential for the continuity of oral cultures without the disruptive and arbitrary shifts to literacy. Earlier examples include the theories of oral performance from the Homeric tradition developed in the 1930s (Parry 1989; Lord 1960), Worth and Adair's project (*Navajos Film Themselves*) and the Warlpiri Media Association efforts to make their own television programs in the 1980s, as reported by anthropologist Eric Michaels (1987). The Warlpiri 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 boundaries of high-tech and traditional cultures in the electronic margins of the digital arts and sciences. Here, a platform exists for engaging and contesting new influences, for making connections within frameworks determined by self- or community-originating spiritual, ideological, aesthetic, and social standards.

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

A metadiscourse such as this one must always self-referentially examine its own process. A written embodiment of the process of examining the interface between written and oral cultures risks losing the flexibility to adjust to the overlapping, criss-crossing factors mediating a constantly changing, evolving communication. A statement by ethnographic filmmaker Jean Rouch aptly captures the problem:

> The fundamental problem in all social science is that the facts are always distorted by the presence of the person who asks questions. You distort the answer simply by posing a question (Georgakas et al 1978).

Caught in this double bind, this written project represents an effort to build a fluid dialogue of ideas and positions from certain

> living relationship to the present' (Turner 1980).

Recognising the expansion and contraction of underlying social and economic forces helps to codify the plethora of transpiring developments. Of all the shifting techno-environmental parameters, electronic media/ communications form the respective axes around which all this activity hinges.

According to Ong (1982), 'oral discourse has commonly been thought of in oral milieus as weaving or stitching – rhapsoidien, to 'rhapsodise' basically means in Greek to stitch songs together'. From their tribal origin in traditional oral cultures, string-figure games have become universally known and played by children of wide and varied ethnic origins. D'Agostino's *STRING CYCLES* uses the ancient art form of string-figure games, popularly known as Cat's Cradle, as an allegory for the transmission of knowledge in our contemporary electronic age. *STRING CYCLES* interweaves aspects of the oral tradition with new technological forms. Through an on-going process, it provides the threads to link a continuum of past in a 'living relationship to the present'.

The subjects of the string-figures commonly derive from activities of daily life or from nature – with configurations that illustrate the stars, the planets, and phenomena such as lightning. Anthropologist Franz Boas described Eskimo string-figures in his writings of 1888 (Boas 1965). By some accounts, these games may have originated in Asia.

In this age of electronic information, however, television and video games have replaced many forms of storytelling. String games may remain but their narrative function has virtually disappeared. Through analogy and metaphor, the processes of 'the game', as well as many of the cross-cultural sources, become integral parts for expanding the interactive possibilities of this hypermedia project. They include on-line telecommunications networks utilising databases and telepresence, and computer or videophone links from a variety of remote sites. They continue to expand the potential cultural diversity of their participants. These 'interactors' take on qualities of the oral performance discussed by Parry in *The Language of Achilles* and Lord in *The Singer of Tales*. The 'oral poet is a composer. Our singer of tales is a composer of tales. Singer, performer, composer, and poet are one under different aspects *but at the same time*' (Lord 1960, 13).

As a living oral history project, *STRING CYCLES* documents aspects of cross-cultural storytelling. Several interrelated threads and themes simultaneously run through the work. While the string-figure games operate in both a literal and figurative sense, they are primarily thought of as a structuring device to combine narratives from a broad spectrum of cultural traditions, from Aboriginal 'songlines', African folktales, and Native American creation stories, to the Homeric epics of Serbo-Croation singers playing the one-stringed 'gusle' instrument, the visual poetics of Stephen Mallarme, and the multi-dimensional 'SuperString' theories of contemporary physics, which have uncanny parallels to the Buddhist allegory of Indra's Net:

> Indra's Net tells of an endless net of threads throughout the universe – the horizontal threads running through space, the vertical threads running through time ... At every crossing of threads is an individual and every individual is a crystal bead; every crystal bead reflects not only the light from every other crystal in the net but also every reflection of every reflection in the universe (Hofstadter 1979, 258).

Each thread and theme, song and string connects and augments tradition by fortifying a sense of self in the context of a difficult and complex universe. Within each community, each individual develops a sense of perspective from their relationships with their peers. Within nature, a community measures its existence by its relationship with the environment. Insofar as these relations remain in constant transition, the interface governing their process becomes a critical site triggering as well as measuring change.

The transformation of the notion of the interface device begins from primitive sticks, paint, pencil and pen, the television screen and its remote control. It continues with the computer keyboard, mouse, touch-screen, and voice activation. Would a voice-activated interface draw a contemporary community closer to orality? How can we begin to speculate? While voice activation as a technology exists, it has yet to be integrated into the type of scenario we have become accustomed to in science fiction novels and films such as *2001*, *Star Trek*, and a host of others. Transported back to our time in the film *Star Trek IV*, engineer Scotty attempts to activate a desktop computer by picking up the mouse and talking into it. Coming from a future society using sophisticated voice-activated computers, he confronts the relatively crude and obsolescent point-and-click technology, which for him proves to be entirely useless. In constant use now, the keyboard, the mouse, and the touch-screen represent the limited springboard of user-friendly interfaces from the early desktop era. From these practical devices come the utopian visions and dystopian nightmares of HAL, the computer in *2001*. HAL not only uses speech recognition and language, it also possesses an artificial intelligence that can virtually take command of the space mission.

Media codifies experience; in short all human history and activity. (By no means sacrosanct, the shape of communications technology embodies other struggles. The natural/artificial split, the consequence of altering the environment, represents the most crucial struggle with the most far-reaching and profound consequences.) A voice-activated interface does not represent the universal solution. The notion of the interface should remain open to simultaneous possibilities. One system does not necessarily replace the other.

A generation brought up on television first begins to believe in the screen as an interface, then (in rapid progression) in the remote control, the videotape, the computer game. Broader notions of interface devices suggest more potent implications. In *The Art of Human-Computer Interface Design*, Brenda Laurel writes that:

> When the concept of the interface first began to emerge, it was commonly understood as the hardware and software through which a human and a computer could communicate. As it has evolved, the concept has come to include the cognitive and emotional aspects of the user's experience as well (Laurel 1992, xi).

Two examples of the broadly defined concepts of the interface can perhaps illustrate what we mean. When the domestic videotape of the infamous beating of Rodney King by Los Angeles police in 1991 was shown on television, it was edited to suit the short-clip TV broadcast format. Later, in court, defence attorneys for the police used a slow-motion version to show analytically just the opposite of what the viewing public had been led to believe on television. In this case, the police officers' night sticks became 'interface devices'. The different uses of the original videotape became 'interfacing strategies'.

The viewing public could only judge the days of rioting and looting that followed the verdict by the selective footage of the TV broadcasts and the slow-motion videotape presentations. Finally, and ironically, the viewer saw the face and heard the voice of Rodney King on television, now the personification of the 'other', himself, pleading for togetherness: 'Stop making it horrible ... Can't we all get along?'

Another graphic example of interfacing – the televised 1991 Gulf War – put virtual reality on display. First, CNN and broadcast network prime-time news transmitted the live sounds and images of the war. Dehumanised, the camera eye of the computer-driven smart bomb positioned its audience within the point of view of the bomb, not of the victims on the ground or anyone viewing the destruction. The bombs moved into their targets, recorded their hits, and exploded not unlike a videogame. Lecture demonstrations by the generals reduced the press coverage to news conferences heralding the success of these strikes. Rarely did other eye witnesses capture the action on video. The news media offered very little evidence of civilian casualties. Even when evidence appeared, it was quickly denied.

Triggered by the stress and strain of expansion, encroachment, and war, the nature/culture interface becomes the crucial frontier. In a recent article describing the annihilation of native culture in the Yosemite Valley of California, Rebecca Solnit writes: 'Many people believe in something untouched called nature, and that only the untouched is natural' (1992, 56). Inseparable sides of the same world, every development in one forces a chain of effects in the other. The sequence of events remains in process until the oscillation remedies any residual imbalance. That chain can stretch beyond fathomable limits, often leading to dire consequences.

Along this horizon, a techno-cultural chain of events often threatens to dislocate cultural activity from the grounded patterns and progressions traditionally governing life activity within those societies whose culture aligns with nature. For these tribes to survive, the restoration of balance becomes crucial.

Balance does not mean equivalence. As an entropic concept, it defines the operant forces active within any and every historic/temporal location or space. As a cyclical entity, the possibilities and constraints of every time and space causally influence their play. Bound with and yet unrestrained by the environment, animal behavior remains the principal agent of nature. The human animal, not surprisingly, makes the only discernible difference. Solnit quotes Ursula LeGuin's reference to California:

> What the whites perceived as a wilderness to be 'tamed' was in fact better known to human beings than it has ever been since, known and named. Every hill, every valley, creek, canyon, gulch, gully, drain, point, bluff, beach, bend, good-sized boulder, and tree of any character had its name, its place in the order of things (Solnit 1992, 56).

This failure to acknowledge or recognise the culture-nature interface represents the evolution of civilisations whose muddled figure/ground categorisations have truncated tribes from their ancestral habitat. Renaming the sacred mounts, these industrial societies measure their presence by the extent to which their manufacturing tools tear up and reconfigure the environment.

The concept of environment becomes a theoretical platform for defining operant forces. As defined by commodities, space equals the presence and absence of raw goods: forests, minerals, waterways, fertile soil, fair climate, and favourable topography. More recently, 'information' has reached the status of a commodity. No longer dependent on groups of people, its distributed production has liberated communities from the space-dictated constraints of their immediate surroundings. Expanded information technology opens up formerly one-company towns to outside influences (Manning 1992, 22-33). Another nature-culture severation transpires. This blatant separation between human tribes and their surroundings embodies the increasingly bounded and contained experience of industrialised societies.

As defined by experience, readable technologies distance individuals from the conditions mediating their environment. While other animals experience cold, a human reads cold by the thermometer in the window. What happens to the experience of cold? What happens to experience? In his book *Technology and the Lifeworld*, Don Ihde writes:

> In a cold environment, I could tactilely experience the wind and chill; but if I have 'chosen' to mediate that cold by wearing down clothing, I now substitute feeling the wind for feeling the warmth of what I am wearing. In this case, the 'environment' is simply brought close and itself has the texture of one of the many cocoons humans employ in all non-Garden situations. The technology (clothing), however, transforms this immediately experienced environment; and it is that transformation which must be investigated (Ihde 1990, 17).

What does the experience of 'cold' mean when viewed through the window? The electronic window, television of course, marks the crucial interface. If experience defines environment, what ramifications follow the reconstruction or elimination of experience? Ihde continues:

> Direct bodily-perceptual contact with an environment counts as one side of the non-technologically/technologically mediated human experience that forms the focus of an entry into the analysis of human-technology relations (1990, 17).

Perhaps that body-perception portal has a (hi)story.

Stories recuperate technological advances that have distanced human societies from the rigours of their environment. Stories function to maintain a balance by cognitively bridging the techno-environmental frontier. Bridging generations, stories tell of forgotten experiences while transmitting knowledge, lineage, and insight. Insofar as they transcend spatial and temporal constraints, the formulation and exchange of stories represent the harbinger of more advanced telecommunications.

Each generation of stories augments the former. Each new technology contributes to this ancient process of mediation. With each qualitative or quantitative, virtual or real disruption, new forces carry the potential to disturb the targeted equilibrium of older stories, their traditions and displaced systems of communication.

A number of factors determine the extent to which new communications technology will change this history, its construct and operation. Subtleties of scale affect these factors. As a function of population density, the transmission of meaning/significance may vary when shifted from the intimacy of a one-to-one or one-to-few encounter, to a one-to-many, or many-to-many production. Information has value. The exchange of that value remains contingent on who maintains access, how certain individuals or groups generate interpretation, and what form of transformation accompanies each phase of further communication.

Habitat shapes communities: topography and climate, proximity to raw materials, farm and industrial production, coastal areas and other population centres. Driven by economies of scale, technology's role depends on the requirements and constraints of each group as cast by their particular habitat. Since technology plays to the largest common denominator, it eradicates differences. Without difference, meaning ceases to have any value. Therefore, small communities must fabricate a certain difference. With the latest technological advances, those remote possibilities exist. Unfortunately, the techno-intrusion threatens to disturb whatever lingering balance remains within native communities.

Aboriginal law, an 'ideology of participation', serves as the perfect example (the term is borrowed from Trudel 1991, 72). As a web of relations, the law keeps the fluctuating relationships of a fluid community of living individuals, situated within an ancestral history, in balance over time. All exchanges – ritualistic, personal, economic – represent divided allocations, reciprocal obligations, perpetually recalculated and reassigned to bring the system back into line (Michaels 1987, 18, 23, 32). Over time, these balances between relations – mediated and controlled – take place over many communications.

In all societies, a common set of traditions, economic needs and social practices define the individual and link that individual into a larger community. In urban civilisations, money mediates and adjusts relations. Money balances the exchanges that initially stem from one's lineage and position. Its uneven distribution becomes a source of power and authority.

To a varying degree, depending on the society, the ideology of the individual masks the interdependence of all people within an industrialised society. The cult of the individual fuels the illusion of limitless freedom. In Aboriginal society, the 'law' foregrounds relationships. This awareness empowers the individual with a legitimate understanding of his or her position. That position has a history and a future guaranteed by those rituals and obligations in support of the law. This reciprocity affects authorship and viewership. It also affects performance.

The story serves as the currency of this exchange. Some family or group owns every story. Specific individuals identify with and assume responsibility for preserving the authenticity of particular stories and their transmission (Michaels 1987, 33). With all stories inscribed by the land, new stories become variants, missing parts – forgotten, now rediscovered – of known accounts. In an oral culture, retrieval operates within the system.

When an oral culture comes in contact with a culture with a written history where recording takes precedence over performance, a problematic schism emerges. Mummifying the system of exchange bankrupts the social order. How does an oral culture bring new technology inside the law?

Replacing linear devices such as the typewriter with the multiplex menu-driven environment of the computer opens up an exchange with the tools that threaten the integrity of language, the story, communication. As the relationship between the machine and its operator changes, so do the relationships among individuals and groups. At the heart, destabilising this interface, rests the nested structure of interactivity. The interactive portal heralds the realm of limitless future possibility. It also poses the gravest risk. Quite unlike the face-to-face encounter between two individuals, interactive conduits mediate the relationship among users. Loaded with parameters, the conditions, codes and procedures of that interaction become the cultural interface, the frontier of appropriation and control.

At the juncture of cultural activity how does any single system reconcile difference? In a computer environment, language has a much broader meaning. Its syntax extends to the procedures nested in the commands. A linear routine represents a grammatical arrangement whose logic lies deeply immersed within lifestyle, within environment derived traditions. Any mass-produced hardware responds to the lifestyle/environmental needs of the largest body of potential users.

Within the more critical area of command structure, programmers writing software do not design, or have the capability of designing, a Rosetta Stone of interpolative response. Users from other cultures must conform to alien scripts. Pull-down menus allocate response activity within certain categorically operant cells. The opacity of computer codes means the loss of inflection and dialect.

For an oral culture, the problem lies within the instruments themselves. Working at a screen implies a fixed set of written conditions that codify the practice and mediate the message. A categorical menu represents a logic derived from specific organisational practices. An assembly-line mentality imposes an arbitrary, perhaps artificial order to those categories and their sub-routines. Original input gets nested into files, folders, boxes, screens, stored in absolute and finite temporal/spatial borders. When these frames adumbrate the message, what happens to the user?

How does the screen change the potential reservoir of stories? With an attention fixed system, can the user adjust the interface to accommodate different story recipients? Does the system shift with reversed roles or recognise the relative differences in the exchange? Does the system permit violations of its built-in limitations?

An interactive system must transcend the programming parameters implicit in the machine. This can come about if the machine serves as a conduit for relaying messages fabricated through some other structuring system. One possibility lies with interactive television. Here, the system merely delivers a message by obviating spatial distance. It works like a telephone with visual and collective features. Designing a flexible software with manipulable access made available to the hypersyntactic input of the user is another possibility. If a user-friendly environment permits the user to structure the grammatical interface, accommodation is feasible. Perhaps, an intermediary between the native community and the manufacturing society can participate in designing an instrument compatible with the needs of local community groups and native tribes. This idealistic and, perhaps, unrealistic collaboration may enable or empower native cultures to preserve their diversity and autonomy. Would that collaboration compromise industrial imperatives?

Why should a community acquire these tools if they have historically functioned successfully without access? Smaller communities do use new tools and their lifestyles do change. Though this techno-integration takes place at a slower pace, its traumatic upheaval remains potentially far more disproportionate. These communities must co-exist with an encroaching outside/other force within a limited and shrinking horizon. For these cultures, the consequences of this compression may mean the irremediable loss of their history, their storytelling apparatus, their contact with the earth and the stars, their balance, and their bonds and relationships. The boundaries shift. Refuge disappears. Smaller communities must appropriate the tools and develop their own conventions in order to weave their own stories and chart their own survival.

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REJANE SPITZ

COMPUTER GRAPHICS *as* *a* CROSS-*Cultural* EXPERIENCE

Culture refers to systems of shared ideas, concepts and meanings that underlie and are expressed in the ways that people live. In the words of Geertz, 'culture is the fabric of meaning in terms of which human beings interpret their experience and guide their action' (Geertz 1978).

Although there are many similarities in the ways that human beings live, each culture has produced its own historical paradigms and codes. Given the same problems and resources, people from diverse cultural backgrounds have developed different ideas, languages, methods, tools and objects.

Music is a good example of cultural richness. The possible combinations of sounds and rhythms have been explored by different cultures originating an incredible musical diversity. European medieval music, Indian lullabies, African songs, jazz, rock, bossa nova, and so on. There is no such thing as an international pattern that could possibly judge the musical quality of these various styles. Each one is the result of a socio-historical situation, and has its own intrinsic value for each community.

The proliferation of the use of computer graphics technology raises questions about its effectiveness as a cross-cultural means of expression and communication. Like the strings of a guitar or the keys of a piano, the basic elements of computer graphics may be the same in different cultures. But even dealing with similar technological concepts of bits and bytes, algorithms and pixels, we should still expect from computer graphics the same artistic richness we find in music throughout the world. However, in spite of the continuous growth of computer related technologies, many artists agree that most computer graphics works do not reflect the real potential of this new technology. Nadin (1989) argues that once we have seen one computer graphic image it seems that we have seen them all. Binkley (1989) points out that the new approach to making art offered by computers is not yet well understood by artists. Aston (1987) highlights the fact that technology produced a levelling effect which made many images look the same everywhere. He quotes Martin Lambie-Nairn, who commented that computer graphics became like the Tin Man in the *Wizard of Oz* – all shiny on the outside but no heart beating on the inside.

Why are artists more constrained by binary codes and algorithms than by clay or ink? Is computer technology so radically different from other artistic technologies? Our ancestors were able to foresee the expressive potential of a pigment extracted from fruits and plants. They faced the introduction of the mechanical printing process, they survived the advent of photography, they discovered new artistic languages in the film and video technologies. But we seem not to be capable of acknowledging our contemporary technological changes, or of assimilating the new means of artistic expression that are now available. Moreover, only a few of us actively participate in the process of computer technological development.

As Stephen Wilson (1986) writes:

> artists have historically served in the time-honoured role of culture reflectors and interpreters. They have helped their audiences to look beneath the surface and to connect the unconnected. Certainly the computer-generated ripples of cultural change washing over the contemporary world cry out for the searching eye and hand of the artist. When artists make

> computers part of their subject matter, they act as a tonic for the cultural development process.

Many authors argue that the use of computer graphics technology makes it possible to extend not only the physical skills of artists but also their cognitive capabilities. By using this technology artists can explore new ideas, create original imagery and develop new expressive means (Owen 1990).

In the light of these ideas, some questions arise: does culture affect the way artists perceive and use computers? Is it possible to discuss computer aesthetics in multicultural terms? What is the role of the artist in the technological development of computer graphics?

In his principles for painters and architects, Taylor suggests that the veracity of a painting is the direct result of the extent to which light reflected from its surface approximates to the light which would be reflected from the depicted object (quoted in Deregowski 1980). Although Taylor wrote in the early eighteenth century, his view – that there is an optimum way of depicting an object, purely based on physical and optical laws – is widely shared today by many computer graphics professionals.

The concept has encouraged certain paths of technological development in computer graphics, developments which in turn have influenced the resulting imagery. The notion that reality can be represented by a set of mathematical equations has directed many researches in computer graphics, leading to a greater homogeneity of visual results. Western European cultural conventions for depicting visual reality have prevailed over other existing representational models (Jones 1989).

Becoming conscious of our cultural preconceptions – or aware of our own 'cultural glasses' (Keesing 1981) – is a hard task. We too often fall into the trap of ethnocentrism. We tend to think about other people's ways of life in terms of our own cultural point of view. The ability to recognise objects in pictures, for instance, is so common in most cultures that it is often taken for granted as a universal human capability. Experiments have shown, however, that it is not: there are significant differences in the way pictorial information is processed and interpreted by people from different cultural groups (Deregowski 1972). Many authors stress that the ability to identify the objects represented two-dimensionally in pictures requires specific learning (Jahoda & McGurk 1982).

Cross-cultural studies on pictorial perception carried out with people from remote and illiterate tribes have discovered some interesting reactions. Research carried out early this century by Lloyd found that:

> The first picture flashed on the sheet was that of an elephant. The wildest excitement immediately prevailed, many of the people jumping up and shouting, fearing the beast must be alive, while those nearest to the sheet sprang up and fled (Deregowski 1980).

But we don't need to go to remote villages in order to observe interesting responses to the presentation of new visual technologies. During recent SIGGRAPH exhibitions (sponsored by the Association for Computing Machinery's Special Interest Group on Computer Graphics), I witnessed similar reactions to those reported by anthropologists during their field studies. I observed people from North American literate tribes, wearing head-mounted displays and data gloves, experiencing virtual environments they could tele-exist in. As they navigated into the images, some of them would laugh with excitement, while others would feel intimidated by the new technology, showing signs of fear or motion sickness. In the words of Meredith Bricken, when experiencing virtual reality environments, 'novices require minimal accommodation time' (Bricken 1991).

The introduction of new forms of art and technology have always represented an important stage, in every culture. In 1926 Ossip Brik, a leading Soviet exponent of futurism, wrote in his article 'Photography versus Painting' that:

> the photographers themselves do not realise their social importance. They think they are only artisans, humble workers far removed from artists and painters. The photographer is enormously impressed by the fact that ... paintings are presented in large exhibitions with varnishing days, catalogues, buffets food and speeches, and that such exhibitions are regarded as cultural events. All this confirms him in

> the idea that painting is true art, photography merely an insignificant craft. This explains every photographer's dream to achieve a painterly effect in his photographs. He does not understand that this chasing after painterly attitudes and the slavish imitation of painting destroys his craft and takes away the forcefulness on which its social importance is based (Brik 1979).

Wilson says that computers promise both great opportunity and danger:

> They could usher in a dark age of increasing passivity and centralisation and a decay into faceless mass society; or they could bring about a great flowering of individual choice, expression and access to information and communication (Wilson 1990).

Human perception is not merely a photographic representation of 'reality', but a slow process of construction of a meaningful culturally-based world. Since culture does affect human perception and cognition, one would expect cultural variations to be reflected in computer graphics images developed by artists from widely differing cultural backgrounds. Some authors have focused on the need for new aesthetic models for evaluating computer art (Jones 1989). But is it possible to discuss computer aesthetics in multicultural terms?

As Keesing (1981) suggests, a culture is always an abstraction, a simplification created in order to capture and describe as a system the shared elements of socially distributed knowledge. We can only discuss aesthetics as a system of conventions established within the artist's cultural group. Jones analyses computer graphics as a reflection of culturally embedded aesthetic theories based on differing views of reality: the conventions embedded in computer graphics technology limit the models that are available.

It seems that for the computer industry the similarities between the customs of various societies are more important than the differences. But in spite of a trend of continuous internationalisation of computer graphics software and equipment, culture still plays a fundamental role as it affects computer graphics artistic approach, methodology, and results. Just as computer technology has much to gain from research on cultural differences, so does the industry stand to profit from discoveries made on preferences among different groups.

The existence of a variety of means of expression and communication among cultures should not be considered an obstacle for computer graphics development. Instead, we have to take advantage of our diversity in order to investigate multiple technological paths that may coexist. The old Tower of Babel can be actually built – and it will lead us to heaven – if we adopt a less ethnocentric view and respect our cultural differences. Computer graphics technology can only benefit from such attitude. The potential for speaking multicultural languages – with the flavour, the look and the rhythms of each different culture in the world – is already available in computer graphics technology. The decision to make it another means of cultural domination or not is partly ours. As artists, our main role should be to foster new directions that will enable us to express our wonderful and desirable cultural diversity.

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HELEN MICHAELSEN

UNDER THREAT FROM THE WEST?

THAI Art & Culture

I want to start with the thesis that the current situation of humankind can be characterised by the development of a global culture. Despite this development, human beings remain embedded in particular cultures, with the consequence that there are many different, 'internal' cultures in existence, not just one universal culture. Each culture determines its human beings' characteristics, which are, generally speaking, behaviour, emotions, intentions, intellect and actions.

This thesis is not entirely self-evident. Every racist approach in the history of humankind denies it to varying degrees. When we say that we are human beings, we have to look at the possibilities and shortcomings of our specific culture, especially since we are now living in a global world which seems to be increasingly 'universal'. The most important means in this process – the advancement of transportation, communication and technology systems – have led to the standardisation of many important aspects of life.

It is also a fact that the means of the global culture are unequally shared. Under the conditions of capitalist societies, the desire to be a 'complete' human being is dependent upon access to natural and social resources which are primarily controlled by states and institutions of the northern hemisphere. It is not surprising therefore that non-Europeans seek to find 'European roots' in their history as well as in significant parts of their present life. At the same time the reverse process becomes increasingly important – the decision not to give up or exchange their own culture, but to extend and connect it with various aspects of European culture.

Although it has been mainly imposed from the outside (and not through the processes of self-determination), this process could develop into a more remarkable ability: for non-European cultures to appropriate the West. At least theoretically speaking, the ability to assimilate and revise foreign cultural values and ways of thinking could put non-European nations into a superior position within a global culture, which originally is formed by many 'traditional-regional' cultures.

In practice, however, the central question remains: how do we know if we are at the beginning of a global culture which is more than a mere continuation or extension of a former, and most likely, European/Western culture? If we look at the popular culture of Thailand, for example – particularly at the apparent ease with which foreign patterns, techniques and technologies are sought, used and appropriated – it seems that we can find support for the thesis that local culture is only an extension of Western forms.

The three major art institutions in Thailand (painting, sculpture and graphic arts at Silpakorn University, fine and applied arts at Chulalongkorn University and fine arts at Chiangmai University) are presently seeking to establish media departments; none yet exist in Thailand. It is barely five years since intensive contacts with foreign art institutions and artists began by way of art exhibitions, artist residencies and exchange programs. They have been increasing ever since.

However, there are a number of questions that need to be asked in relation to these new contacts and exchanges. Why is there a relatively recent interest in such exchanges from both sides? What interrelated factors are involved? What future prospects might these developments possibly hold?

Thailand's drive to become a NIC (Newly Industrialised Country), its booming economy, and its interest in tapping into new and expanding markets have certainly helped this process along. Cultural interest in the 'other' always follows the paving of roads. Initially this is never a genuine interest in the 'other', but is instead a beginning, which by its nature is based on power. The roles of the givers and takers are very clearly defined.

From both the Western and Thai perspectives, prospects for the future are difficult to decipher. At first glance it appears as though the Thais will lose out. If their culture becomes too Westernised, the future of their artistic and cultural heritage seems threatened.

Consequently it is not surprising that internal discussions within the Thai art scene about how to deal with foreign culture (in terms of the receptive processes that frame Thai culture in general) have been very controversial. The frictions between 'modernists' and 'traditionalists' are part of a dichotomy that reflects an internal flaw within the present Thai art system, which includes artists and art teachers as well as administrators. Here, the terms 'traditionalist' and 'modernist' derive their meaning from the Thai context and do not have the same connotations that they might in Western contexts.

The central argument of 'traditionalists' is about loss of identity and tradition. They often articulate a fear (either visually in their works or verbally in their discussions) in terms of an opposition between science and the arts. From their viewpoint, science is synonymous with Western values, rapid change, progress, materialism and so on. Art, on the other hand, is to do with tradition, customs, religion, language and cultural institutions. It is seen as part of their Thai cultural identity and heritage, which needs to be preserved, for it is the soul and the spirit of the nation.

The differences between the cores of Thai culture, as well as the demands placed upon them by technology, appear in a number of different forms. According to one, traditional Thai values are the essential 'cement' which keeps the society stable and unified. Another posits the idea of a fundamental opposition between Thai and Western values. A third possible position sees Western values as cultural pollution, whereas Eastern values are not.

In addition to this, where identification with a particular mode of living is strong, contradictions tend to be filtered out of the realm of awareness, while those experiences that confirm the existing order are emphasised.

Their deep-rooted fear is revealed in the widely held view of 'black and white juxtaposition' whereby the Western societal system is seen as 'materialistic', while the East is seen as being 'spiritual'. Here the spiritual is presented as the essence, often in such a stylised, stereotyped and mystic way that it becomes quite difficult, if not impossible, to argue against it. The spiritual is equated both with Buddhism and the purity of a traditional life led in harmony with nature.

The West is used to explain away the undesirable effects of rapid change, which are inherent in the process of modernisation itself. The 'Western' label is thus used as an explanation of certain events, when in fact it is only a description of them.

Due to the feeling of being culturally threatened, and fearing that their traditional way of life is disintegrating under the impact of alienating policies (which appear strange and imposed from the outside) they condemn anything modern as an enemy of Thai culture.

Social change unavoidably introduces inconsistencies into established systems. As a consequence, reactions are provoked and new consistencies tend to be established – as a compromise between the old and the new, or as a rejection of previous consistencies in favour of new ones.

In this context 'consistency' is understood as the quality of a system made up of personalities, social stratifications and rules of behaviour. 'Consistency', therefore, is more a feeling of belonging together, an intuitive certitude of order rather than an impervious logical coherence.

Since the cultural value of 'traditionalism' is based on the rule of custom, things are accepted simply because they have existed for long periods of time. This is one of the major aspects of the conflict between the 'traditionalists' and the 'modernists'. The modernists do not see their view in opposition to the question of Thai representations of self. They have the readiness to develop old, internal structures into something new in order to gain access to (and to actively participate in) global culture. As a result, however, the modernists inevitably question the traditionalists' attitude towards all kinds of innovation, challenging the cultural value of traditional hierarchies of authority based on principles of seniority. It is precisely in this context that the plans to develop media art departments in Thailand must be seen.

The term 'media art' has initially been appropriated from the Western context. But this is where the similarity ends, at least for the time being. It has been applied to local contexts, aimed to counter-balance existing conflicts – especially the generational ones – that, from the modernists' point of view at least, made this development necessary.

The Thai version sees the establishment of media art departments primarily as a means of making the borderlines between accepted art forms more transparent and of securing space for new forms. By loosening up the conventional boundaries of art disciplines, these new departments are intended to create more space and freedom for the younger generation of art students. To some extent younger artists and students already challenge the traditional patrimonial education system through wider access to foreign languages and therefore information.

However, it should be noted that this does not automatically mean that the hierarchical, linear and ideological centralistic culture (which actually frames the things they question) is challenged. The idea of setting up media departments also implies the provision a rather safe institutional outlets for this challenge.

Although it is always problematic to generalise, these contrasting standpoints do in fact reflect the three major directions of Thai contemporary art:

- to resume and further develop traditional subjects and forms independent of foreign art;
- to accept the influence of European art and to question tradition;
- to establish a synthesis between the Thai tradition and foreign influence, which is neither a continuation of the old traditions nor a mere imitation of outside directions.

Once the new media departments commence their teaching programs, they will contribute to the further re-examination of Thai culture, and perhaps establish core values which do not damage the integrity of Thai sensibilities.

I am indebted to the following people with whom I conducted interviews during October 1992 in the course of researching this paper: Montien Boonma, in Dortmund, Germany; and Alfred Pawlin, Vickoke Mukadamanee, Pongdej Chaiyakut, Kamin Lertchaiprasert, Araya Rasdjarmrearnsook, and Vasan Sitthiket, all in Bangkok, Thailand.

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PATRICIA SEARCH

THE *RHYTHM* & STRUCTURE OF MULTICULTURAL COMMUNICATION

Global culture: one, many or none?

Social scientists throughout the world are raising questions concerning the impact of telecommunications on the development of a global culture. While some theorists take the position that telecommunications will erode cultural differences and leave museums as the sole purveyors of cultural history (Horne 1984), other experts propose the emergence of not one, but several types of global cultures. For example, Arjun Appadurai (1990), Professor of Anthropology and South Asian Studies at the University of Pennsylvania, proposes five dimensions of global culture:

- **ethnoscapes**: the migration of tourists, immigrants, and refugees;
- **technoscapes**: the flow of machinery and technology produced by international corporations and government agencies;
- **finanscapes**: the international flow of currency and stock exchanges;
- **mediascapes**: the international distribution of news and media communication;
- **ideoscapes**: the images and associations linked to national ideologies.

Not all social scientists are following Appadurai's lead in detailing distinct levels of global interaction. However, many experts, like Ulf Hannerz from the University of Stockholm, define two general categories of global culture: local cultures defined by geographical boundaries, and cosmopolitan cultures which are comprised of transnational cultural networks (Hannerz 1990). While such perspectives on global cultures acknowledge that electronic technology is reshaping the structure of international dialogue, there is little evidence to suggest that telecommunications will lead to a universal global culture that eliminates cultural diversity.

Anthony Smith, a sociologist at the London School of Economics, points out that a true global culture would have to be based on a shared identity stemming from common history and social practices, further negating the prospect that a global culture could be 'constructed' merely on the basis of communication technology that diminishes the significance of national identities (Smith 1990). In fact, in recent years there has been a resurgence of submerged ethnic cultures (Richmond 1984). Smith attributes this phenomenon to the growth of telecommunications which has intensified cultural diversity by linking communities that share similar cultural backgrounds (Smith 1990, 175).

In the future, the potential for reaffirming and preserving cultural diversity will increase as global networks provide users with a wider range of interactive applications and expand the use of audio-visual data. However, in order to take full advantage of multimedia computing as a medium for cultural expression, systems designers must acknowledge the authors of electronically disseminated information and use the semantic structure of the program and the semiotics of the user interface to define the 'rhythm' and 'structure' of ethnic identities. The user interface must reflect the psychological, historical, and social forces that form the foundation of cultural diversity. However, before we can evaluate design criteria for such interfaces, we must understand the differences between the psychodynamics of oral culture (where the seeds of cultural diversity were sewn) and of multimedia computing.

The psychodynamics of orality and multimedia computing

In oral culture, knowledge is derived from physical and psychological interaction with the environment and individuals. Representative objects establish perceptual and cognitive references for interpreting the subtle nuances in interpersonal communication. Communication is based on group interaction in which sensory input is derived from speech inflections, body language, and tactile stimuli – all of which convey immediate, perceptual feedback.

With electronic communication, the lack of movement and interaction in physical space reduces tactile and kinaesthetic-spatial stimuli. The rhythm of communication changes. Knowledge is removed from physical action and becomes highly symbolic through abstraction (Zuboff 1988). Time and place are established by the content of words and images not via physical space or events. Furthermore, with interactive digital technology, it is possible to alter the perception of time and space by digitally modifying data and viewing information outside its narrative context – a process that further increases the levels of abstraction and codification in electronic communication.

Multimedia telecommunication is also changing the way we interpret concepts of authorship and invention. In oral culture (and most forms of narrative communication) considerable emphasis is placed on the significance of the 'storyteller' or individual who creates the information as well as the social group that translates the ideas into a cultural identity. Authorship and invention, whether individually or group defined, are the hallmarks of cultural diversity. However, with electronic communication, there is a tendency to focus on the content of the data and the synthesis of individual and collaborative perspectives, instead of highlighting the creators of the information. The result is a communication format which is characterised by cultural anonymity rather than cultural distinction.

Preserving cultural diversity

Once we understand the psychodynamics of orality and multimedia computing, we need to learn how to use the design of multimedia telecommunications to articulate and preserve cultural diversity. Interactive multimedia programs should acknowledge the role that authorship and invention play in defining cultural identities by clearly documenting the names of individuals or groups who contribute information to the program. Multimedia programs should also use the semantic structure of the program and the semiotics of the interface design to convey the rhythmic structure of a culture (Figure 1).

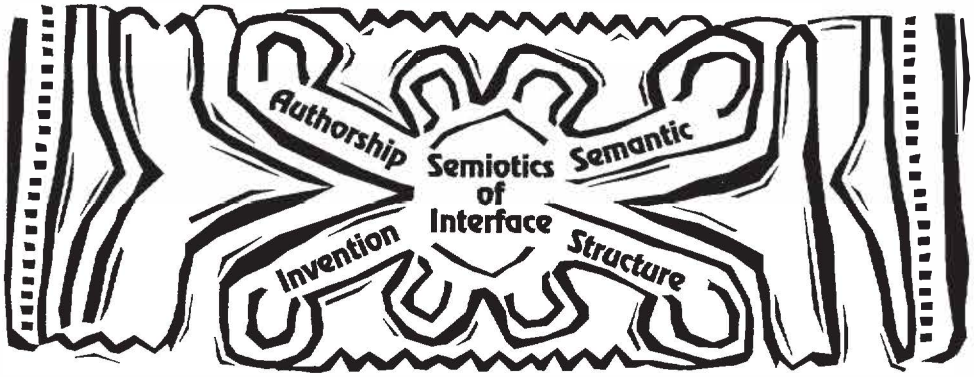

Figure 1. The design of multimedia telecommunications. Multimedia networks can use authorship and invention, the semantic structure of the program, and the semiotics of the interface design to articulate and preserve cultural identities.

Authorship and invention

Interactive multimedia programs contain multiple levels of authorship, including the authors of the individual source documents in the database, the editors and designers, and the users of the program who organise the database information to meet individual objectives (Search 1992). Most of today's interactive programs fail to define these individual levels of authorship. The editors of the programs are rarely mentioned, and users can follow predefined links between references without ever seeing the names of the authors, artists, or publishers.

In order to establish the cultural perspective of a multimedia program, it is important to acknowledge its designers and editors as well as the authors of the database references. In global networks, it is also important to identify the participants who contribute documents, images, annotations, or modifications to the database. The foundations of all social structures are rooted in the beliefs and inventions of individuals. By perpetuating the rights of authorship in electronic databases, global networks generate recognition and respect for cultural diversity and acknowledge the value of the creative spirit which nurtures and sustains cultural identities.

Semantic structure

Digital and video technology provides a wide range of interpretive tools to structure and communicate multiple levels of perception and cognition. Information can be presented in narrative as well as non-linear formats. The structure of the program can be highly perceptual with a focus on visual images and audio stimuli, or it can be logically oriented with a strong emphasis on language and conceptual hierarchies.

While most literature on designing multimedia computer programs emphasises the need to develop a semantic structure that meets the objectives of the user, little attention has been given to the issue of cultural identity and the importance of developing communication models that integrate the symbolism and perceptual fabric of a culture into the conceptual design of the program.

In order to define this audio-visual structure, we need to understand the historical, psychological, and organisational forces that form the social framework of a culture. If we understand this, we can articulate the semantic structure of its language, objects, and actions (Cupchick 1988, 243-260). We can then integrate the semiotics of this cultural system into the design of the multimedia program, specifically through the selection of sources for the database, the designation of associative links, the design of interactive functions, and the hierarchical organisation of the program.

Careful editing of the individual sources in the database and the authored links between the references can preserve the rhythm and continuity of the culture. It may be necessary, for example, to limit the number of associative links within specific references so that digressions to other parts of the database do not disrupt the context and integrity of the information. Editorial notes in the introduction of a program can recommend that users peruse specific documents or video segments in their entirety in order to fully comprehend the context of the ideas.

We also need to use the correct audio-visual media to communicate individual cultural perspectives. For the past 2000 years, civilisation has been primarily language and logic oriented. With the advent of multimedia technology, we now have an opportunity to use images and sound to convey perceptual experiences. For example, to help the user understand the iconography of the Native American Indian culture, it may be better to develop segments in the program which restrict the associative links in the database to audio-visual references, as opposed to written documents, in order to emphasise the perceptual relationships between audio-visual design and the spiritual forces in nature. On the other hand, a program on French literary criticism might emphasise a highly structured, relational database in which the links and associations between ideas are derived from logical deductions.

Semiotics of the user interface

In interactive multimedia programs, information is interpreted through an interface of symbols and text that defines the hierarchy of the information and the syntax of the program functions. Like the semantic structure of the multimedia program, the semiotics of the user interface can establish perceptual and cognitive relationships which define the cultural identity of a nation. Colour, layout, typography, and sound can convey the sensory dimensions of a culture as well as define information hierarchies that visualise the cognitive structure of unique cultural perspectives. Cultural identities can also be expressed through the language and symbols that are used to label information structures and describe the relational models in the database. In addition, the interface design can use motion and time to control the momentum of the perceptual stimuli and, in turn, create emotional interludes that enable the user to abandon the role of passive observer and actively engage in the cultural experience.

We can also use synaesthetic transference to create a dynamic array of spatio-temporal relationships. Gombrich describes synaesthesia as 'the splashing over of impressions from one sense modality to another' (1960, 366). Although synaesthesia has traditionally referred to literary metaphors, researchers have confirmed the existence of synaesthetic effects in audio-visual stimuli (Marks et al 1987). Multimedia computing provides an opportunity to use synaesthetic transference to compensate for the loss of kinaesthetic-spatial stimuli by using sound, colour, and perspective to define perceptual and cognitive relationships in time.

In order to use computer interface designs to define the rhythm and structure of particular cultures, we need to develop methods of identifying the audio-visual symbols and perceptual relationships that accurately communicate unique social and cultural perspectives. One of the best resources is the art of a nation. Researchers believe that by analysing the social events that led to the design of the art, it is possible to generate a formal description of the artistic conventions used in the work (Cupchick 1988). Harold Cohen (1979), Joan and Russell Kirsch (1988), Terry Knight (1989), Ray Lauzzana and Lynn Pocock-Williams (1988) and Roman Verostko (1990) have already experimented with developing sets of rules or grammars that define aesthetic relationships and stylistic changes in works of art. The next step is to integrate social and historical perspectives into these definitions and to use these descriptions to establish guidelines for designing audio-visual interfaces in interactive computer programs.

Spatio-temporal models for multicultural expression

Interactive multimedia computing also provides an opportunity to use the psychodynamics of the medium to establish new perceptual models that use space and time to define diverse cultural perspectives (as well as to structure different levels of user interaction). These spatio-temporal structures can expand the potential for using global networks for multicultural communication by devising user interfaces that create perceptual bridges between cultures, convey the spirituality of a culture, and define different levels of psychological involvement for the user (Figure 2).

Figure 2. Spatio-temporal models in telecommunications. Interactive multimedia programs can create perceptual bridges between cultures, convey the spirituality of a culture, and encourage user identification through psychological involvement.

Although these types of communication model are not yet defined in existing multimedia networks, we can see examples in many works of contemporary art. By studying these artworks, we can learn how to integrate layers of audio-visual data into multidimensional computer programs that channel the creative energy of cultural diversity into new levels of global interaction and sensitivity.

Perceptual bridges between cultures

The sensory and cognitive data found in interactive multimedia programs establish links between ideas and create multidimensional information hierarchies. In this type of information environment, perceptual stimuli expand the analytic structure of cognitive thinking into an integrated view of reality. This type of communication model can be used to create perceptual bridges between the linear, deductive reasoning of Western society and the cyclic, metaphysical perspectives of cultures that are deeply rooted in an uninterrupted tradition of kinaesthetic-sensory interaction with the physical environment.

In contemporary art, we can see examples of this type of perceptual experience in bookworks by artists such as Michael Harvey, George Brecht, and Michael Snow. Harvey's *White Papers* (1971) and Brecht's *Water Yam* (1972), for example, consist of boxes of loose, unnumbered 'pages' which encourage the reader to reevaluate the dynamics of perceptual data by juxtaposing text and images in non-linear communication formats that restructure relationships in time and space. Michael Snow's *Cover to Cover* uses a series of photographic essays to structure an array of causal events which create a visual dichotomy between perception and the logic of anticipated, sequential actions (Search 1992).

As with these bookworks, multimedia computing can integrate different levels of cognition and perception into one communication model. Audio-visual data can convey the sensory dimensions of a culture on one level, while the logical channels of the communication model enable users to analyse new cultural perspectives within the context of their own cognitive information structures. In a global network, these multiple channels of perception and cognition can create dynamic bridges between cultures by providing a framework for understanding and preserving cultural diversity.

The spirituality of a culture

We can also use images, motion, sound, space and time in multimedia interfaces to convey the spirituality of a culture. Western communication, with its emphasis on scientific reasoning, tends to analyse and categorise information, and often fails to recognise the significance of sensory and emotional feedback as a valuable source of information about people, objects and events. In multicultural communication networks, we need to use audio-visual stimuli to convey the humanistic and spiritual relationships that define and sustain cultural identities.

The artworks of many video artists, especially video pioneers such as Nam June Paik and Bill Viola, provide excellent examples of ways that we can create audio-visual montages to control the rhythm and structure of perceptual data. In Paik's *Guadalcanal Requiem* (1977), two-dimensional, pseudo-coloured images are contrasted with realistic video of a three-dimensional, island landscape. This contrast sets up a visual rhythm between colour and texture that defines multiple levels of perceptual space (Search 1992). In works like *Chott el-Djerid* and *Ancient of Days*, Bill Viola expands these levels of audio-visual interaction by using sound, images, and non-linear perspectives in time to create 'spiritual allegories' or metaphors for consciousness and perception (Youngblood 1976). Youngblood's 'metaphysical structuralism' can be used in multicultural communication systems to accommodate the cultural specificity of Aboriginal Dreamtime or the cosmic vision of tribal societies like the Navajo and the Xavante.

Levels of psychological involvement

The multiple dimensions of perception and cognition that exist in interactive, multimedia computing can create different levels of psychological involvement for the user. On a perceptual level, audio-visual stimuli can be used to define multiple layers of emotional and psychological space that help the user become an active participant in the program rather than a passive observer. This type of spatio-temporal structure can help the user understand the differences between the unique cultural perceptions of Eastern cultures (such as the Japanese concept of MA which defines space by its relation to time-flow and the events that occur in it) and the spatio-temporal perspectives of Western cultures which support the concept of a homogeneous space in absolute time (Isozaki 1979). Similarly, the multidimensionality of audio-visual communication can help users identify with specific cultural personifications of space. For example, an interactive program that uses sensory stimuli to project the user into a simulated, perceptual world can help Westerners, who see themselves as external viewers looking at space, understand other cultures who may view themselves and the surrounding environment as an integral part of a spiritual, internal space (Lawlor 1991, 270-271).

We can also create different levels of psychological involvement by allowing the user to define levels of authorship. Through interaction with the multimedia data, individuals or groups can create information hierarchies that define cultural identities.

Numerous artists working in interactive video – such as Lynn Hershman (*Lorna, The Electronic Diary, Longshot*), Grahame Weinbrun and Roberta Friedman (*The Erl King*), and Peter d'Agostino (*transmissions, DOUBLE YOU (and X,Y,Z), STRING CYCLES)* – are investigating the relationships between culture and perception by allowing users to shape the outcome of audio-visual experiences. Other artists are creating interactive projects that use the audio-visual syntax of multimedia data to define varying levels of user identification. In Abbe Don's *We Make Memories*, for example, the artist uses an interactive computer program, modelled after his great-grandmother's storytelling style, to show users how ideas are shaped and communicated through the linear and associative interaction of words, images, and events.

Future directions

Interactive multimedia computing is a new medium that can establish multidimensional communication structures that integrate perception and cognition into an expansive view of reality. The use of sensory stimuli in user interfaces can help capture some of the intuitive immediacy of oral communication and create isomorphic bridges between cultures. To achieve these objectives, the interfaces must emphasise perceptual relationships which are analysed according to gestalt-like or holistic processes before the user deciphers the semantic relations in the audio-visual design (Neisser 1967; Julesz 1981). Empirical research has shown that attention can be focused on perceptual-sensory information (Craik & Lockhart 1972, 671). In addition, perceptual processing can be 'deautomated' so that intuitive, rather than learned, responses are evoked (Deikman 1966, 324). In a multimedia program, a highly perceptual or holistic communication model for the interface design can provide the abstract format that is needed to allow users to become part of another cultural space while at the same time retaining the perceptual freedom to interpret cultural differences within the context of familiar, user-defined perspectives.

This ability to compare cultural identities is an important part of understanding different cultural perspectives. Interactive, multimedia programs encourage these comparisons because there is a physical and psychological juxtaposition of two different views of reality: the user's reality and the perceptual, metaphysical reality of the interactive program. The ability to explore new cultures within the context of familiar, cultural references enables us to recognise cultural similarities as well as differences. An artist named Isz, who recently participated in a Chicago art exhibit entitled Perceptions of 'The Other': Exploring Cultural Diversity, summed up this task as follows:

> It is in realising the other in each one of us that a true image of the other can be achieved. That same/different group of 'Others' can become 'We' (Isz 1990).

The strength and success of global networking will be determined by our ability to use logic and perception to define flexible, information architectures that allow the user to shift perspectives and redefine relationships in a dynamic, sociopolitical world structure. Contemporary artists are in a unique position to contribute to these objectives by defining new levels of perceptual and cognitive interaction in audio-visual communication. The most important breakthroughs in information design may be yet to come, as electronic artists reshape the tangible dimensions of telecommunications by examining the visualisation process itself (and its impact on the communication of interactive procedures).

I am currently working on a project called HyperGlyphs, which is investigating how people map perceptual symbols to cognitive structures and sequential actions in hypermedia programs. The HyperGlyphs project is using a database of abstract contemporary art to evaluate new levels of interaction between words and images. The results of this research will be used to develop orientation cues and interactive functions that help users define visual and conceptual hierarchies that are tailored to individual perspectives and goals (Search 1993).

As more insight is gained into the relationships between sensory perception and cognitive interaction in multimedia programs, we will be able to develop spatio-temporal communication models that realise that all-important, albeit elusive, 'seamless' interface. These interfaces will push technology into the background and facilitate more spontaneous, multidimensional dialogues between users. In global networks, this intuitive interaction will restore many of the perceptual attributes of orality and in so doing, preserve and strengthen cultural identities. This type of multimedia communication model will also channel the energy from diverse cultural perspectives into new levels of global awareness, sensitivity, and creativity.

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McKENZIE WARK

SUCK ON THIS, PLANET OF NOISE!

Arguably, the last thing a critical theory of culture ought to have anything to do with is electronic art. It is not popular. It is not cheap. It is not influential. No matter how much well-meaning people talk about how new technologies can empower people, it is still mostly white Americans who have their finger on the trigger. Yet there is something critically useful about electronic art, even if it does not always recognise this itself. Electronic artists negotiate between the dead hand of traditional, institutionalised aesthetic discourses and the organic, emergent forms of social communication.

Electronic art is an experimental laboratory, not so much for new technologies as for new social relations of communication. This is why electronic art matters to critical theories of culture, be they the Frankfurt school or, in my case, the Birmingham school of cultural studies.

Moreover, a confrontation with electronic art might have some salutary effects on criticism, which sometimes lapses in spite of itself into moral and conservative homilies. When confronted by technologies – the tools of rapid change – criticism gives in to Burkean urges to conserve 'cultural difference' from what it imagines to be the entirely negative and homogenising effects of change. This moral reaction forecloses debate on the necessity and desirability of change. Some dynamics in culture cannot be halted. Some may be positively beneficial. A dialogue with experimental electronic media may help keep these questions open for a criticism which all too often forgets its own history – and forgets how to think historically. This Burkean criticism imagines that it is *this* technology, *this* epoch of change that ushers in 'the fall' from grace, from an organic and unified culture. Everything from the newspaper and the illustrated magazine to cinema and television, and now Nintendo and CNN are imagined to be the last straw that hurls us out of Eden. As Simon Penny notes, 'this all creeps up on us while we're asleep anyway: who worries about our dependence on the global computerised telephone network, or that because of pocket calculators nobody can do mental arithmetic any more?' (Penny 1988).

While uncritical faith in the liberatory potential of technology may in the main be the principle ideology to combat, uncritical fear of it is also debilitating. The convergence of the critical tradition with new technology seems to me to be a dialectic with potential to raise both to a new level of cultural and political salience.

Given a will to think historically about cultural change and to use electronic art as a foil, two problems arise in thinking about the emergent, global forms of culture. One is the problem of access to knowledge about new techniques. The other is the problem of generalising from specific experiences. In other words, we confront a limit to what we know of time and of space. We know least about what is nearest in time – the emergent present, and what is most distant in space – the forms of culture of our antipodean others. What compounds the issue is that the thing we want to critically examine – new media – is precisely what appears to overcome these problems for us. This is a problem which calls, in short, for art and for theory; for intuitive visualisation and speculative conceptualisation.

No matter how global and how abstract the analysis wants to be, it can never extract itself from its quite specific cultural origins. Hence this writing takes the form of an essay and asks the essay's classic question: 'What do I know?'. I want to begin with my own experience of this planet of noise we now live on. The result is a very abstract essay, but also a very self-consciously partial one, tied to quite particular experiences. Here, want to I rephrase Montaigne's self questioning from 'What do I know?' to the more suitably antipodean: 'From where am I interpolated?' (de Certeau 1986).

To the vector the spoils

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, which, as Hegel says, 'gives us the idea of the indefinite, the unlimited, and infinite: and in feeling his own infinite in that Infinite, man is stimulated and emboldened to stretch beyond the limited: the sea invites man to conquest and to piratical plunder, but also to honest gain and to commerce' (Hegel 1991, 90). Thus, ambivalently, did this first regime of the vector traverse the globe.

The cultures that invaded Australia did so using a naval technology. This technology turned the space of nautical dangers into an abstract space of movement, migration, trade and above all, of strategy. This history was one 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 presupposes this abstract space of flows. From the first fleet to the fast clippers, its development is central to the project of *modernity*.

Yet overlayed on this second nature of material flows there is now another abstract space which produces another feeling of the unlimited – the terrain of the media vector. 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 communicational spaces created by the telegraph, telephone, television and telecommunications. These are the techniques of telaesthesia, of perception at a distance. Since the telegraph, the time of communications has run at a faster speed to the time of transport, and indeed these two synonymous terms begin to diverge in meaning as they diverge as terrains of abstraction (Carey 1989).

Put somewhat more theoretically, second nature emerges out of the struggle to wrest freedom from necessity. It is an overcoming of the tyranny of nature, achieved through the social organisation of labour. As we know only too well, the process of creating second nature creates new tyrannies as well. Freedom from nature becomes the elimination of nature. The social organisation of second nature is, among other things, a class relation. The division of labour makes every function – including art – partial and fetishised (Taylor 1991, 535ff).

An artist who I think quite graphically maps most of the predicament of second nature is Stelarc, who makes of the surfaces of his body a theatre of second nature. In his performances, his skin becomes the point of interface for relations to the technical. He appears strapped and wired to any and every device. Some are devices he controls through the movement of his muscles. Some are devices which control him, triggering involuntary parabolas and disconcerting jerks. Here is the body exactly as second nature made it and maintains it: in a state of permanent dependence and symbiosis with what video artist Peter Callas calls technology as territory.

The decline of modernity is in many respects a loss of faith in second nature. The division of labour brings with it fragmentation, anomie; the compulsions of discipline and the anarchy of the market. The redemptive vision of second nature withered in both its Marxist and bourgeois forms. Yet this does not stop the projection of the fantasy of redemption onto third nature. In both the cool and the nerdy techno literature, in both *Mondo 2000* and *PC Monthly*, redemption is always around the corner in virtual reality, hypertext, cyberspace. Although the terrain is different, the projection of a vectoral field of total communication extends and completes the projection of a vectoral field of extraction and production. With an extra 10 megabytes I can finally RAM down the doors of data heaven! Such is the new fantasy of wresting freedom from necessity – for those at least who are at the very heart of the relations of power that constitute third nature.

From second nature to third nature

When we can go to the antipodes and back in an instant, what will become of us? Perhaps, among other things, we start making and appreciating art like the Photoshop collages of Robyn Stacey. Stacey's work keys into this expanded terrain that the media vector creates. She has grasped and exploited the radically new protocols of third nature as a space of perception and relation. A space which is not void of rules and conventions of historicity, appropriateness, genre and scale, but a space where such rules are in a constant state of evolution. Unanchored from the space of places and cast into the space of flows, images become polyvalent, revealing a visual poetics which the surrealists could only imagine but which the vector has now rendered as a philosophy made concrete. While art can map and display an image of this new space of vectoral relations, it cannot theorise it. Both art and theory need to look into the experience of everyday life – that elusive reservoir of tactics and ethics – for the practical foundations of a critique of this new terrain, our 'third nature'.

The development of third nature overlaps with the development of second nature – hence the difficulties of periodising the modern and postmodern. The salient point for me is the development of the telegraph. What is distinctive about the telegraph is that it begins a regime of communication where information can travel faster than people or things. 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.

If there is a qualitative change in the social relations 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, which appears to us as the geography of cities and roads and harbours and wool stores is progressively overlayed with a third nature of information flows, creating an information landscape which almost entirely covers the old territories. While this process has been going on since the telegraph, it reaches critical mass in the late 1970s. 'Postmodern' is 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.

We can see now, very clearly, what the terminal state of third nature would be. Deleuze and Guattari ask provocatively and more than once: 'Perhaps we have not become abstract enough?' (1984, 321). What would it mean to become more abstract, ever more abstracted from the boundedness of territory and subjectivity? One can imagine a delirious future, beyond cyberspace. Not the future of Marx's communism: from each according to their abilities, to each according to their needs. Rather it is the future of the rhizome made concrete; where every trajectory is potentially connected to every other trajectory, and there all trajectories are equal and equally rootless; where we no longer have origins, we have terminals.

This fantasy appears in different guises: among the Californian techno-freaks, the postmodern wing of the green movement, in the corporate improvisations of Rupert Murdoch and among the high frontier hegemonists in the Pentagon (Shawcross 1992; de Landa 1991). The struggle over the relations of communication and the making of third nature are every bit as intense as the struggles over the relations of production and the shaping of third nature – but many of the old rules no longer apply.

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 ethnocentric concepts. One way to do so is to try to discover the relations of antipodality lurking within them. 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 (Gibson 1992). This is 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.

I think that these days 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 on the planet of noise 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. Cultural differences are no longer so tied to the experience of the particularities of place. These 'vertical' differences, of locality, ethnicity, nation are doubled by 'horizontal' differences, determined not by being rooted in a particular place but by being plugged into a particular circuit. We vainly try to preserve forms of difference that are rapidly reorganising themselves along another axis (Robertson 1992).

This new experience of difference is an experience of an active trajectory between places, identities, formations, rather than a drawing of borders, be they of the self or of place. This is antipodality – 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 people are experiencing 'antipodality', the feeling of being caught in a network of cultural trajectories beyond their control.

In the overdeveloped world, both the culture of everyday life and the culture of scholarly thinking about the present seem to me to betray traces of unease if not downright paranoia about antipodality. Yet it is undoubtably the emergent axis of technocultural struggle. At present, antipodality exists in the politics of third nature in two forms. On the one hand, it leads to attempts to shore up identity against the flux. Black nationalism and born-again Christianity seem to me to have elements of this reactive return to an imagined core of immutable identity and community. On the other hand, the kind of coalition building involved in queer politics or the politics of affinity Haraway (1991) speaks about in contemporary feminism, seems to me to treat antipodality more as a fact of life than as a threat to identity.

Now, the point about this is that any attempt to create communities of resistance of necessity excludes something or someone. Community only exists dialectically, as a struggle against something other, be it nature, other communities or the vector. While struggles still of course take place in relation to nature and second nature, they now have an added dimension: the struggle, not for natural space, not for social space but for information space. Every community 'de-informates' certain spaces within itself and creates certain barriers to the flow of information from without. Every community, by definition, requires some degree of 'correctness' from would-be members. Hence I want to signal a certain moral ambiguity about the concept of community and identity. They are necessary, perhaps, but as intellectuals we need to keep a critical distance.

The work of VNS Matrix plays on antipodality to the extent that this group of women artists continually draw a connecting line between phallocentric and technological culture. They play off, play on and play up to the antipodal position women are supposed to occupy in relation to the male techne. 'We are the virus of the new world disorder' they casually announce (VNS Manifesto 1992, 66).

VNS are not afraid to take on board the threat to traditional notions of female identity posed by the relentless development of the masculinist technology of second nature and the phallocentric image repertoire of third nature. Their project, as in the 1992 work *All New Gen*, is to create new and open *relations* of subjectivity. There is a sense of closure in the process of creating these works: VNS Matrix is an all-women collective. That closure makes possible a radical openness to the flow. VNS take the most incorrigibly gendered imagery of Nintendo and imagine it otherwise: as a feminised space.

The virtues of moral ambivalence

For every set of oppositions within a given culture, there is always a trajectory along which one can bypass the fixed speaking positions that identities prescribe. One must try not to occupy either the position of domination in an antipodal relation, nor reactively take up the minor position. As 'petit-bourgeois' intellectuals, we are always shuttling in between (Morris 1988). I'm reminded here of the use video artist Peter Callas has made of the images from a Japanese card game which is like the western children's game of scissors-paper-stone. Unlike conventional cards but like the children's game, each of the three terms is superior to one of the other terms and inferior to the other. There is no fixed hierarchy, and while every relation involves a difference, each is contingent on which cards turn up. That seems to me to be a diagram of antipodality.

When one knows what it's like to always be both the major and the minor pole of these ambivalent relationships of flow – to be scissors one minute relative to paper but stone the next – then one can begin to think about the problem of cultural diversity and the information vector with some subtlety. 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. Very briefly: as the tyranny of distance gives way to the vector, new defensive mechanisms have been required at the level of the nation. 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 (O'Regan 1988).

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 a successful 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 (Cunningham 1992).

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 (Michaels 1987).

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 which 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 could 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. Like rocks, paper and scissors, media are never simply good or evil; they are always contingent.

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 an ironically 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.

At this point we can return to Deleuze's question: 'what if we have not become abstract enough?'. Out of the course of this analysis, some answers begin to suggest themselves. Whether we like it or not, cultural differences cannot be preserved from the impact of media vectors. New forms of difference are emerging out of the struggle with the vector, others succumb and become extinct. The abstraction of social relations from identity and place is not something that technologies achieve of their own accord. It results from the dialectic between communities and the technical regime of the media vector. Innovative forms of autonomous communication give the planet of noise, so to speak, something to suck on. The dialectic of autonomy and antipodality structures an emerging politics of relationality and flow rather than of identity and locality. Our communicational interventions (for that is what both art and criticism are) have to be rethought for this world of third nature we have made, which is very rapidly remaking us.

New technology cannot be used to *preserve* cultural differences. Traditional culture reified as museum interactives – even if they are virtual reality – does not constitute preservation so much as mummification. New technology can be used to create new differences and new forms of autonomy and community, but it cannot be used to 'preserve' old differences in any meaningful sense. Traditional forms of cultural difference are not independent of the techniques used to maintain them. The work of Eric Michaels and Francis Jupurrurla in the Warlpiri Aboriginal community is interesting precisely because Michaels thought video could be used to *create* a viable community which would grow organically out of traditional information practices (Michaels 1987) – even though, as Tim Rowse points out, Warlpiri social organisation does not traditionally take the form of anything remotely like 'community' at all (Rowse 1990).

This was not preservation, it was a creative process. It was not ethnography, it was art. Naturally, it was a far more morally ambivalent project than simply preserving a form of communication assumed to have always been there. Michaels thought that only by becoming abstract – by incorporating the information managing relations of third nature – could the constraints on knowledge so vital to the oral information economy of the Warlpiri be developed and sustained. Such are the order of problems for a critical *practice* of electronic media art.

The ends of art

This is, of course, a rather sweeping and world-historical way of framing criticism. I see no reason to relinquish the point of view of the totality to conservative interpreters of Hegel and Kojève such as Francis Fukuyama (1992). While we may be more inclined to agree with Deleuze that the 'only universal history is the history of contingency' (Deleuze & Guattari 1984, 224), there is something heuristically useful and perhaps even tactically necessary in framing the critical or creative act in such a way that it appears as an instant within a much wider and intelligible process. If anything, such a perspective makes us more humble about the possibilities of art and criticism, yet none the less cognisant of the significance of what is at stake. The point of this particular rewriting of the trajectory of cultural history is to insist that there is considerably more to struggle for and to struggle against than Fukuyama's rather smug picture of the completion of liberal democracy as the completion of universal history. When viewed from the antipodes rather than from the centre, things appear otherwise. Both art and criticism can make a claim to imagine a particular vision of the totality. This seems to me entirely preferable to the folly, which begins with Hegel, of imagining a total vision which encompasses all particulars. As Adorno warns, 'the whole is the false'

(Adorno 1973, 50). Our imaginings of what is at stake in the transformation of the space of the globe by third nature are still only that: imaginings.

Nevertheless, electronic art is a practice which cannot help but raise issues of the totality, for it works with the tools that are themselves transforming the totality of social relations into the domain of third nature. Electronic artists cannot help but use the material of transformation itself, although they do not always choose to work critically on the issues involved in this transformation itself. The artists mentioned in this essay – Peter Callas, Robyn Stacey, Stelarc, VNS Matrix, Eric Michaels and Francis Jupurrurla – do, in my opinion. They have made use of the interzone of antipodal relations, of their status as 'no-one' marooned between the channels of third nature, to produce critical work in Australia but of a wider provenance.

Earlier versions of this paper were presented at Cultural Studies: Pluralism and Theory, University of Melbourne, 11-13 December 1992.

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CYNTHIA BETH RUBIN

Quoting & APPROPRIATION
WHOSE WORK IS IT?

I am a converted appropriator. I used to believe that taking images from other artists, no matter how long dead or removed from my own culture, was in some way immoral or cheating. And doing this with the computer was even more immoral, because it did not even require that I had the technical skills of drawing and painting. It was as if the computer and the dead artist conspired to eliminate me from the process of making art, leaving me as only the conduit. The fear was that somehow I could not make art 'all by myself'.

After all, those of us who are artists like to think that we are producing something unique, something which is a reflection of ourselves as individuals, something that could not be done by anyone else, and without our direct participation.

So, if we take so much pride in what we are doing, why would we ever want to use the computer as a tool for appropriating from other artists? If we use the computer to replicate someone else's work, to include someone else's images within our own work, how can we claim it as our own?

The answer lies in the fact that sooner or later we all come to the realisation that whatever our art form, none of us arrives at images all by ourselves. We are products of our cultural conventions, and once we come to understand this, most of us start looking for ways in which to expand our visual vocabularies.

Artists have always looked to other artists for this purpose, even without the computer, and even in the days when working within the conventions of one's own cultural tradition was considered adequate. Traditionally, art students would copy from the masters, hoping to understand the masters' work through the act of interacting with the source. Frequently artists have quoted elements from other artists in their work, often simply because a particular compositional structure or motif was interesting enough to merit being worked on again. Appropriation has also been used to cross cultural barriers. Picasso took the image of an African mask into his work, and by doing so learned about a different kind of representation.

But when artists working outside of the computer quote from other sources, a certain amount of interaction with the source is assured. When Picasso placed the image of the mask in his painting Les Demoiselles d'Avignon, we can be reasonably certain that he had either personally observed this mask, or at the very least had access to quality reproductions. The very fact that his hand recreated the forms of the mask confirms that he did some careful looking.

Had Picasso been working on a computer, we might not be as sure that he had looked at his sources so carefully. He could have just gone to a laser disk on African Masks, cut out one that caught his eye, and stuck it on the face of one of his figures. With a few computer commands for feathering, blending edges, and changing color contrasts, he could have made it appear to 'fit' in his painting. The computer eliminates the need for the kind of careful looking that was previously part of all quoting.

This is a profound difference. The traces of the artist's hand, even in the act of quoting, have traditionally been used to give a kind of authenticity to the new work. Now, this is gone.

So, is quoting with the computer legitimate? Now that we can use all of art history, from across culture and time, as clip art, cutting and pasting it into our work, how do we make sure that it becomes our own? Or are we in danger of engaging in cultural colonialism, where we take without thinking?

I believe that the very quality of computers that makes it possible to appropriate so easily, is the quality which makes them the ideal tool for interacting with them as never before. Now our sources can come out of the museum showcases, out of the books, off the little postcard reproductions which used to fill our studio walls, and into the same material in which we create our images.

The computer is the great equaliser. Our imagery, what we appropriate from others, and what we draw into the computer ourselves, is all in there together. And, in some way which I still do not completely understand, this liberates us to interact with sources as never before. My suspicion is that this is because, by seeing them inside the computer, we are in some way seeing them in a state which is more 'pure' than on the museum wall. After all, we can never completely understand another era or culture in a way which allows us to approach the art of that culture with a non-biased understanding. But perhaps putting it inside the computer eliminates all of the intermediary cultural garbage which is present in any other form of presentation.

For example, in his essay on 'Third World Art as a State of Mind', Paul Kagawa (1976) talks about his own frustrating experience as an assimilated Asian-American, in viewing the art works of his ancestors in museums where they are presented as trophies in the white man's world. The setting makes the works inaccessible.

My conversion to the world of appropriation came from my experience accessing my own cultural heritage, from which, like Paul Kagawa, I was alienated. In Western culture, as non-mainstream cultural groups gain economic power, they tend to leave behind their traditions. Years ago, when I still believed that taking directly from other artists was in some way immoral, I set out to expand my sensibility. In the aftermath of the Vietnam war, I was not the only American who felt that we had become culturally arrogant. When, after some years of studying Indian and Asian art I stumbled on the tradition of Jewish art, particularly Hebrew manuscripts from Western Europe and North America, I set out to teach myself in the usual ways. I spent hours in European libraries, carefully drawing the motifs of the texts, which I later re-drew onto canvases or into the computer. When the Bibliothéque Municipale in Marseille gave me permission to photograph (perhaps because no one had asked to see their 1260 manuscript for years), I turned to scanning my sources. Strangely, I found that everything I had believed about drawing as a means to learn about structure was ridiculous. Once my source was inside the computer, I came to understand it much more quickly. In fact, I found that I could even scan pages from books that I had never seen, and find a way into them more easily than I could with drawings from manuscripts that I had seen.

I have some thoughts about why this happens. Lucy Lippard, in her 1990 book *Mixed Blessings*, states that 'there is a difference between homage and robbery, between mutual exchange and rape' (Lippard 1990). She is speaking of taking work from other cultures, but I would expand this to include all other artists.

Because of its special quality as an instrument for storing, accessing, and creating, the computer is better suited for dialogue than for rape. When we must recreate an image from another artist or artisan in order to use it, using drawing as notation for future reference, we filter the image in terms of our own aesthetic prejudices, as well as our technical skills. These limitations are not insignificant. While it is true that artists have long copied the masters in order to improve in both of these areas, the appropriating artist still must be able to make a perfect circle in order to copy a perfect circle, and must think that it is worth the time to make a perfect circle, in order for this kind of interaction to take place.

With the computer easily able to scan images from photographs, the appropriating artist is not limited by preconceived filtering. The appropriating artist can keep returning to the original image, taking and discarding different pieces of information each time, and engaging in a different kind of filtering in each instance.

More importantly, the appropriating artist gets to learn by feeling the limits of the original image. How much can the shapes be distorted, how much can the colour be changed, how much can be eliminated, while still maintaining the integrity of the source? This is a better dialogue with the source than just simply copying it. This is a process of getting inside the image, and pushing it around until the appropriator begins to feel the decision-making process of the original artist.

Still, appropriation with the computer is not without problems. The moral issues of taking from others, as well as the legal questions which reflect our society's attempt to deal with these concerns, change when the computer is the instrument of appropriation.

Legally, copying and appropriation may be viewed similarly, but for the artist, the issues are quite different. Copying is not interesting. The problems of exact copying may be changed in some legal sense with the introduction of computers, but the moral issues in copying are still the same. Passing something off that you took directly from someone else as your own is not a good thing, whether you do it by computer or paint brush. Of course, with the computer you can break into my office and steal a disk, take it home and have an original which is as authentic as the back-up I left at home. Obviously this is something you cannot do with the painting hanging on my wall, but morally, should you try to pass either of these off as your own work, you are engaging in similar acts of deception.

But what about the use of appropriated images that are copied not for purposes of deception or profit, but for the purpose of incorporating them into new imagery, which one then claims as his/her own? When is it fair to do this, and how do we judge whether the appropriating artist actually did more than simply cut and paste? In the case of Picasso, we could see the physical traces of his brushstrokes, but what does the computer artist have to show?

What the computer artist has to show are traces of the artist's thought. As we let go of technical virtuosity as the measure of artistic success, and look to the quality or the visual integrity of the work itself, it is important to understand that appropriation is only as effective as the art that results from it. It is silly to make a rule about how much transformation is enough, because in the context of a specific image it may be that no transformation of an element is needed, that simply changing the context is enough to make a profoundly distinctive image, highly reflective of the appropriating artist's sensibility. Trite, banal and thoughtless imagery will always be possible, and no one should expect to guarantee against that.

This still leaves us with the legal problem. How would I, as artist, feel if my work were appropriated? As an American, this is a problem that I currently do not have to face, as we are very well protected under the copyright laws which extend to 50 years after my death. Still, while no one can copy or publish my work without my permission, I am not sure that this is always to my benefit. After all, if someone else can get my work out there in the public eye better than I can, even by changing it, I am not sure that it hurts me if I am credited.

I suggest, therefore, that we take a clue from our non-visual colleagues. I suggest simply that now, in the age of mechanical reproduction and 'easy-quoting', that we always try to cite our sources. When we publish or exhibit our work, we could note the sources with images and text. This would free us from only quoting long dead artists, or well known artists. In this way, we could use the computer to full advantage and freely engage in a dialogue with all of the visual images which are now available to use from across all of time and culture.

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NORIE NEUMARK

DiagnosingTHE COMPUTER USER

ADDICTED, INFECTED OR TECHNOPHILIAC

We are living in a moment of computer-related identity crisis. We fashion ourselves as computers. We feel hardwired. We scan our memory banks and databases to access information. Gone are the days of the mechanical self with plumbing and tubes, sparking on all four cylinders. People have thought about themselves as machines before and now many of us think of ourselves as microcomputers on legs. We feel digital, though some parts of our bodies feel more digital than others (our brains for instance).

Addiction, infection, technophilia. While these terms often have a negative connotation, that is not the (only) way I will be using them. Rather, I invoke them because they each suggest a different relationship between the user and the computer. In an addictive relationship the user is separate from but dependent on their computer. With infection the user and computer are still separate but begin to mix vital bodily fluids and to merge their identities. With infection, the relationship between the user and the computer becomes more intertwined and requires a more complex scientific discourse to unravel its 'doubled helix' – the computer has become organic and exhibits the symptoms of viral infection. Technophilia goes one step forward (or backward) in time towards a cyborg moment where user and machine are one in a whirl of pleasure and power. With technophilia the user and computer have merged into a new, cyborg entity.

How did this computer-related identity crisis develop? How can we understand the computer user who is emerging from this crisis? The following analysis explores the variety of meanings related to what it is to be a computer user. The paper is in two parts. The first part is the diagnosis of the computer user's relationship to their computer. In the second part I will attempt to locate the computer's cultural meanings historically.

The Diagnosis: identifying the symptoms, prescribing the treatment

Diagnosis 1 – Addiction

In talking about addiction, the first step is to recognise the problem. It is comforting to know that this is happening in the computer world. Take for example the advertisement for a network-monitoring program which reckons 'If you're running an AppleTalk network, you know how life feels in the fast lane' where 'traffic levels surge out of control' (*Australian Macworld* October 1992, 12). Recognising you are 'out of control' is an important first step in identifying computer-related disease so you can make the moves necessary to get into the recovery lane. Listen also to the testimony of Alan Jones, editor of *Australian Macworld*:

> I'm a victim of a disease just waiting to be classified – addiction to speed. It first started back in 1989 when I went from a Mac Plus without a hard drive to an SE with 2Mb of RAM and a 20Mb hard drive. I'm sure you know the feeling – on startup the smiling Mac face flashes up on the monitor like a subliminal message, INIT's march across the screen at double time and the progress bar on the Copy dialogue box travels like the bullet out of a gun.
>
> Then, as quickly as it starts, the feeling wears off ... The scroll bar slows to a crawl as we drag ourselves across a scanned image in a document. How quickly we begin to think of our new Mac as slow. When news comes that a faster Mac is just

> over the horizon, the awful addiction begins to clamour for attention again (Jones 1992, 6).

So what happens after you have recognised the love of speed, with or without full military fanfare? You need to recognise a power greater than yourself. (Jones does, recognising that there is a higher power and that power is Apple.) Another part of this process is, naturally enough, regular attendance at a user group.

The formation of computer user groups around Australia is symptomatic of the vast extent of the addiction problem. 'Users' is a term widely associated with drug addicts. Here we clearly see the notion that using a computer is addictive. For those who are not able or ready to go to meetings, there is fortunately a burgeoning literature of self-help (such as *The Official Computer Widow's (and Widower's) Handbook* 1990) addressing related co-dependent problems.

Those users who have come together in user groups have recognised their powerlessness in the face of the computer and put their faith in a power greater than themselves – Apple. Their monthly group meditations on the latest computer products bring the necessary humility needed for each user to ask Apple to remove their shortcomings, through purchases. The users go forward from the meetings renewed and able to carry forth the message of Apple to the world of needy PC users.

Where, you might ask, does the addiction lie? Is the addiction about habitual and excessive need for speed, the confessed drug of choice for many computer users like Jones? Do users develop a sense that they cannot survive without it? Does speed become part of their identity, as some of the self-help books claim? (*The Official Computer Widow's (and Widower's) Handbook* 1990, 4-6). This would suggest that the addictive effects of the computer are more to do with speed than narcosis or hypnosis (though some users do claim to experience the effects of the latter). As with any addictive drug, the more you take, the more you need. The speed of computer use brings with it a fear of the abyss (loss of time-space orientation) that threatens to open at low speeds. (This is a classic case of the cause of the problem becoming the only 'solution' – the 'hair of the dog' syndrome.)

Another common trait of computer users is an addiction to the lingo of computers. This goes beyond the pleasure of language play that helps to bind the subculture of users together. The prominent symptom in these cases presents as an inability to refrain from computer metaphors, no matter how inappropriate or excessive they may be. Indeed, excess is pursued avidly. This goes beyond 'interfacing' with friends. Nor is it confined to management types who use technobabble to present their proposals as 'the rational output of the data they've accessed off their latest spreadsheet'. It extends to the groovers with laser chips on their shoulders, or to the *Mondo 2000* types with the cyber-baby T-shirts – 'How fast are you, how dense'. They are definitely more aesthetically exciting and sophisticated than the technobabblers, but they still exhibit the unmistakable symptoms of addiction.

What are the deep psychological causes of this addiction? I will define addiction as an obsessive need for a substance without which the personality begins to crumble. The substance offers a seeming escape from (bourgeois) individualism, whose demands for control, separation, imaginary wholeness and an autonomous self are experienced as painful and impossible. To drink compulsively, for instance, is to lose control, to let go, to get outside the self. Computer addiction also seems to take the user outside themselves – allowing them to merge with the computer, to move so fast that the separate, controlled self is left behind in a new realm of drunken ecstasy.

For some, the addiction can offer new and better ways to help shore up the painful and inadequate identity which is the subjective reality behind the cultural ideology of individualism. Computer addiction can promise to make up for a 'lack'. The computer operates as a sort of phallic fetish: the bigger your machine, the bigger you are; the bigger and harder the drive, the better you feel. As one female user put it, recalling the experience of telling some men in her user group about her new IIci, 'suddenly they treated me differently, like I had the biggest prick in the room'.

Perhaps the computer makes up for an absence in the self in the same way a love object does? This would explain those computer users who think their computers are cute, want to buy them little outfits, a jaunty cap or something to make them feel warm and 'scuzzy'. There are even those who quack back to their computers or greet them when they arrive home – 'Hi honey I'm home. Quack, quack'. They project their emotions onto their computers in the fashion of an addictively obsessed lover.

Diagnosis 2 – Infection

To understand the computer user as infected is to enter a world where the computer embodies organic characteristics and dangers. It suffers from side effects and infections, and it transmits them. The computer and user are still separate, though they have begun to intertwine and exchange essential characteristics – they are both 'organic' and they can both infect and be infected. Here the computer no longer is the drug – it takes drugs. As the advertisement for an IBM laser printer says 'if they were any faster they would be tested for steroids'. Things are moving so fast that they have gone beyond 'feedback' (Virilio & Lotringer 1983, 30). The line between the user and the computer blurs.

Symptomatic of the widespread infection between computer users and their computers is the way that viruses now also strike the users, not just their machines. One user reported symptoms of a virus occurring regularly after extended use of the machine – the main symptom being a 'spaced out' feeling. While some users argue these are the disorienting effects of the computer's dangerous rays, what we are undoubtedly facing in these cases is computer infection.

Among those seeking an explanation of the epidemic of computer infections is cultural critic, Andrew Ross. Ross brings the computer virus under the microscope of his analysis and notes two important effects. Firstly, there is a windfall for software manufacturers of 'vaccinated workstations' and 'sterilised networks'. The second effect is to feed the privatisation bug that is infecting the basic democratic potential of information technology for 'processing, copying, replication and simulation' (Ross 1991, 111-112).

His analysis of media infection with the virus uncovers a connection between the AIDS virus and computer viruses. The media focus has been on high-risk personal contact: obsession with defence, security and immunity; and the climate of suspicion generated around communitarian acts of sharing. The underlying moral imperative being this: you can't trust your best friend's software any more than you can trust his or her bodily fluids – safe software or no software at all! (Ross 1991, 108).

On the tail of such viruses ride a whole chain of signifiers: infection means threat of invasion by outsiders, sexual perverts and dirty, dangerous, different foreigners. (The conflation of 'wogs' as foreigners and wogs as germs in the Australian racist vernacular is significant here.) Such a grave threat is therefore seen to have an inbuilt need for 'protection' (Watney 1989; Singer 1989, 49-51; Treichler 1988). When the *Sydney Morning Herald* (5 October 1992) reported that some of the threatening computer viruses came from Soviet and Bulgarian virus factories, they were invoking the same Cool War danger-zone that also gave us the Russian flu a few years ago.

Ross sees the syndrome of computer users' fascination with infection growing out of an understanding of computers as living organisms, and grounded in an increasing use of biologically derived language (1991, 109). Maybe language is a virus after all? Certainly the prolific mutations of language (even around infection itself) is phenomenal, with virus vaccines, immunisations and defence systems appearing at an algorithmic rate. Here the language does more than bind addicted users into a subculture. It binds both user and machine together.

The use of language invoking the logic of defence and security systems is not innocent – it reveals computers as a biological weapon in the military arsenal, embodying military-scientific values (hierarchical, disciplined and technical ways of knowing and organising against a threat). According to such a logic, computers have emerged from boot camp to become the embodiment of the military-scientific complex. I am not just talking about the military as a source of the money behind the scientific developments of computers, which is certainly true. What I am interested in here is the military-scientific character of computer-user infection, which has deep links with the nature of both the military and modern Western science. The goal of both is control. Both involve the instrumental rationality of separation (alienation) from the sensual, the qualitative; both refuse a connection to 'nature', which stands as the first enemy/other to be probed, dissected, detailed, manipulated, controlled, objectified, neutralised, conquered and distanced. The computers infected by military-scientific thinking embody the cultural, political and social relations of those institutions.

This rampant infection has been described by some users (in a sort of sci-fi/horror style) as scientific reasoning eating the ethical heart out of computers. Maverick computer scientist Morris Weizenbaum identified something similar decades ago. He saw this process as the reduction of technology to calculability and logic; the reduction of ethics to rule-bound morality; and the replacement of judgement by 'truth'. In this way, rationality (as logic and control) and 'truth' became linked in techno-thinking. This has resulted in a loss of responsibility and concern with contextual considerations. In other words, the ability to judge was replaced by calculation, and process was replaced by result (Weizenbaum 1976, 1-16). As a consequence computers are available to make bombs 'smarter' than the enemy and the operator. As demonstrated in the Gulf War and in the simulations of *Patriot Games*, computer warfare promises a battleground that is Western, clean, and technological, controlling and 'deleting' the dirty, chemical, threat of others (Arabs, Irish, etc). Perhaps the real has been infected by the simulacra. For as film critic Bill Nichols has suggested (following Jean Baudrillard), the real has become the simulation and the simulacra has become the basis for how we think the real:

> Star Wars will be the safe sex version of international conflict: not one drop of our enemy's perilous bodily fluids, none of their nuclear ejaculations, will come into contact with the free world (Nichols 1988, 36).

Nichols notes that this is a postmodern cybernetic logic where electronic simulation has replaced mechanical reproduction. In cultural terms this produces an addictive desire for the illusion of control rather than the desire for the fetishised object or image itself (1988, 33, 43). In the end, addiction itself has been infected.

Celeste Olalquiaga pictures a different, reversed version of this infection, but one that still fits into the scientific-military armoury. According to her, in the interchange where body and computer exchange their peculiar traits, the body becomes mechanised at the same rate as the technology is made human. Thus in her view, both body and computer become mechanical rather than both becoming organic (Olalquiaga 1992, 12).

Diagnosis 3 – Technophilia

The concept of technophilia is appropriate for users who are in touch with a different quality of their computer. They are intimately, alchemically in touch – not alienated by addictive obsession nor by the military-scientific mode of experiment, quantification, and technical mastery. Technophilia may present the appropriate diagnosis here – if we can grasp hold of it. It tends to elude us, occupying an ambiguous, dangerous, exciting place of potential that is difficult to analyse. It might look something like a *Thelma and Louise* version of *Sneakers*, if we can imagine that.

Technophilia goes one step further forward or backward in time toward a cyborg moment where self and machine are one in a whirl of pleasure and power. As a time-warping vision it can be either (or both) future and past – a return to a mythical future or a magical past before/after a scientific/technical creation of and separation from a world of 'nature'. Perhaps it is a world of 'infomagic' (to borrow a name from a local software company). Technophilia is elusive, without the hard-edged clarity of scientific vision. Located on the border between pleasure and danger, it is a fascinating, desirable and dangerous place to inhabit. 'Philia' – does it evoke love or devouring? It is an appropriately ambiguous and ambivalent concept for computer users who can slip at any moment from an exciting boundary state towards the abyss of either foolishly optimistic belief in or dangerously pessimistic refusals of technology, as cyborg idol Donna Haraway has identified (1987, 18-27, 35-36).

The technophile plays with such boundaries. The computer writer enjoys the creativity and flow of the unconscious, freed from logical constraints by the possibilities of cut, paste, copy and Command Z. Yet there are also dangers, such as saving compulsively for the fear of loss and the terror of RAM. The computer artist has the opportunity to join the ranks of previously elite guilds that may have excluded them before on grounds of race, gender, ethnicity. The danger for the technophile artist, though, is that the computer gets too big for its boots – too expensive, for many.

If technophilia is so elusive, perhaps we can approach cyborgs more easily through our senses. Does technophilia involve a move beyond the alienated sensory limits of infection, which is still locked into a sadistic vision-centredness of the scientific/military paradigm? (Haraway 1989, 233). What does it feel and sound like to be in a cyborg relationship with your computer? Do you get pre-menstrual together? (I have known photocopiers to be pre-menstrual but they have been in a cyborg relationship with their users for a long time.)

The question of the auto-erotic cyborg emerges here. Is something disruptive and subversive happening sexually for the cyborg that differs, say, from computer sex in an infected or addicted relationship? During infected computer sex, the user has a (computer) 'handle', rather than a self with sex, gender, body and history. When addicted, the user maintains that gendered, sexed self but only to 'escape' into a sexual/love relationship with the computer. Both addicted and infected sexual relations between computer and user might have positive as well as negative sides (depending where you are located) but the auto-eroticism of the cyborg has no sides – it sits on a boundary. Here the phallic power of the machine does not objectify or represent the woman, nor does she need to objectify or master it. Rather, as cyborg she takes pleasure in her own power.

Locating the computer user – an historical interlude

Before writing this paper, I went through the inevitable process of trying to gather my thoughts, thinking it's all there in my mind, if only I could 'access' it. It occurred to me that before computers established their current cultural role as a major source of metaphors through which we shape our senses I thought differently. I used to think that if I read a lot and had enough sleep I would wake up with the paper all together. That was part superstition, part experience. It also came from and expressed some belief in my unconscious self – *my* unconscious self, not my mind as computer. But times have changed and so has language and my unconscious.

My aim in this second part of the paper is to analyse these historical changes in time, space, and subjectivity in relation to computers. I want to focus on the ways that computers have affected subjectivity at several levels. Briefly, technology embodies social relations – including cultural, aesthetic, sexual, economic and political relations. These relations construct technology, giving it shape, content and power. Technology then perpetuates the very relations that constructed it. When people use or interact with technology, it is not culturally neutral; rather they engage with 'embodied' social relations which in turn (re)construct their subjectivity. Because technology is so powerfully determined and determining in culture, society, politics and economics, it is also particularly powerful at a meta-level of representation. Cultural values, fears and desires are easily projected onto technology. This is most evident in science fiction but it also has a very strong everyday aspect. Fears, fascinations, and desires about 'others' (women, non-Anglo races and ethnic groups) are easily projected onto technologies by dominant culture. Technologies then come to represent those same fears, fascinations and desires.

In order to examine the ways technology embodies and therefore transmits culture, perhaps we can draw a useful example from before the era of the computer. Historians have shown that during the process of industrialisation certain kinds of machines were invented and successfully developed because of the political (as much as economic) role they played. How industrialisation happened was not inevitable but varied from country to country. Once established, machinery embodied the relations that created it (Samuels 1977, 45-60). Machines that were brought in by managers and owners to control workers, transferred control from the workers to the managers, decreasing the workers' knowledge and producing a sense of alienation. The machine had the control and knowledge built into it. The Luddites knew that there was nothing inherent in 'machines' or 'technology' in general, but that certain machines embodied particular economic and political relations that were not in their interests – they only smashed machines which had been developed in that way (Thompson 1968, 515-659).

'Control' has long been a politically significant dimension of the social relations embodied in technology. Today control is being maintained by computers specifically with regard to the use of information and surveillance systems. Olalquiaga (1992, 1-18) analyses the cultural dimensions of such control, suggesting that there is a pornographic dimension to surveillance-centred information/computer culture. Technological images become mirrors for identity, and the whole process in turn produces a fragment of the self. She argues that this 'fragmentation ... is compensated in the intensification of pornographic and painful pleasures'. Thus the 'need to gather and categorise information' involves some of the compulsive controlling procedures found in pornography – namely fragmentation (mutilating information so it fits a code), homogenisation (of the information into a predictable code or narrative), repetition (difference is reduced to variations on the same theme), apparent choice, and a voyeuristic control exercised digitally (Olalquiaga 1992, 13).

Information processing masks a 'controlling perversion of a voyeuristic type' that lies at the heart of surveillance (Olalquiaga 1992, 13). Surveillance and information processing also contribute to a sense of loss of control and identity by way of their dangerous fallibility. Incorrect data entry and malfunction can wipe an identity out of the computer and 'out of existence'. This can create a continuous state of self-doubt, hesitation, confusion – if you are not 'in the computer', you do not exist.

Something else is also happening at another level of all this surveillance and information processing. According to Olalquiaga (1992, 19-35), in postmodern culture simulation and obsessive repetition alter the individual's perceptions of space and time. The individual's basic sense of identity is disoriented. Although such change began long ago with the scientific capitalist 'revolutions', today they have moved into another dimension (Thompson 1967; Mumford 1986, 324-332; Virilio & Lotringer 1983, 45, 61, 98, 115). How is this experienced? How does a subjective sense of time and space change when information and data move instantaneously in ways that we as individuals never have and never could?

We are locked into decontextualised vision – losing the sense of seeing, hearing, smelling and feeling different places. Travel may broaden the mind; but as one computer user has put it, now the information gets to have all the fun. In an odd way the users are both more static and more mobile. It is not surprising that many are confronted with a certain disorientation and identity crisis. As our sense of time and space go through such major upheavals, it is not surprising that this has led to a fascination with speed that recalls the Russian futurism of the 1910s and '20s (which was also a period of social, political, economic, cultural and individual identity crisis). These crises were produced in part by the very technological changes that embodied all those relations (Kaplan 1986, 3-5, 26-30). In turn, as happens today, technology offered 'solutions' which varied and were of course contested.

One of the conservative 'solutions' to the sense that technology has led to a loss of control is to embrace and bolster shaken individualism. A striking development here can be found in psychology of neurolinguistic programming (NLP), which ties behaviourist psychology to computer lingo. According to NLP, problems can be solved either by long years of analysis, or by 'reprogramming', engaging the services of a highly paid professional who can do it for you. Surely it's more economically rational and efficient to make a withdrawal from your memory bank and deposit a new data set?

Because technology in general and computers in particular are such powerful embodiments of social relations, they are particularly susceptible to the projections of culture. In those cultures that construct a mind/body split, it is no surprise that the computer represents the mind and that the mind is experienced as a computer (through metaphors and language and imagery). This is epitomised by the approach of Artificial Intelligence (AI).

AI has changed the cultural (and therefore the personal) concept of mind. What is 'deleted' here is a sense of the mind as irrational, dreaming and unconscious (Sofoulis 1992, 21). But not all computer users succumb to such readings of the mind in computer-centric culture. Indeed, some alter the computer's mind rather than change their own. Take, for instance, a novice computer user who, each time she lost some data, spoke not about losing her material but about it disappearing into the computer's unconscious. Was this act of attributing an unconscious to the computer a move to make it more desirable by giving it an attribute she valued? Or perhaps it was her way of dealing with fears about the computer which she still needed to overcome?

Connections between the unconscious and computers make a lot of cultural sense according to Sherry Turkle, one of the pioneer researchers into computers and culture. The idea of the unconscious is, she argues, both culturally frightening and fascinating. The conscious self which was 'in control' is no longer. Not only does the unconscious play a role in individual actions and subjectivity, but to make things worse, it is obsessed with taboos such as sex and death. According to Turkle, people have responded to the idea of computers a bit like they did to the idea of the unconscious — with excitement and fear at the idea of being 'programmed' by forces outside themselves (1984, 290-305).

We could also ask whether the related category of 'memory' has changed with the advent of computers. Has memory become more quantitative and less creative? If memory is now an efficient calculation, and therefore something that a computer will always do 'better' than a person, how does that make people feel? Does it produce an alienation from the self and a subsequent desire for the machine as the solution to that alienation? When memory and knowledge are considered in terms of quantity, quick access and logic, rather than judgement, experience, context and practice, what does this say about a culture? What is intelligence worth if a computer is used to measure it?

At first glance AI seems like a quintessential statement of postmodernism: simulation is the same as reality; the image of an autonomous self is empty ideology (Turkle 1984, 290-305; Olalquiaga 1992, 5). But behind this apparently postmodern decentred subject of AI lies a very centred self who authored it – the old rational logical subject of science. It is a very convenient lie because this kind of self-denial avoids having to take individual responsibility, to have emotions, to engage in politics, or to recognise the significance of context (by denying its own agency).

Rather than ending with the impression that nothing has changed (which is only part of the story) I want to return to the ideas presented in the first part of this paper. We are living at a time of wide cultural crisis and political contestation over culture, with all the confusing, conflicting, and exciting subjective effects that go along with it (Olalquiaga 1992, xi-xxi). What positive political moves are available for the addicted, infected and technophile computer users? Perhaps the addict can accept an imperfect 'self' and the impossibility of control. They might enjoy their addiction to their computer as a recreational drug, as a love object or even as a fetish with phallic power (especially for women). Perhaps infected computer users can reject the military-scientific armoured embodiment of their computers and go with the organic flow. Perhaps they might find some sort of 'mad' perverse creativity in their mutual disease. The technophile cyborgs (especially those 'others'), can perhaps recognise the impossibility of ever avoiding culture (and all its subjective implications) by being disembodied, and take their pleasure in a re-embodied cyborg self. They can enjoy their cyborg selves with the possibility of finding different kinds of creativity and subjectivity.

I would like to thank Maria Miranda, Leola Jacobs and the students in the Technology and Culture course at the University of Technology, Sydney.

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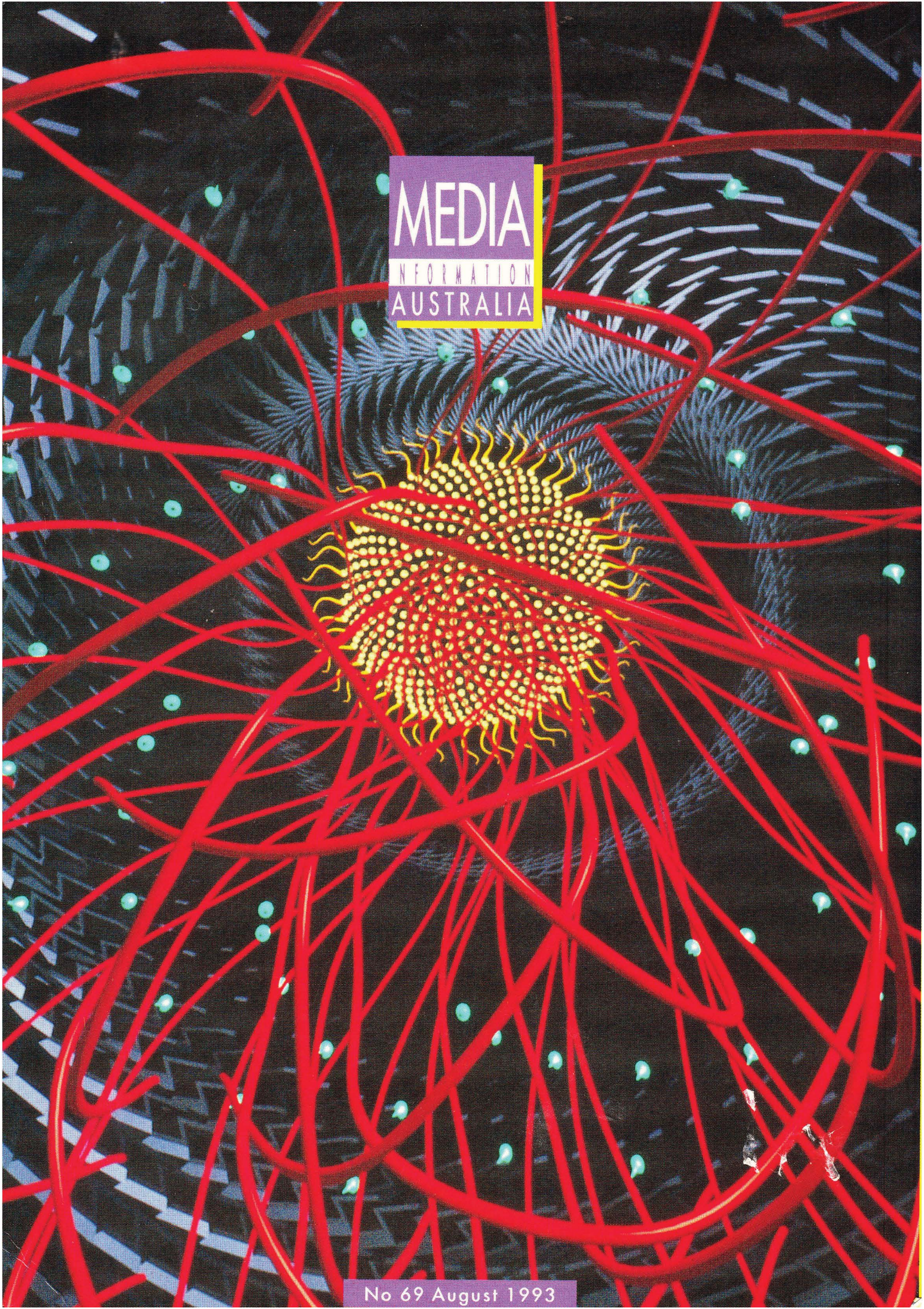

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No 69 August 1993