HUMANITY  TECHNOLOGY

A DISSERTATION VISUALIZED THROUGH MULTIMEDIA COMPUTER-RELATED DESIGN WITH REFERENCE TO ASPECTS OF THE DISEMBODIED SELF, FRAGMENTED REALITIES AND THE HUMAN–COMPUTER PARADIGM

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I would like to dedicate this book to my parents

Selwyn Jack Musikanth
and
Bernice Goldie Musikanth (Atlas).

Thank you for giving me the opportunity
to develop my various creative skills.

Table of Contents

	Page
Acknowledgments	3
Abstract	4
Brief subtitle definition	5
Section one	
Introduction	7
Section two	
The disembodied self: the influence of technology on humanity and the environment	11
Section three	
A. Technology and the postmodern tool—the computer	16
B. *Fragmented realities* of images and text found in art and the digital image	19
C. The computer medium	23
Section four	
Early Computer Art and its developments: 1950s to 1990s	27
Section five	
The human–computer paradigm: an investigation of the metaphorical relationship between the human body, mind and technology	
A. A definition of the brain	32
B. Early historical misconceptions of the mind and thought	33
C. Introduction to the beginnings of artificial intelligence	37
D. A brief history of the early developments of calculating computer devices	39
E. Historical and theoretical developments of AI and its reference to human intelligence: Turing Machine, Cybernetics, Cognitive Science, Emergent AI	42
F. Alienation	52
Section six	
Conclusion: The future	56
Section seven	
Conceptual issues and working process	58
Section eight	
Multimedia representation:	
A. Installation instructions	64
B. Script	67
C. Brief notes on the explication of selected frames of multimedia presentation	71
D. Preliminary selected sketches and source material	72
Text references	73
Visual references	77

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Abstract

When ... interacting with a computer,
you are not conversing with another person.
You are exploring another world.
John Walker 1988 (Woolley 1992:154)

We are entering a new century in which you are connected to the world, to the virtual world.
And much more intimately than you are connected to the real world ...
Our connection with the real world is very thin, and our connection with the artificial world
is going to be more intimate and more satisfactory than anything that's come before.
Marvin Minsky 1990 (Druckrey 1993:17)

[We live] ... in a data-rich world of virtual environments and posthuman bodies ...
(Ross in Bender & Druckrey 1994:49)

Our society has begun to look like a vast electronic beehive ...
(Winner in Bender & Druckrey 1994:194)

We construct our technologies, and our technologies construct us and our times.
Our times make us, we make our machines, our machines make our times.
We become the objects we look upon but they become what we make of them.
(Turkle 1995:46)

My research project investigates a historical, metaphorical and theoretical framework of the technological condition of the 20th century. I have chosen to contextualize my arguments within the time span of the mid-20th century till the present Digital Informational Age, investigating the influences, specifically that of computers (the chameleon-machine) within the Western mass-media environment and Fine Art Tradition. The theoretical framework that has been defined within this paper is extremely broad and as a result certain areas have been focused upon while others are briefly mentioned.

When dealing with the relationship between humanity and technology and the way people utilize computers within our media environment, one is looking at the way our visual perceptions of 'reality' are being distorted and fragmented via this computer technology, and how boundaries between real and virtual, truth and reality are eroding. The various themes selected for my body of practical work have been extracted from my theoretical research, thereby combining text with image, all reflecting and questioning this notion of reality, our environment and our psychological and metaphorical relation towards computers.

In this dissertation, both the theoretical and practical components (multimedia presentation) attempt to reflect upon this computerized environment and how it is affecting our ideas about the self, mind, body, machine and reality. I have concentrated on the intense relationship people have with computer technology (historically, metaphorically and psychologically) and how these relationships are changing the way we think, feel and view ourselves. This new computer simulation environment has affected the notion of human identity and needs to be reconsidered.

Brief subtitle definition

The following paragraphs briefly review the subtitle; these issues are then expanded upon in this theoretical body of work.

The disembodied self

This notion of *The disembodied self* reflects upon the Cartesian theory, that is, the self: body, mind and soul are separate, disconnected entities. Within the context of this dissertation my reference to the Cartesian theory differs and is to be read on both a physical and metaphorical level.

On a physical level, the body, mind (non-physical) and soul (non-physical) are intricately connected, the mind cannot live without its body, although some researchers and science-fiction novelists believe it is possible. The physical and mental are inseparable, and if 'separated' they do not function properly, as can be seen in case-studies on the effects of brain damage on physical functions of the body. However, our means of altering our physical external appearance via cosmetic surgery and our emotions via chemical products such as Prozac reflects upon human ability to 'disembody' the physical and alter the emotional, creating a post-human form—post-human in the sense that we have gone beyond the acceptance of our inherited genetic code, our organic form, as we can change and alter its shape, size or colour (skin) via a slice of a knife or superficially by the 'click' of a mouse, utilizing various computer software. The latter becomes a space where the image can be disembodied from its content and form, floating in a cyberspace of digital codes.

On a metaphorical level, our mental space can be 'separated' from our physical space via the use of the Internet, cellular phones and e-mail, all a form of electronic space—a place where private and public spaces are dissolved, where individuals 'surf' the Net and can create various personages (through MUD (Multi-User Dungeons), NCB and other virtual chat lines/games), all contributing in creating a 'crisis' of identity, where 'Real Life' is but another window within the computer world, a place where humans can become imprisoned by their screens, a 'passive' drug of addiction.

The notion of *self* is no longer one of stability, but is in constant flux and diversity, a post-modern characteristic. In addition the self is influenced by mass-media, where stereotypes are produced, brainwashing the spectator, who in turn 'enframes' his/herself into various surface roles. Both in RL (Real Life) and VL (Virtual Life, such as through the Internet) our sense of identity and reality is being challenged and our notion of humanness in relation to computers (AI) is being questioned.

Fragmented realities

Fragmented realities reflects upon the truth of images and text, of reality and of that which is simulated and virtual. With today's technology images can be fragmented and distorted without the spectator's awareness and knowledge, creating a myth of representation. Thus, what we see is no longer to be viewed as a mirror of reality and truth, but is a constructed image of the world.

On the surface level the image found upon the computer screen is digitized and pixelized. Here the notion of reality, truth, is easily altered via the manipulating and distortive capabilities of computer software, a space where the digitized image is fragmented (pixelized) into an image of illusion, a phantom and/or fragmented reality. This notion of *Fragmented realities* can be further extended into the realm of mass-media and how media enframes and fragments a specific type of marketed reality.

The human–computer paradigm

The human–computer paradigm is an area of research which developed out of my constant reference to computer technology and its influences on the self. In addition, the use of the computer as a tool in the art production process has led to the use of its form and content within a theme which relates to humanity and computer technology—a theme which briefly refers to the complex history of Artificial Intelligence (AI) and its relation to human intelligence. Another element of focus within this theme is the issues of technophobia and alienation.

Section one

Introduction

This dissertation was influenced by the writings of Radin's (1992) dissertation entitled 'The human and computer relationship: a vehicle for character metamorphosis in fictive literature' and Rutsky's (1991) dissertation entitled ' "High Techne": technology and art in modernity and beyond'. From this I began to investigate the relationship between technology (computers), humanity and the environment. A body of research emerged and developed into various themes.

The influence of technology upon our environment is quite evident. Our social landscape is being transformed by fax machines, answering machines, beepers, cellular phones, laptop computers, modems, e-mail and numerous other devices and systems. We are now being bombarded by the insistent call of incoming and outgoing messages of data. Similarly, we are becoming 'immersed' in a technological environment: virtual reality[1] (*Figure 1*), artificial reality[2] , virtual/cybersex, cyberspace[3], artificial intelligence, artificial life, virtual libraries/museums, virtual communities, dataspace, telepresence, interactive television, multimedia, electronic cellular space, e-books, the Internet ... the list is growing.

1. Virtual reality is a type of interactive simulation that allows a participant to be inside an artificial environment. To enter virtual reality (VR) a person puts on a head-mounted display that looks like a scuba mask and navigates within that 'world' using data gloves which encase the hand and body in fiber-optic cabling. VR is an alternative simulated reality.

The 'desktop metaphor' turns files, filing cabinets, electronic mailboxes and digital trash cans into graphic symbols/icons on the computer screen. This type of interface design, created by Macintosh and IBM software, is a form of cyberspace in which icons of the real world are displayed upon an artificial desktop interface. In other words, Macintosh desktop design encourages users to stay at a surface level of visual representation and forget the inner mechanism, the true nature of the workings of the computer, that which is run by on/off switches and bits and bytes. We are moving towards a culture of simulation in which people are substituting simulation of reality for the real.

In our culture of simulation we take things at interface value. We are moving towards a culture of simulation in which people are substituting representations of reality for the real. Our typed assignments, lecture notes, class lists and visual imagery found upon the screen is no less real than the written draft found on our real desk or the printed work.

2. The term 'artificial reality' is a provocative notion, a contradiction, an ambiguity which questions the notion of what is real, imaginary, truth, false, natural, artificial. The term reveals a 'myth' of reality, the way the idea of reality is understood and constructed in Western culture. Yet it does not imply that reality is a myth; we have to look at how technology is changing its appearance. The term 'artificial' has been dismissed because it means 'fake' in English, and 'virtual', meaning almost, is used. This would certainly meet the much lesser expectations we have in this field: artificial reality = almost reality.

3. The term cyberspace originates from William Gibson's writings: *'A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the non-space of the mind, clusters and constellations of data. Like city light receding.'* (Gibson 1984:67)



Figure 1
Evans & Sutherland: Nite-View head-mounted display, offering fully immersive virtual reality with stereo opticals and audio. (Cotton & Oliver 1994:91)

Due to these changes brought on by our technological environment, new diverse means of representation developed by electronic devices modify and affect our senses—the way we see, touch as well as our thought and communication processes. Developments which expand upon our abilities to perceive and shape the way we see, and in the end can determine how we see, result in a controlled vision of our society—controlled, when we are unaware as well as aware of the technological 'power' to manipulate and fragment our visual and verbal interacting systems. This is an environment of capitalistic endeavour for information where information (data) = knowledge = power.

With developments such as the Internet, individuals/users are no longer passive spectators of CRT tubes who are loaded with brainwashed consumption but have become active participants whose 'input'[4] is required amongst this flood of information and global communication.

This form of interaction between user and computer is activated by the 'clicking' of a mouse. In a sense this form of interaction is passive as moving from web page to web page is but a simulation of flipping the pages of a book. On the other hand, e-mail and interest groups found on the Net require a form of virtual communication, of active participation, even though the participants are virtual in connection.

We have experienced dramatic changes in the way we use and view computers. We no longer give commands to a machine; we enter into dialogues via the networking cables, navigating through simulated worlds. Furthermore, the computer is no longer limited to person–machine interaction. Billions of people interact via computer networks, where they have the opportunities to talk, exchange ideas and feelings, view each other digitally and even assume a persona of their own creation, on games such as MUD or chat lines such as NCB, IRC (Internet Relay Chat). What is emerging is a new state of human identity, decentred and multiple, where the self is metaphorically disembodied via the Net.

Similarly, a dramatic shift in the notion of the self, *'other',* machine and the world are emerging. Here the boundaries between humanity, technology and simulation are being fused (Turkle 1995: blurb). Computers have become more than tools—we are stepping through the looking glass where we live in virtual worlds, we are connecting with people and having intimate inter-cultural relationships with people whom we may never meet physically.

4. Involvement. Input and output are key computing concepts. A computer is a device that takes information in—input, processes it and then puts it out—output. The use of the verb 'input' displays how computer terminology has not only influenced nearly every field within our modern Western environment but also our use of language, our means of verbal communication.

As Foster (1993) claims, the new visual technologies reveal the world in new representations, and shock the observer into new perceptions. It is further stated that we are living in a techno-science and/or techno-cultural system where culture and technology cannot be separated. Lovejoy (1989:180–190) adds that technology is creating a *'crisis of meaning'* not only in personal life but in the way culture as a whole is and can be produced and experienced. As we become more media dominated our *'tele-selves'* become our *'real selves'*, we lose our private selves in publicity, through constant transmission to the external world.

The human self develops through the process of social experience and activity, through his/her interaction with other individuals and society. Individuals are constantly exposed to marketed identities through electronic mass-media systems (i.e. advertising and the promotion of various gender roles), creating an identity crisis in which the individual can be influenced and sucked into a complexity of consumer identities, resulting in a fragmentation of identity. *'It is clear that the production of new technological capabilities—in communication ... will displace things completely.'* (Derrida in Brunette & Wills 1994:29)

Therefore, we are residing in an environment of multiple 'realities', identities and perceptions—a world entrenched with commodities and systems of stereotypes which all end up producing and manufacturing marketed identities, all of which entice the audience into an illusionary 'reality' found upon the screen. To expect media to provide an accurate representation of our social landscape is to oversimplify. Media does not reflect 'reality' as if a mirror onto the world, but is a simulation of an enframed type of reality. As Lacan has stated, the real is that which is unrepresentable (in Bender & Druckrey 1994:8–9).

'The body is a highly contested site—its flesh is both the recipient and source of desire, lust and hatred. As a pawn of technology, it is sacred and sacrificial, bearing the politics of society and state. The body is our common bond, yet it separates us in its public display of identity, race and gender.' (Augaitis in Ewing 1994:324)

Advertisers show us how our bodies should be clothed, adorned or groomed. Our culture holds the 'body beautiful' in great esteem, and the female body is sexualized and objectified (*Figure 2*). A cult of physical perfection often leads to obsession and the neurosis of eating disorders, as well as cosmetic surgery. Advertising imagery encourages us to compare our own imperfect bodies with the idealized forms of others. The fact is that those idealized forms bear little relation to reality. They have been carefully fabricated by photographers in collusion with stylists, make-up artists, fashion editors, DTP retouching, a

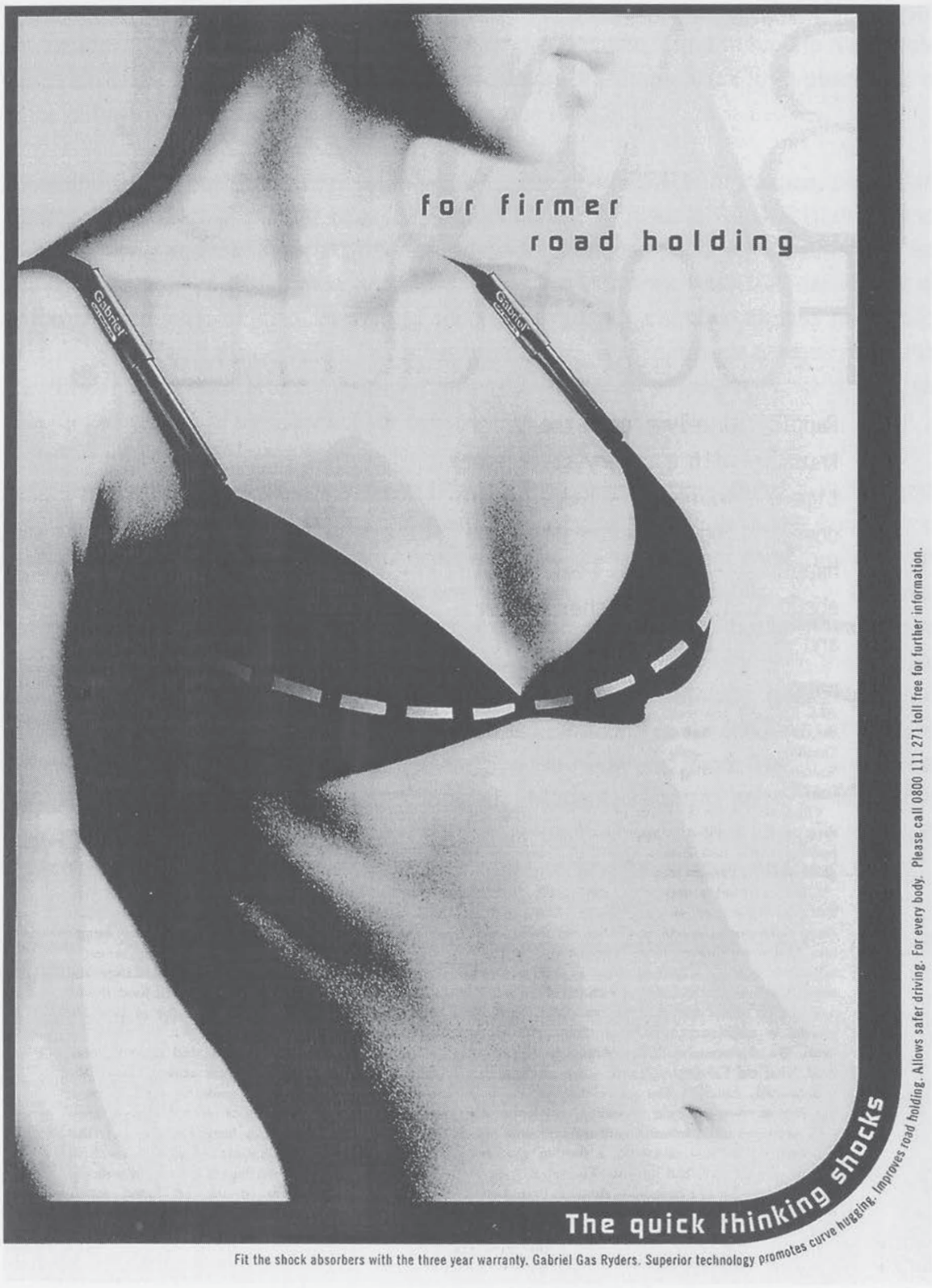


Figure 2
Female body sexualized and objectified in this Gabriel shock absorbers advertisement. (*Cosmopolitan* August 1996:90)

fact that passes 'unnoticed', which reflects upon our blind acceptance of such misrepresentations. Our bodies are giving way to a misrepresentation found within the media/television and various other advertising means, where the human being is perceived as nothing more than an item wrapped in skin (Kruger 1993:36).

As stated by Rotzer (in Druckrey 1993:63): *'... the consumption of images, particularly images that change in rapid succession without continuity, leads to superficial experience ... to a fleeting and distracted manner of reception ... Images seduce us, distract us, and bar our access of reality or truth.'* Artist Carol Flax (in Druckrey 1993:102) states that we live in a world where media, news and docu-dramas freely combine fantasy and reality. According to Foster (1985:100), *'The artist has become a manipulator of signs more than a producer of art objects and the viewer an active reader of messages rather than a passive contemplation of the aesthetic or consumer of the spectacular.'*

Artist Richard Hamilton's *Fashion Plate* (*Figure 3*) reconstructs the glamour myth perpetuated by fashion journals, whereby he takes photographs of models' faces from various magazines and combines them into a collage image. Barbara Kruger combines word and image to produce dramatic attacks on media issues (*Figure 4*), while Cindy Sherman uses her body as a template from which to examine various mass-media representative issues (*Figure 5*). Helen Chadwick, on the other hand, moves away from the external physical body to that of the internal organs, commenting on identity, gender and race (*Figure 6*). All these artists, and many more, are commenting on the influence of our technological media environment and its effect upon the body and mind. These works comment on this flood of uninterrupted, dislocated, fragmented images and text, which hypnotize the spectator in his/her private and public space—images that saturate the public sphere and psyche, as seen by the effect of television and the Internet on the individual.

The following section further expands upon the notion of *The disembodied self* within our computer cultural environment.



Figure 3
Richard Hamilton: *Fashion-plate*, multimedia print 1969-1970.
Photo-offset lithograph, collage, screenprint, and retouching with cosmetics.
(Ewing 1994:338)

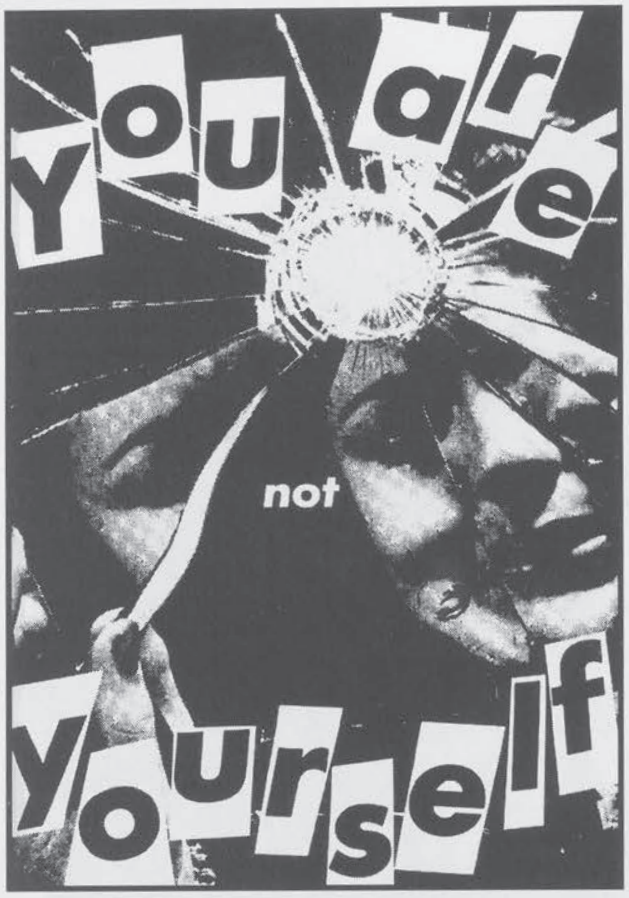


Figure 4
Barbara Kruger: *Untitled (You are not yourself)* 1983.
(*Aperture* 1992:65)



Figure 5
Cindy Sherman: *No. 6* 1977.
Photograph 102 cm x 76 cm.
(Wood 1993:84)



Figure 6
Helen Chadwick: *Self-Portrait* 1991.
'According to Cartesian Dualistic philosophy, woman equals body and man equals mind, intellect. By moving away from depicting the body as specifically female, and by focusing on my own body ... I ... explore a form of self-portraiture that would bear evidence or testimony to a common body, a universal body in which you couldn't read gender.'
(Aperture 1992:64)

Section two

The disembodied self: the influence of technology upon humanity and the environment

This technological generation has been described by critics as contributing to the removal of the individual from direct experience of reality, where real time and space are distorted into an electronically mediated space, a disintegration of spatial division between private and public life. Druckrey (1993:17) claims:

'The shift from technologies that "enframe" experience to technologies that immerse experience is portentous. The penetration of technology within the body and the socialization of simulated realities is more than a signifier of technological progress, it marks a radical transformation of knowledge, of biology, and of the cultural order in which knowledge is linked with ideology, biology, or identity in terms of a technological imperative not fundamentally connected with necessity.'

Druckrey goes on to say that this transformative aspect of technology, a shift from the 'enframed' to immersion, is the most disruptive and challenging dimension of the shift from the triumph of machines to the 'biologizing' of technology. Biologizing refers to the human organism which is immersing in the technological environment, whether it be metaphorically via our physical use of the Internet or through technological inventions which are based upon the human anatomy (i.e. neural networks, AI).

McLuhan's (1964:60), well-known phrase reflects upon this biologizing of technology: *'After three thousand years of explosion, by means of fragmentary and mechanical technologies, the Western world is imploding. During the mechanical age we have extended our bodies in space. Today after more than a century of electric technology, we have extended our central nervous system itself in a global embrace, abolishing both space and time ... '*

McLuhan (1964:534) views the self as a network which has become electric, and is absolutely connected to the world, and states that technology has become/is an extension of our senses, of ourselves. Through our constant contact and exposure to numerous electronic devices,*'... the central nervous system could no longer depend on the physical organs to be protective buffers against the slings and arrows of outrageous mechanism.'* New concepts of time and space are being shaped and the language of culture is adapting to the language of technology.

McLuhan goes on to say that our society is experiencing a technological transformation where electronic and digital artifacts, such as computers, television, video and other various 'universal' networking database-informational systems (the Internet), constitute and symbolize the radical alteration of our time and spatial consciousness.

'Men are suddenly nomadic gatherers of knowledge, nomadic as never before, informed as never before, free from fragmentary specialism as never before but also involved in the total social process as never before, since with electricity we extend our central nervous system globally, instantly interrelating every human experience.' (McLuhan in Cotton 1994:7)

According to Deitch (1992), through technological developments we are adding a new stage to Darwinian human evolution—a realm of artificial evolution where a new concept of self, a new construction of what it means to be a human being, is being shaped. He goes on to say that one is freed from the constraints of one's inherited genetic code and past, creating a disintegration of the 'self', with the freedom to reinvent and transform the self—a transformation where the self, body and mind have become disconnected and disseminate into a free-floating body of parts, a Cartesian ideal state.

Deitch (1992:29–30) claims that: *'As radical plastic surgery, computer-chip brain implants, and gene-splicing become routine, the former structure of self will no longer correspond to the new structure of the body. A new post-human organization of personality will develop that reflects people's adaptation to this new technology and its socio-economic effects.'*

Similarly, Woodward (in Bender & Druckrey 1994:50) states that: *'Over hundreds of thousands of years the body, with the aid of various tools and technologies, has multiplied its strength and increased its capacities to extend itself in space and over time ... one that ultimately displaces the material body, transmitting instead its image around the globe and preserving that image over time.'* Today the image of the body as well as its physical form can be altered by the use of any number of computer software programs. In addition, Batchen (in *Aperture* 1994:48–50) states that the body has always been involved in a process of continual metamorphosis: *'Digitization, prosthetic and cosmetic surgery, genetic engineering, artificial intelligence, virtual reality—each of these expanding fields of activity calls into question the presumed separation of nature and culture, human and non-human, real and representation, truth and falsehood ...'.*

Bender & Druckrey (1994:49) add, that we live in a *'... data-rich world of virtual environments and posthuman bodies'.* They go on to say that besides the body being altered via technology, it is also altered via the media: *'We are taught to regard our body as an instrument, as apparel; our culture customizes its bodies like it customizes its cars. The body is representation only, an external appearance, and may be adjusted to suit the taste of the owner.'* (1994:241)

This notion of the post-human form is echoed in the writings of feminist biologist Donna Haraway, who discusses the notion of post-gender in her *Cyborg Manifesto.* Haraway's essay is theoretical science fiction; she envisions a convergence of biotechnology and communications technology in the figure of the cyborg: *'... humans have migrated to cyborg, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction.'* (in Bender & Druckrey 1994:16) Today the cyborg is a postmodern myth, a myth which is promoted by films such as *Robocop I, II, III, Terminator I, II, Lawnmower Man I, II, Johnny Mnemonic, Strange Days, Hackers, Ghost in the Machine, 2001, Power Rangers* and numerous other film productions.

However, with the developments of artificial limbs, heart implants and computer-chip brain implants, the cyborg may not be so far removed from actuality; it is an issue that needs to be acknowledged. Morse (in Bender & Druckrey 1994:161) continues this seductive analogue by stating that there are cyborgs today (people who believe they are) that live on smart drugs and smart drinks—technofood reduced to byte-sized chemical constituents— a strategy by which the mind is fed and freed and the body is purified of organic deterioration.

In a sense we 'may be' becoming like machines, when our bodies and emotions can be controlled by medication (such as machine-life support systems, anti-depressant medication and Prozac). Similarly, when issues such as the human genome project and artificial intelligence are discussed in *Newsweek* cover stories and *Time* ('Can Machines Think?' front cover of *Time* April 1996), it becomes harder to maintain that people are not programs. Notions of free will have had to jostle for position against the idea of mind as program. In addition, the notion of life as a key boundary marker between people and machines has become the fundamental issue, where new technologies are prolonging lives and sustaining premature infants. Emotion itself has been under attack as that which is a chemical imbalance and can be cured via medication.

When it comes to analysing our DNA code[5] (genetic engineering) for answers of how our body works, some medical scientists begin to see people as 'programmed' beings, identi-

5. Pryor (1991) points out that with the development of technology people seem to be shifting almost unconsciously from this 'mechanical' model of themselves to a model based on computer technology. The computer metaphor is used increasingly to explain or model human biological processes, for example, references to the idea that biological organisms are really information processing devices, the mind as merely a complex pattern of information in the brain, and references to information that is supposedly 'hardwired' in DNA. According to Mitchell (1992:52), DNA not only carries hereditary information, but apparently is also in a digital form, allowing replication without degradation.

fying the self with the latest preoccupation, the computer (further discussed in Section five). This type of research shows us how computer technology not only do things for us, but how they do things to us from a subjective viewpoint, altering the way we think and see ourselves in relation to our computer environment.

To elaborate, when an individual purchases a computer, she/he is firstly attracted by a consumer product, say a computer with a Macintosh-style interface. Consumers think they are getting an instrumentally useful product, but when at home they interact with it every day and so do their children, this directly affects family interaction and communication. When linking onto the Internet to interact with other virtual individuals, they think that this will provide them with new access to people and information: it does, but it also enables the individual to take on multiple roles (as in the game MUD), where the individual's true identity can be concealed and created, challenging the idea of the unitary self and reality (Turkle 1995:49).

The Internet is an element of computer culture which is contributing to the concept of human identity. Turkle (1995) states that users can create screen personages as if they are an actor in some theatre production. They wear an array of virtual masks: *' "The persona thing intrigues me," said one."It's a chance for all of us who aren't actors to play (with) masks. And think about the masks we wear every day." '* (1995:256) Such character impersonations occur on the Internet game called MUD, a virtual environment where users can acknowledge their inner diversity and multiple personalities, yet at the same time users want an authentic experience of the self. *'... the many manifestations of multiplicity in our culture, including the adoption of online personae, are contributing to a general reconsideration of traditional, unitary notions of identity.'* (Turkle 1995:260) These computer games/chat lines can become an addiction to many users, who are able to create multiple personalities in a place where real-life personalities are just another 'role' in this game.

Can anyone tell me how to join www.@real.life?

Alternative identities have become a way of life for people who live in virtual reality as they cycle through different characters and genders, moving from window to window on the computer screen. Identity (on the Net) is fluid and multiple, a signifier no longer clearly points to a thing that is signified (that is, the real 'you' may not be you behind the screen).

According to Turkle (1995), every era constructs its own metaphors for psychological well-being. Not so long ago stability was socially valued and culturally reinforced. These stable social worlds have broken down and today one adapts to change, new jobs, career directions, gender roles and new technologies. According to Gergen's (in Turkle 1995:257) notion of a 'saturated self', he believes that the self has vanished. Gergen (in Rheingold 1994:169) adds, *'...as the century has progressed selves have become increasingly populated with the character of others. We are not one, or a few ... we "contain multitudes." We appear to each other as single identities, unified, of whole cloth. However, with social saturation, each of us comes to harbor a vast population of hidden potential ...'*. Jameson (in Turkle 1995:49) wrote that in a postmodern world, the subject is not alienated but fragmented. Alienation[6] presents the self as one who could become lost to him/herself. Yet in a postmodernist light the self is seen as decentred and multiple, creating an anxiety of identities.

'We are entering a new century in which you are connected to the world, to the virtual world. And much more intimately than you are connected to the real world ... Our connection with the real world is very thin, and our connection with the artificial world is going to be more intimate and more satisfactory than anything that's come before.' (Minsky in Druckrey 1993:17)

Lyotard (1984) states that knowledge is altered as societies enter what is known as the post-industrial age. Electronic machines are changing the ways in which learning is acquired, classified and exploited, as well as creating a different psychological impact on the human being, the creative process and the nature of art.

The following section will reflect upon the computer medium and its effects within the art production process.

6. The notion of alienation is the result of a mechanization that destroys the sense of wholeness. For instance, within the psychological realm, if one fears an element by not knowing it, one's inner stability is unstable, resulting in a lack of control and an alienating feeling towards that specific element. Within the context of this paper, the 'feared' element is computer technology.

Section three

A. Technology and the postmodern tool—the computer

Technology has been defined within the parameters of the developments of manufacturing to the developments of information processing, industrial to post-industrial, mechanical to electrical. However, technology does not deal solely with inventions of improved and more efficient types of machinery: modern Western society has been defined by numerous writers as a technological society. Such a viewpoint suggests that a change has taken place in how we view ourselves, culture and society.

What we term 'Modern Technology' began with the 18th century development of mechanical production. According to Lewis Mumford (1934:6) *'... the clock, not the steam-engine is the key-machine of the modern industrial age.'* With the invention of the mechanical clock, time became a collection of hours, minutes and seconds, an abstraction of time and space. During the Renaissance, the mechanical clock and the modern system of time came into existence. With the rational, mathematical ordering of the world, by Renaissance science, the world was seen as 'mechanical'. Mathematics became a new way of conceptualizing the world. Theories of perspective and proportion began to dominate paintings and buildings, demonstrating this mathematical space (*Figures 7a and 7b*).

During the Industrial Revolution technical changes were not just a set of inventions, but a powerful influence within the society. According to Thomas Carlyle (1984:37), who coined the term 'Industrialism', *'... the "Age of Machinery" was not only brought on by machinery but by a mechanical outlook on the world.'* Carlyle viewed technology as out of control, instead of seeing it as a tool he saw it as a controlling force unto itself. In contrast, Heidegger (1977:37) viewed technology *'... as a means to an end, as a tool or instrument.'* This attitude corresponded to the most common definition of modern technology as applied science, as functional, logical, 'under control'. The scientific technological rationale has always been to place 'nature' under human 'control'. Science attempts to legitimate itself as neutral and objective, as the truth about reality rather than a particular way of ordering reality.

Modernity has in many readings defined technology as a mere tool or an autonomous process which has been viewed in terms of an instrumental rationality.[7] Yet in 'Modernist art' a different concept developed in which technology emerged as not solely defined in terms of its instrumentality. 'Modernist art' attempted to maintain an autonomous status of the aesthetic, to break from history, the past, and become a subject which was free from

7. An anti-technological viewpoint sees humanity's scientific technology (inventions) as that which dominates 'nature' and comes to dominate humanity itself. Thus, the desire for human control becomes the loss of control. Modern technology seen as an instrument may be considered either as a tool for human control (over nature) or an instrument of human domination. As a result, technology is seen not 'only as out of control' but as controlling, an autonomous technology that objectifies and mechanizes not only things, but humanity itself, an '*other life*' (metaphorically) that threatens to 'control'.

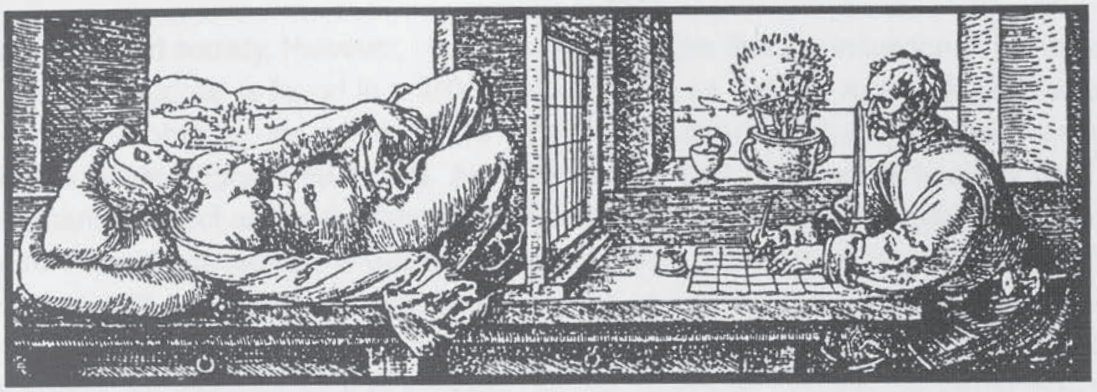


Figure 7a
Albrecht Durer: *Untitled* 1538.
Woodcut.
(Lovejoy 1989:28)

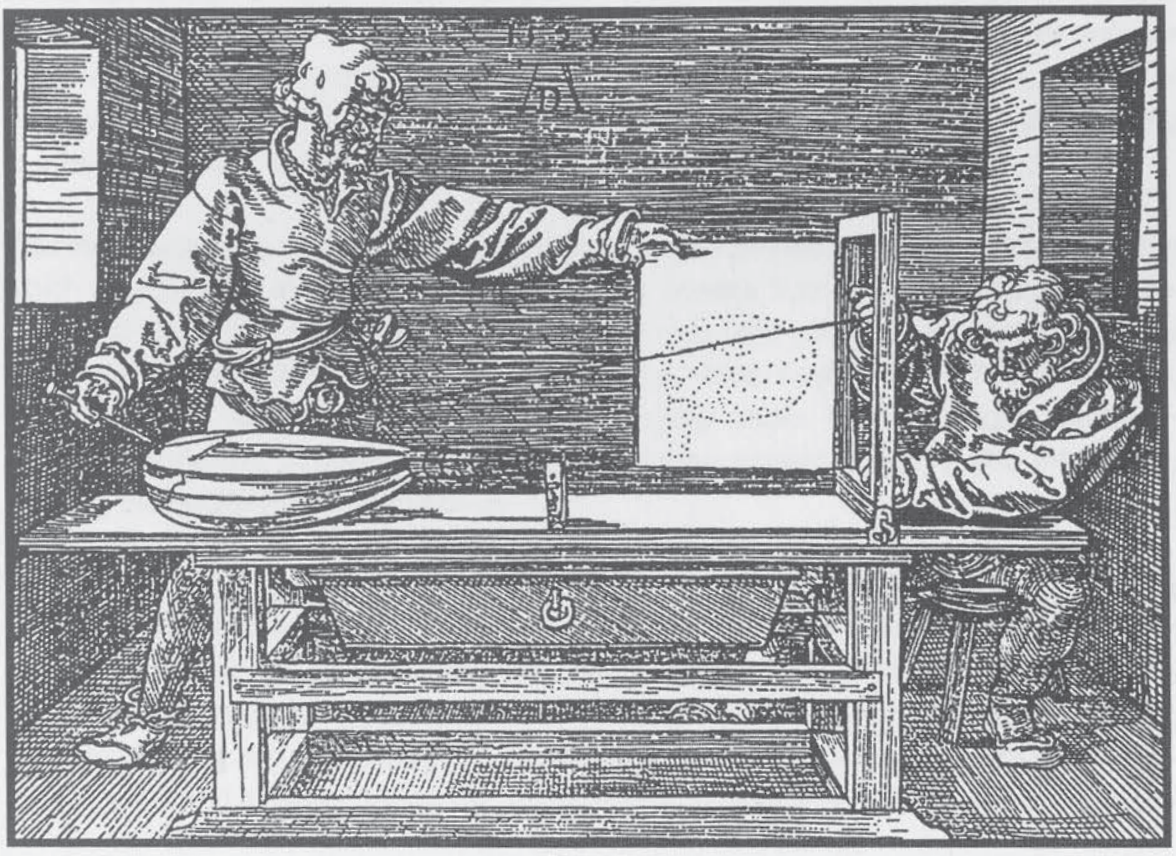


Figure 7b
Albrecht Durer: *Demonstration of Perspective* 1525.
From the artist's treatise on geometry.
Woodcut.
(Mitchell 1992:155)

technology and society. However, Huyssen (1986) claims that the influence of technology on the 'avant-garde' is found in artistic practices such as collage, assemblage, montage and photomontage, as seen in the works of Cubism, Futurism, Dadaism and Constructivism (*Figures 8a to 8g).* Art 'movements' that liberated technology from its instrumental aspect and at the same time destroyed the aura of an autonomous art form, which become dependent upon external forces. Cubism, Futurism, Dadaism, Constructivism and Surrealism can be considered as having an influence on the relationship between art and technology. Futurism can be viewed as an exaltation of dynamism and speed, the fusion of art and science. Dadaism revealed the qualities of the machine aesthetic, as can be seen by Duchamp's pre-Dadaist work *Nude Descending a Staircase* (*Figure 9*). Each of these art 'movements' can be researched in their own right and are sighted here as a reflection of the influence of the technological environment within the field of art. With the developments of Postmodernity, where the 'author' became the appropriator of history, imagery, text and all hybrid forms, the 'computer' became the metaphor of such an act, a postmodern tool.

According to Lovejoy (1989:180), *'The computer is a metaphor for Postmodernism itself in the sense that it makes possible a melding of genres where art forms become fused. Because it is a universal tool ... it is capable of eventually combining work in not only our major means of representation in the visual arts—video, photography, drawn, painted or sculptural forms—but all forms of communication: music, literature, and theatre, leading to inter-arts crossover production.'* It is seen as eclectic, a mixing of codes.

This interdisciplinary activity became an element in the 'Postmodernist' position, a force in which very different kinds of impulses and forms emerge from cultural production, creating hybrid forms (Jameson in Lovejoy 1989). The computer with its programmed software can simulate media that cannot exist physically (i.e. virtual reality). It can 'become' words, writing, printing, publishing, sounds, speech, singing, music, marks, designs, photography and animation, in short, a multimedia of communication which is also interactive, allowing the user/viewer to participate.

Turkle (1995:19) adds that the notion of programming itself has changed. It is no longer that which is systematic, logical and mathematical. Computing today has little to do with calculation, but is about navigation, simulation and interaction. The very image of the computer as a giant calculator has become dated. Fifteen years ago all programming was governed by text commands, today one uses off-the-shelf software to draw with simulated paints and brushes, a process which once would have been a programmer's night-

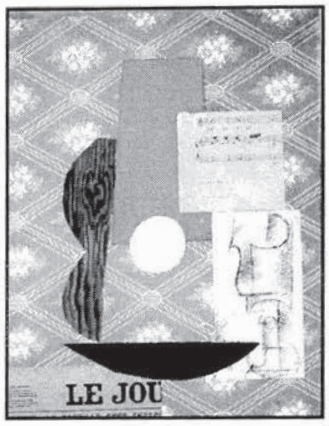


Figure 8a
Pablo Picasso: *Guitar, Sheet Music, and Glass (Guitar and Wine Glass)* 1912. Paste paper, gouache, and charcoal 18 7/8 in x 14 3/4 in.
(Waldman 1994:16)



Figure 8b
Carlo Carra: *Patriotic Celebration* 1914. Pasted papers and newsprint on cloth, mounted on wood 15 1/4 in x 12 in.
(Waldman 1994:56)

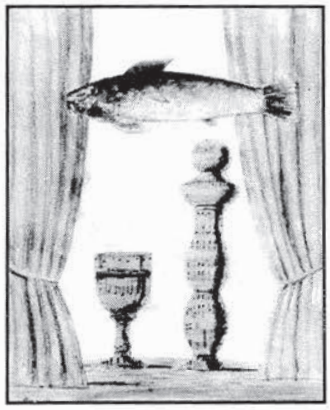


Figure 8c
Rene Magritte: *L'esprit et la forme* ca. 1928.
Collage and gouache 18 in x 14 in.
(Waldman 1994:178)



Figure 8d
Kasimir Malevich: *Composition with Mona Lisa* 1914. Oil on canvas with graphite and collage 24 3/8 in x 19 1/2 in.
(Waldman 1994:75)



Figure 8e
El Lissitzky: *The Ship's Chart* 1922. Collage and drawing with watercolour.
(Waldman 1994:98)



Figure 8f
Raoul Hausmann: *Dada-Cino* ca. 1919. Photomontage 12 1/2 in x 8 7/8 in.
(Waldman 1994:106)

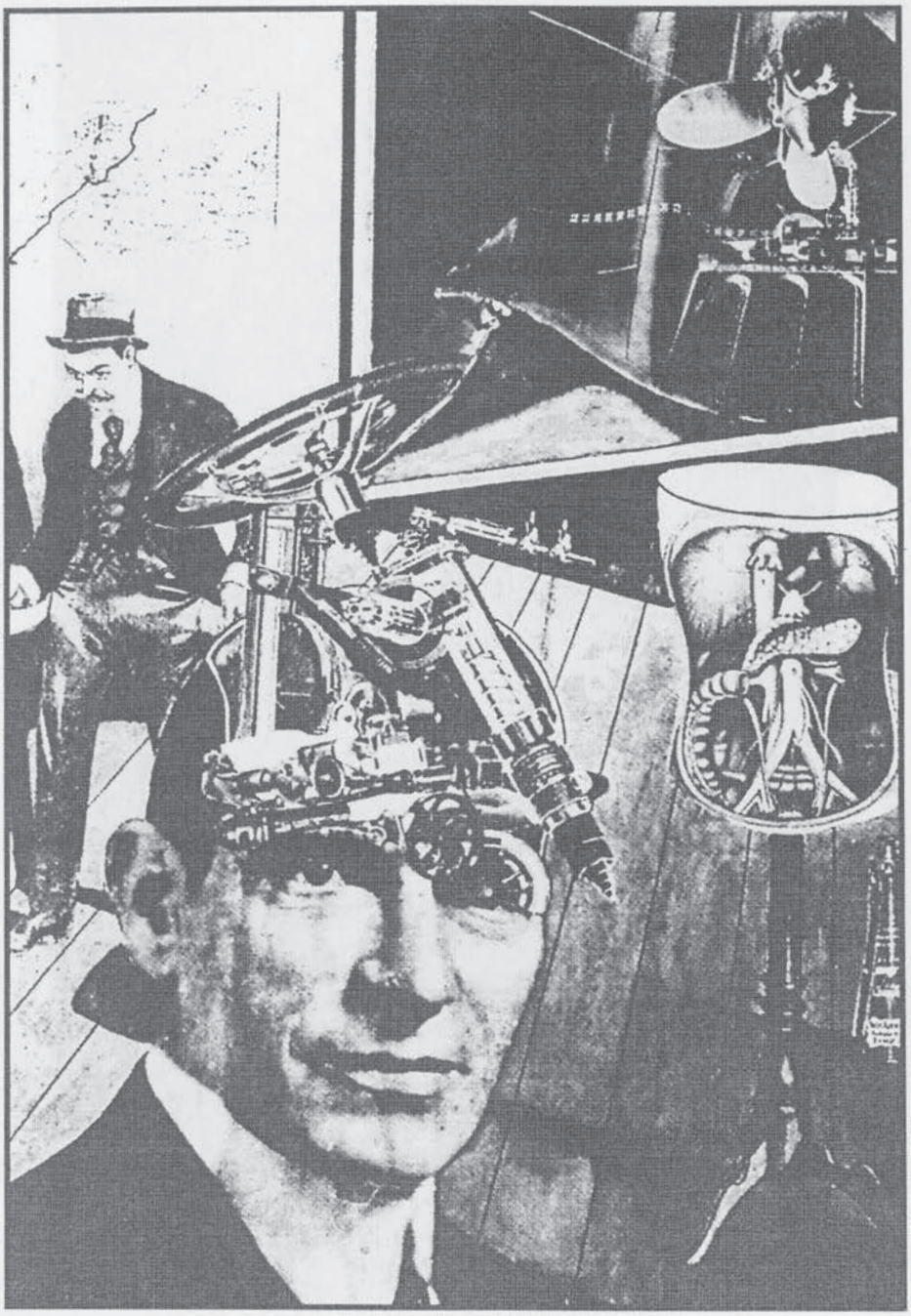


Figure 8g
Raoul Hausmann: *Tatlin at Home* 1920.
Collage of pasted photo-engravings, gouache, and pen and ink. 41 cm x 28 cm.
(Lovejoy 1989:40)

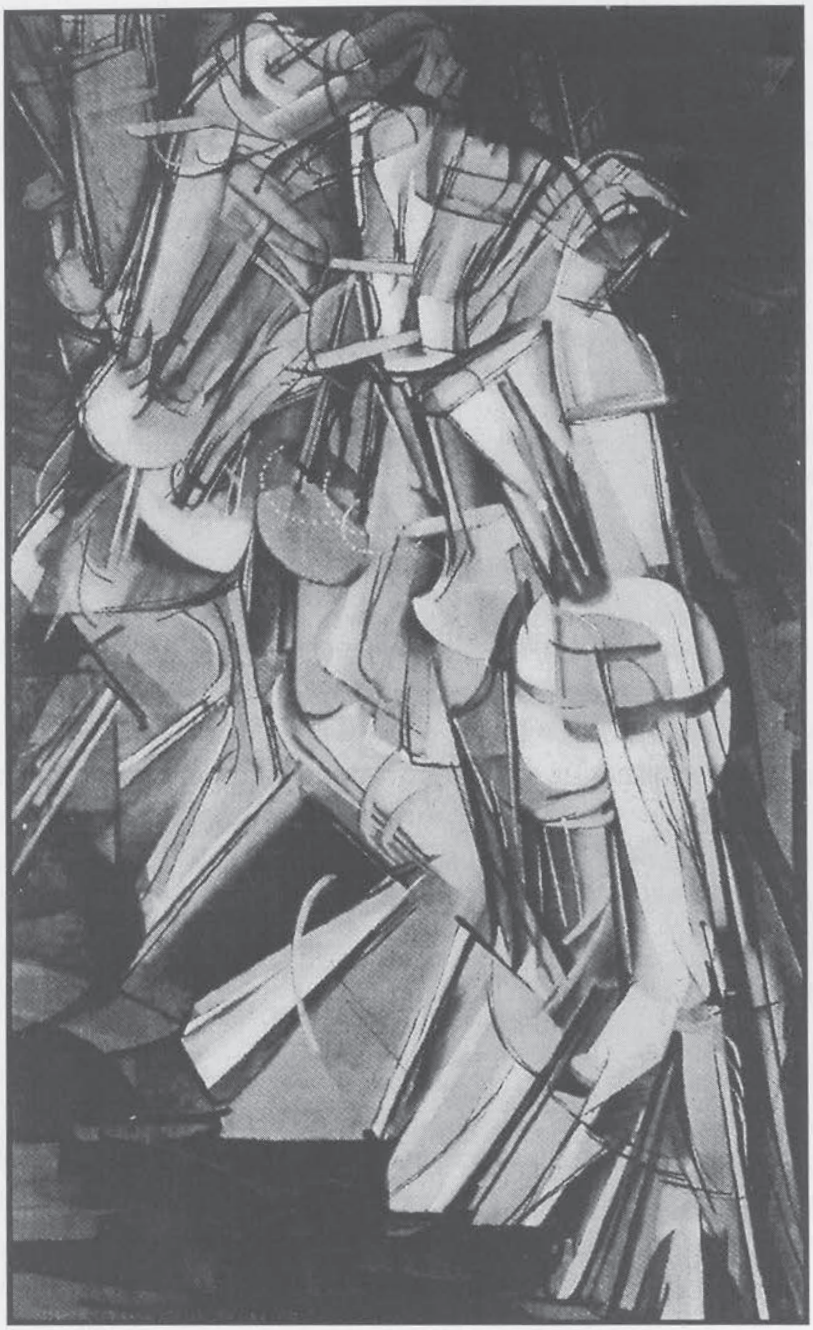


Figure 9
Marcel Duchamp: *Nude Descending a Staircase* No. 2 1912.
Oil on Canvas 58 in x 35 in
(Lovejoy 1989:51)

mare of textual commands. Similarly, Turkle (1995:45) views hypertext as another example of postmodernism. Hypertext is a non-linear text formation found on the Internet web pages—a system which allows the users to create links between 'related' texts, songs and photographs, whose links/connections are as arbitrary as the collected material, creating the instability of meaning. No longer does the modernist master narrative exist: hypertext creates various narratives and is a meta-narrative of arbitrary connections. Turkle also views the Internet (World Wide Web) as a form of postmodernity. One could *'... say that we are moving from a modernist culture of calculation to a postmodernist culture of simulation.'* (Turkle 1995:20)

Postmodern theorists have written about worlds without origins, simulacra, copies of things that no longer have originals. Files and documents found on the computer screen function as copies of 'objects' of which are the first examples—there is no other thing itself. The postmodern world is without depth, a world of surface. Postmodern theorists argue that the privileged way of knowing can only be through an exploration of surfaces, much in the way we explore the surfaces of the Macintosh interface.

The computer is a chameleon-machine which can simultaneously simulate spoken word and written sign, aural and visual imagery, displaying colour and black and white, still or in dynamic motion, all in virtual digital space which is subjected to none of the restrictions of gravity that govern the material world (but only to the constant flow of electrical energy). It is a 'virtual' instrument. 'Virtual' is derived from the Latin word 'virtualis', meaning powerful capacity. The adjective 'virtual' refers to the phenomena that exists in essence but not in actual fact, a kind of phantom reality[8] that is there but not there. The virtual entity then is a simulacrum, a product of simulation (meaning to 'imitate'). The computer is an instrument of simulation, of digitally encoded mathematical algorithm, which 'live' in cyberspace. The objects on the screen have no physical reference, they are elements which illuminate on the screens from a space of abstract binary notation and electronic pulses. As Woolley (1992:68) claims, the computer is a 'virtual' machine, an abstract entity or process that has found physical expression, a simulation which is not necessarily anything actual.

The following sub-section will discuss the internal structure of the computer medium and its different qualities in relation to other art mediums (i.e. photography, painting, etc.).

8. One could extend this concept to the mirror–self relationship where the self in the mirror is not the self but a simulated image of the self, a reflection. Foster (1993:8) claims that our identification is always also an alienation "... for at the very moment that we see our self in the mirror we see this self as image, as other".

B. *Fragmented realities* of images and text found in art and the digital image

Spatial fragmentation is an element found within computer images and text, which is a space where images are fragmented and pixelized from reality, and transmitted via electronic pulses into a world of simulation and illusion. From an art-historical reference viewpoint, spatial fragmentation was clearly evident in the works of the Cubists, whose developments of collage and montage addressed the notion of 'differential space'. According to Baudelaire (1964), collage is a construction of images, fragments which have been technologized, images which are mere copies, imitations, citations which are arranged and constructed arbitrarily. For Benjamin (1970), technological reproduction was like a quotation, an allegorical technique, breaking up space and time into images that were assembled not as a whole but as montage found in the technique of collage, a technique in which the connection between form and content is broken down, allowing things to be divided. Thus collage is a form of fragmentation, of images and text piled together whose 'connections' become a meta-narrative as opposed to a master narrative.[9] It is *'... the combination of various dissimilar fragments ... [which] propose a dislocation of time and space.'* (Waldman 1992:11)[10]

The next significant shift in the recognition of fragmentation emerged in the assimilation of consumer culture within the aesthetic practices of Pop Art. During the 1950s and 1960s Pop Art looked ironically at consumer culture, mass-production and mass-media (*Figure 10*). With the development of mass-production, images were popularized and viewed within a context out of their original settings, allowing for a wider spectrum of accessibility over time and space. According to Hughes (1991:324–325): *'Because nothing could be retrieved or reproduced ... the pre-technological eye was obliged to scrutinize one thing at a time. Objects and images could not, except at the cost of great labour, be reproduced or multiplied, today the object spouts into a swarm of images of itself, clones and copies. Mass production strips every image of its singularity.'*

Druckrey (1993:6) goes on to say that what unites Dada, Surrealism, Pop, television and, ultimately, the computer image is their underlying relationship with the photographic. Within the field of art, the reception and attitude towards computers has been like that of photography (Lovejoy 1989). It represented a threat to the tradition of subjective expression in the same way that the camera did 150 years ago. As a result, the comments found within the early controversies of photography are parallel to today's digital media.

9. A master narrative itself can be viewed as a meta-narrative as it represents a specific imposed interpretation of that period.

10. According to Waldman (1992:8–11), collage did not originate in the 20th century but was only recognized then as a viable medium in the context of fine art. He goes on to say that few would argue that collage involves the pasting together of various materials on a flat surface, whereby assemblage was a process of joining 2- and 3-dimensional organic or prefabricated materials that project out from the surface plane.



Figure 10
Andy Warhol: *Marilyn Monroe (Twenty Times)* 1962
(Baal-Teshuva 1993:6)

Today photography is generally accepted as subjective.[11] At the beginning of photographic inventions, Dziga Vertov wrote in 1918 a subjective comment: *'I am the camera's eye. I am the machine which shows you the world as I alone see it. Starting from today, I am forever free of human immobility. I am in perpetual movement.'* (in Druckrey 1993:21)

With the discovery of photography, the function of art was questioned, as was the 'divine genius' of the painter, the mark of the sanctity of handskills. From this, a negative attitude grew out of a reaction of fear and threat towards the machine age. Issues such as 'authorship', 'aura', 'subjectivity', 'uniqueness' and 'originality' came into question. Benjamin (1970) commented on the photograph as the dominant tool of visual production which evaded the traditional 'aura' of the Modernist notion of rare/original artwork, and 'deconstructed' the Modernist notion that the 'original' (material uniqueness) dominated, in the assessment of art value (and/or commodity value).

Baudrillard (1988) viewed reproduction of the real as simulation, through another medium. The 'real' was/is violated, the hyper-real created, which no longer is the object of representation, but is a 'copy', 'imitation', 'likeliness', a loss of 'the original'. 'Reality' has therefore come to be seen in terms of 'information', 'consumption', as a matter of 'simulation' or 'hyper-reality', a world of simulacrum[12], a post-industrialist world characterized by 'signs' that simulate rather than represent the real. The electronic image vacillates between actuality and hypothesis. The alliance between the seen and the experienced is challenged in this environment.

'It is in this environment—with the transformation of media, the initial phases of interactive telecommunication, and the advanced development of computer reality—that art reaches a reinvented relationship with the symbolic. We now have a third phase of montage: electronic montage ... It is a wholly different way of constituting an image than in painting or photography ... visual order is formulated by a mathematical order. And once the image is digital, it has little to do with photographic systems except by implication ... they are perceptual, but not registered in the optical system of the camera.' (Druckrey in *Aperture* 1994:7)

Representation needs to be deconstructed once again, and nowhere is the evidence of this deconstruction more problematically signified than in the images and text illuminated

11. Contemporary theoretical discourse has dealt extensively with the subjectivity and simulated reality inherent in photographic representation. It is now generally accepted that even though the photograph 'represents' that which is in front of the camera, photography is a symbolic practice where its meaning is determined by beliefs and generated through connotative strategies of subject selection, framing, retouching and cropping of 'reality'. Photography is highly contrived and subjective, reflecting the photographer's own psyches, as well as the aesthetic, political and commercial demands of the moment. Today, art-value is viewed as both socially, historically and culturally constructed and not isolated by its materiality. In addition, the tools utilized to create this materiality themselves comment upon a value structure.

12. 'Simulation ... is the generation by models of a real without origin or reality: a hyper-reality.' (Buadrillard 1988:166)

on the computer screen. Computer imaging systems have come to echo the forms of representation that dominate this culture. These imaging models found in digital technology have their practical roots in the photographic, but their conceptual schemes lie in simulation. The configuration of data used to construct an electronic image is epistemological—based on a knowledge of how the structure of perception can be rendered—while the photographic recording is phenomenological.

This digital image is synthetic and can perpetrate violence, fragmentation and distortion of original visual forms and content through various applications of surface manipulation found in specific computer software. The surface area of this digital language comprises dark and light pixels which can be individually altered, manipulated and repositioned. Seeing is no longer believing. The computer has the ability to change perceptive reality and alter 'acceptable truth'. As a result, the very truth of those images and text are questioned, creating a reality which is fragmented, an element visualized in my body of practical work, which plays on the notion of *Fragmented realities*. Does this mean we will no longer believe in the truth of the photographic image? Images we see in newspapers, magazines, television and the environment? There have been numerous political, social and legal case-studies in which photographic evidence has been rejected as unsubstantial evidence due to the fact that elements have been tactfully removed or placed into new backdrops, which create a false or forged piece of evidence.

According to Batchen (*Aperture* 1994:47), our culture has put much trust in the photograph which has never been 'true' in the first place. Photographers intervene in every photograph they make, whether by orchestrating or directly interfering in the scene that is being imaged, and finally by adding captions and other contextual elements to their image, to anchor some potential meanings and discourage others. The production of any and every photograph involves some or all of these practices of manipulation, whereby the absence of truth is an inescapable fact of photographic life (*Figures 11a and 11b*). Computer visualization allows photographic-style images to be made in which there is no direct reference to an outside world. Thus, the 'reality' the computer image presents to us is virtual rather than actual, a mere simulation of the reality whose original source lies in the scanned material and programmed software and hardware.

To confuse matters more, photography is but a re-presentation of a reality that itself already is nothing but a play of representations. Kevin Robins (1992:101) uses the term 'postphotographic' and states that: *'postphotography promises a new image where the real and unreal intermingle.'* The recognition of the dematerialization of the 'real' is no shock to the art world. According to Virilio (1988:60): *'Images have become munitions.'*, weapons which attack our visual senses.

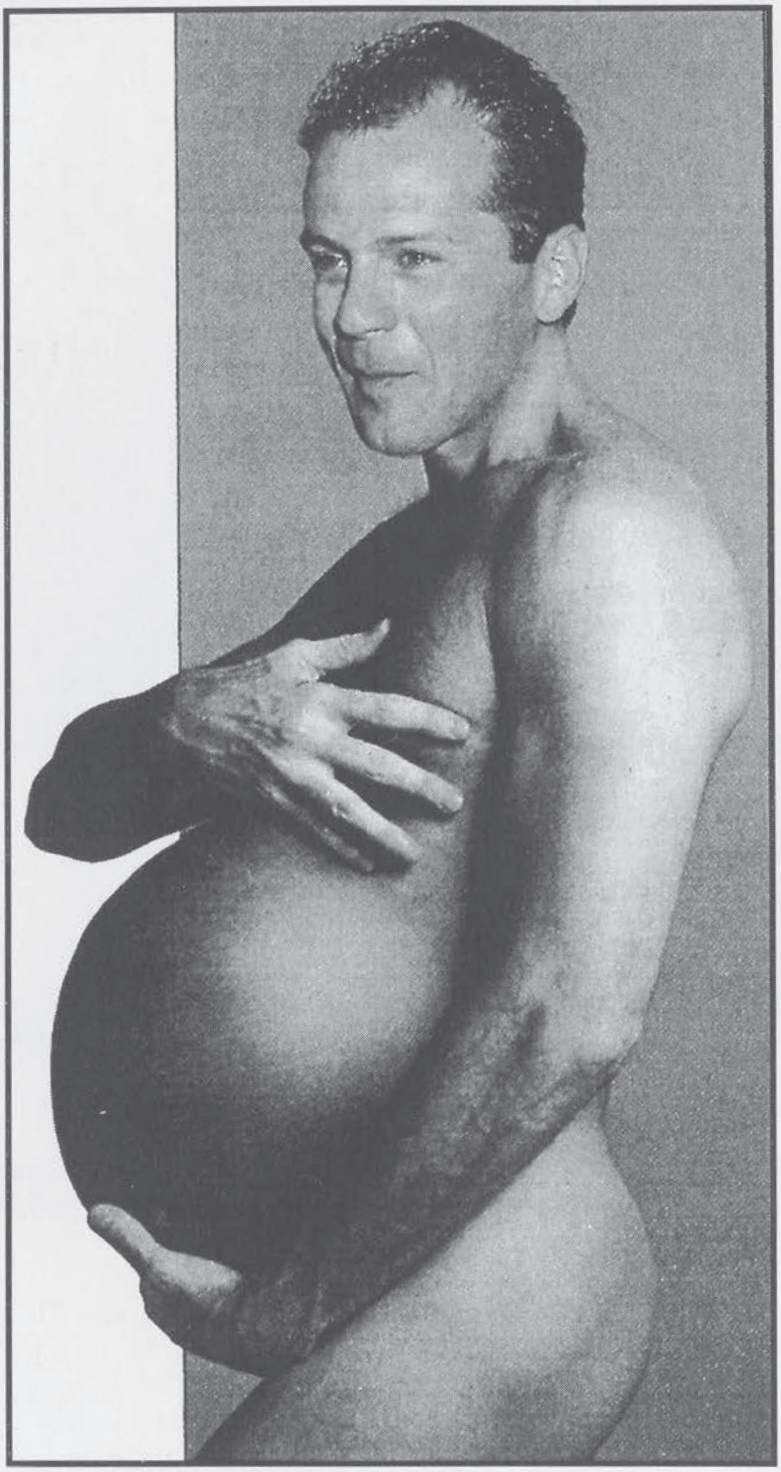


Figure 11a
Computer manipulation.
Spy magazine and the FCL/Colourspace studio used a Quantel Graphics Paintbox to create a pregnant Bruce Willis.
(*Computer Graphics World* November 1991:97)



Figure 11b
Computer manipulation.
Front cover, of *Spy* magazine.
(*Computer Pictures* March/April 1993:21)

'Only the revolution replacing real numbers and their infinite number of places behind the decimal point with calculable quantities of entire numbers has been able to bring about the modern manipulation of images.' (Druckrey 1993:25)

All these issues are relevant when working within the computer medium. One is working in a cyberspace environment, a form of virtual reality where all elements are intangible and abstract. One could state that we are no longer dealing with a sign–signifier relationship as the signifier is abstracted further through an algorithmic space. That is to say the word cat means a physical cat due to cultural conventions, yet the word and image of the cat found in computer memory (RAM/ROM) has been further physically displaced and abstracted into a composition of mathematical digits, a digital stew of zeros and ones which are displayed as pixels on the monitor of the computer screen—a fragmented hyper-real digitized cat.

This form of image manipulation has been utilized by the motion-picture industry, producing special effects in films such as *Bladerunner, Tron, Terminator I, II, Robocop I, II, III, Until the End of the World, Lawnmower Man I, II, Wild Palms, Jurassic Park, Beauty and the Beast, Johnny Mnemonic, The Mask* ,*The Net, Toy Story, Independence Day, Twister and Dragon Heart* (*Figures 12a to 12d*); the list is growing. Each film reflects upon a landscape of spectacular attractions as well as our obsession with computer technology, the environment and reality.

The following sub-section will further analyse this computer medium and its diversity.

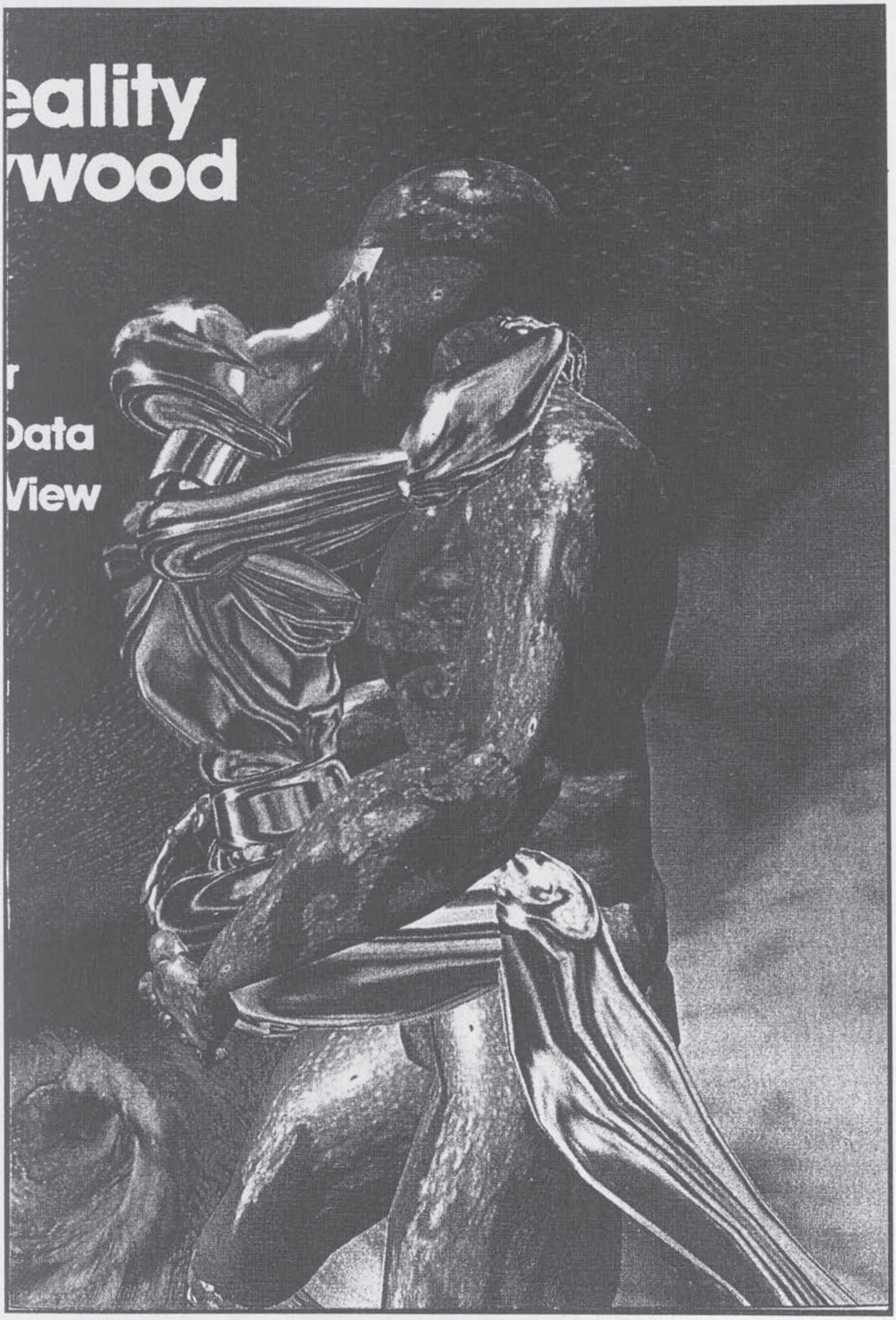


Figure 12a
Lawnmower Man I 1991.
Created by Angel Studios for Benjade Films Inc.
Trapped in virtual reality, CyberJobe (above) was created by Angel Studios by constructing a highly manipulable mesh from digitized photographs of actor Jeff Fahey.
(*Computer Graphics World* April 1992:45-46)



Figure 12b
Lawnmower Man I 1991.
Created by Angel Studios for Benjade Films Inc.
Instead of emphasizing photo-realistic effects, Angel Studios used colour, motion and emotion to draw the viewer into a virtual world.
(*Computer Graphics World* April 1992:45–46)



Figure 12c
Terminator II 1991.
The pilot's expression is mirrored on the head of T-1000, the computer-animated robot.
(*Computer Graphics World* October 1991:57)

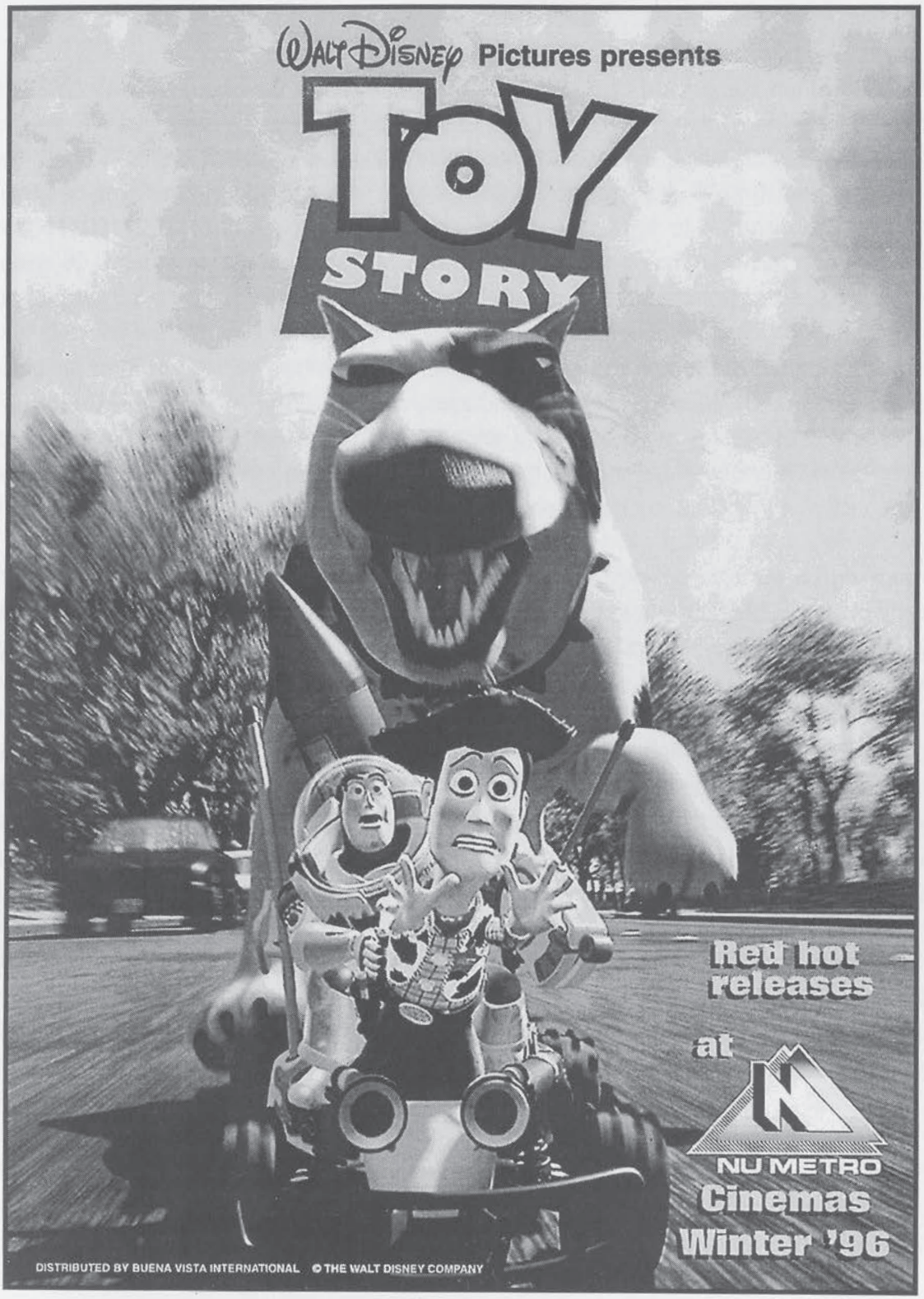


Figure 12d
Toy Story 1996.
An entirely computer-generated movie.
(The Walt Disney Company, public brochure)

The telescope stretched our visual 'power' in allowing us to have direct contact with the cosmos. The microscope unveiled an unseen living world, one hidden beneath the ordinary world of sight. Today, with the development of electronic digital computers, human sight, sound and thought have been further expanded. Computer language (0000111001100111) has been translated into the language of human perception by means of pictorial and textual display. The invention of the computer not only expands our senses, but also our vision of the universe though global communication. Using computer devices we can see temperatures by heat waves, clouds by radar, geological and biological patterns of the earth surface (*Figure 13*), and internal structures of planets (*Figure 14),* which were previously inaccessible. Depending on its construction (hardware) and programming (software), the computer is viewed as an eclectic tool. Individuals can now communicate throughout the world utilizing the Internet, creating a kind of global village which McLuhan predicted and which was once thought of as science fiction.

The computer is a central icon of this period in history, the Informational Data Age. It symbolizes the end of the machine era and an announcement of the post-industrial electronic age. The concept of electronic networking is replacing the industrial concept of destination, the manual/physical element is being dominated by the electronic digital transmitted waves of visual and verbal data. The ability of computers to generate and manipulate data or information has transformed the field of flight simulation (*Figure 15)*; design mechanics CAD, CAM, CAE (*Figure 16);* computerized tomography (of sensors of the internal human body which tune into X-ray radiation and store information, while thermography techniques produce displays of the invisible tides of skin temperature) (*Figure 17*); typesetting and graphic layout (*Figure 18),* music and sound (digital sampling, MIDI interface), interactive multimedia productions, photographic images, animation, video and film. There are numerous other avenues which have utilized the computer for the application of visual and verbal graphic effects: virtual reality, lasers, fractal designs (*Figure 19*), holograms and live performances (drama, music, dance). Each category can be researched in its own right, but for the purpose of this dissertation they are briefly mentioned to portray the diversity of this digital medium.

Today the computer is often presumed to be neutral, that is, impartial and objective. The fact that one views a computer as a sender–receiver model of communication (input–output) *'... reinforces the view that the ideas, information, and data that are transmitted through language are objective.'* (Bowers 1988:42) This is a misnomer.

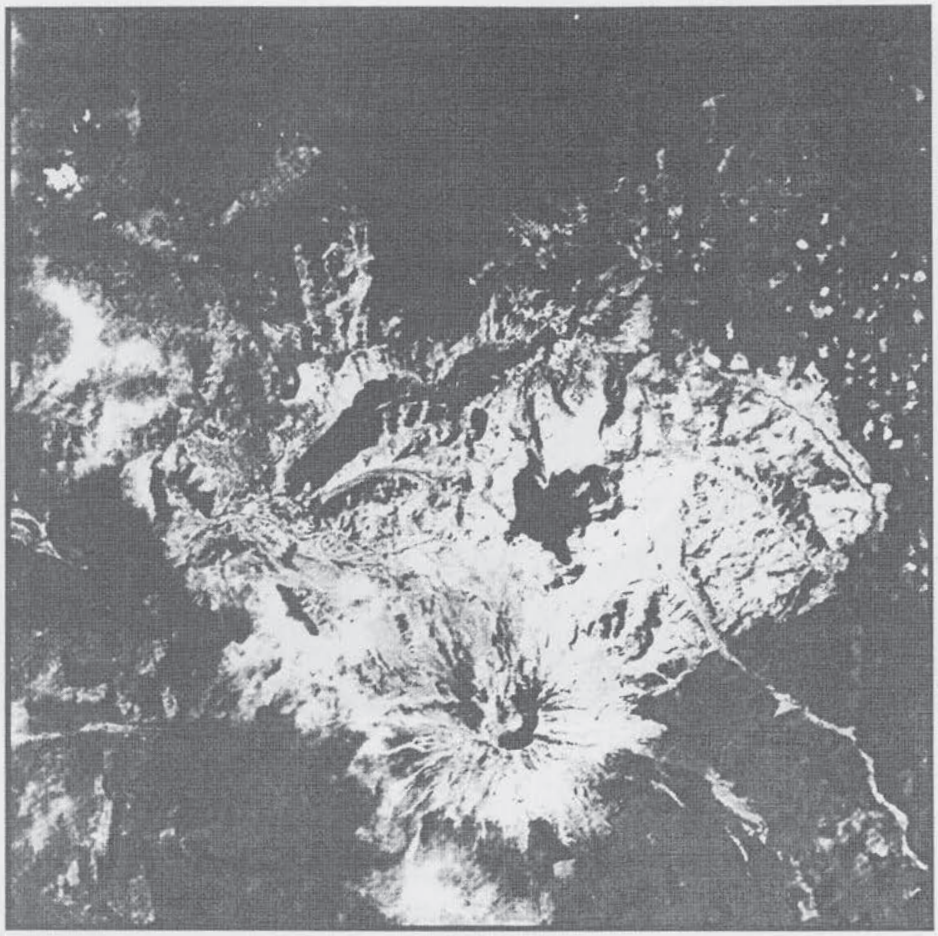


Figure 13
An image of volcanic Mount St. Helens in Washington State.
This work demonstrates the use of a digital scanner sensitive to wavelengths. Landsat computer images help geologists pinpoint oil sites, ecologists locate water-pollution spots, cartographers redefine maps of the earth surface.
(*Time-life books* 1986:42)

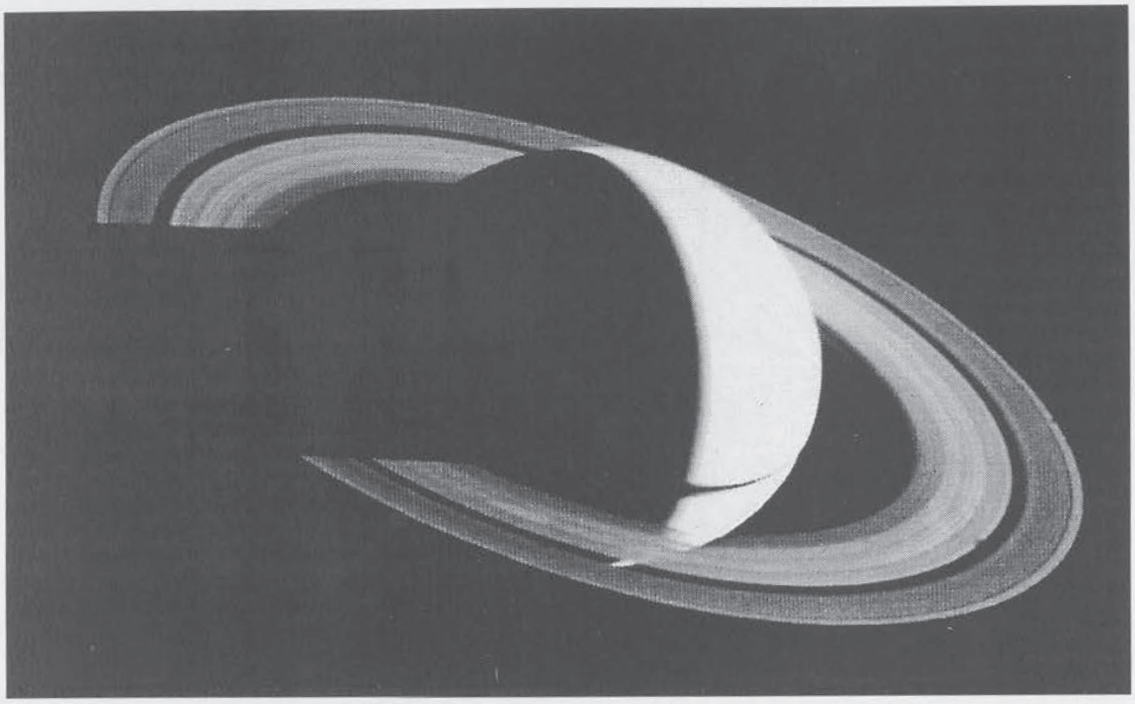


Figure 14
Simulation of Saturn with rings.
This backward glance at Saturn was taken by *Voyager 1* on 16 November 1980.
Digital data were interpreted to produce this image.
Jet Propulsion Laboratory, Pasadena, California.
(Lewell 1985:117)

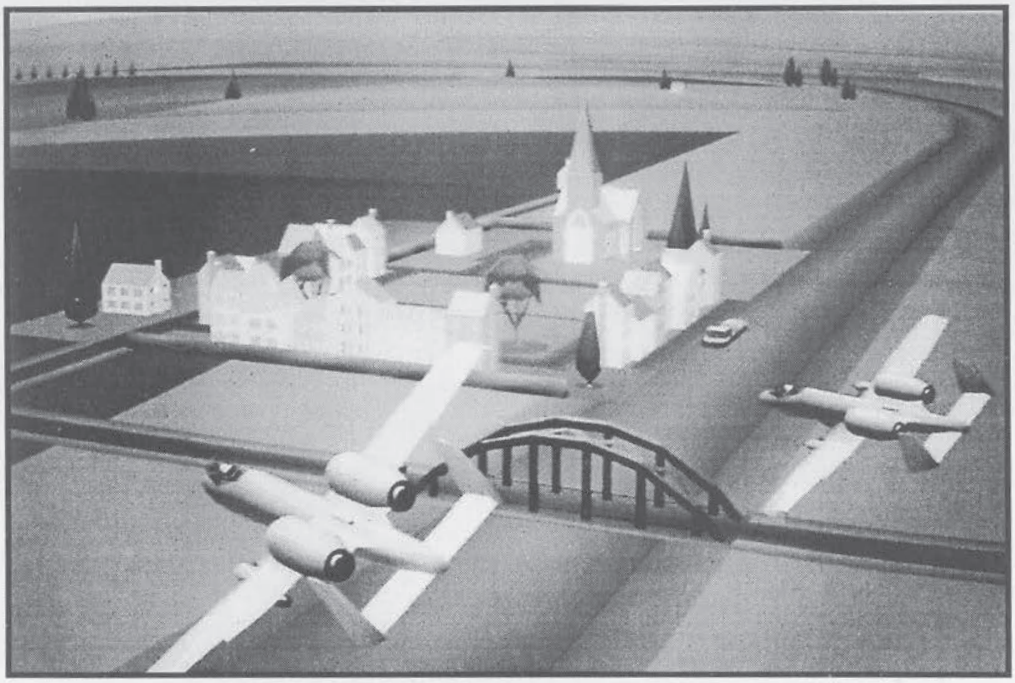


Figure 15
Fairchild A-10 ground-support aircraft, simulated in tactical training scenarios over western Europe. Evans & Sutherland, Salt Lake City, Utah, and Rediffusion Simulation
(Lewell 1985:23)

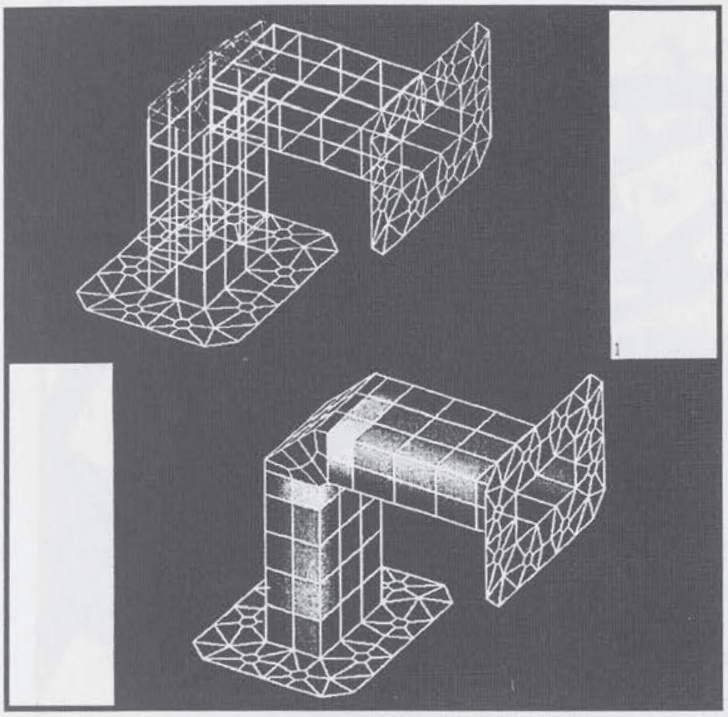


Figure 16
Computer aided design/manufacturing (CAD CAM).
Using computer graphic techniques for creating the internal and external structures of a specific model.
(Lewell 1985:126)

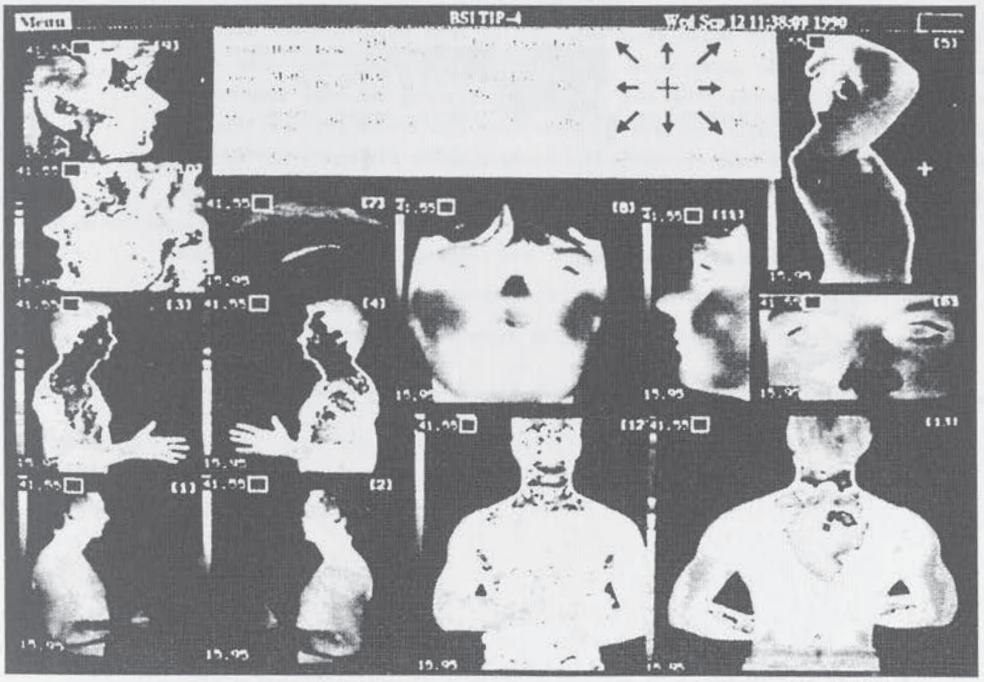


Figure 17
Thermographic imaging from Bales Scientific.
Thermographic imaging can detect diseased nerve roots called radiculopathies (*Computer Graphics World* September 1992:48).

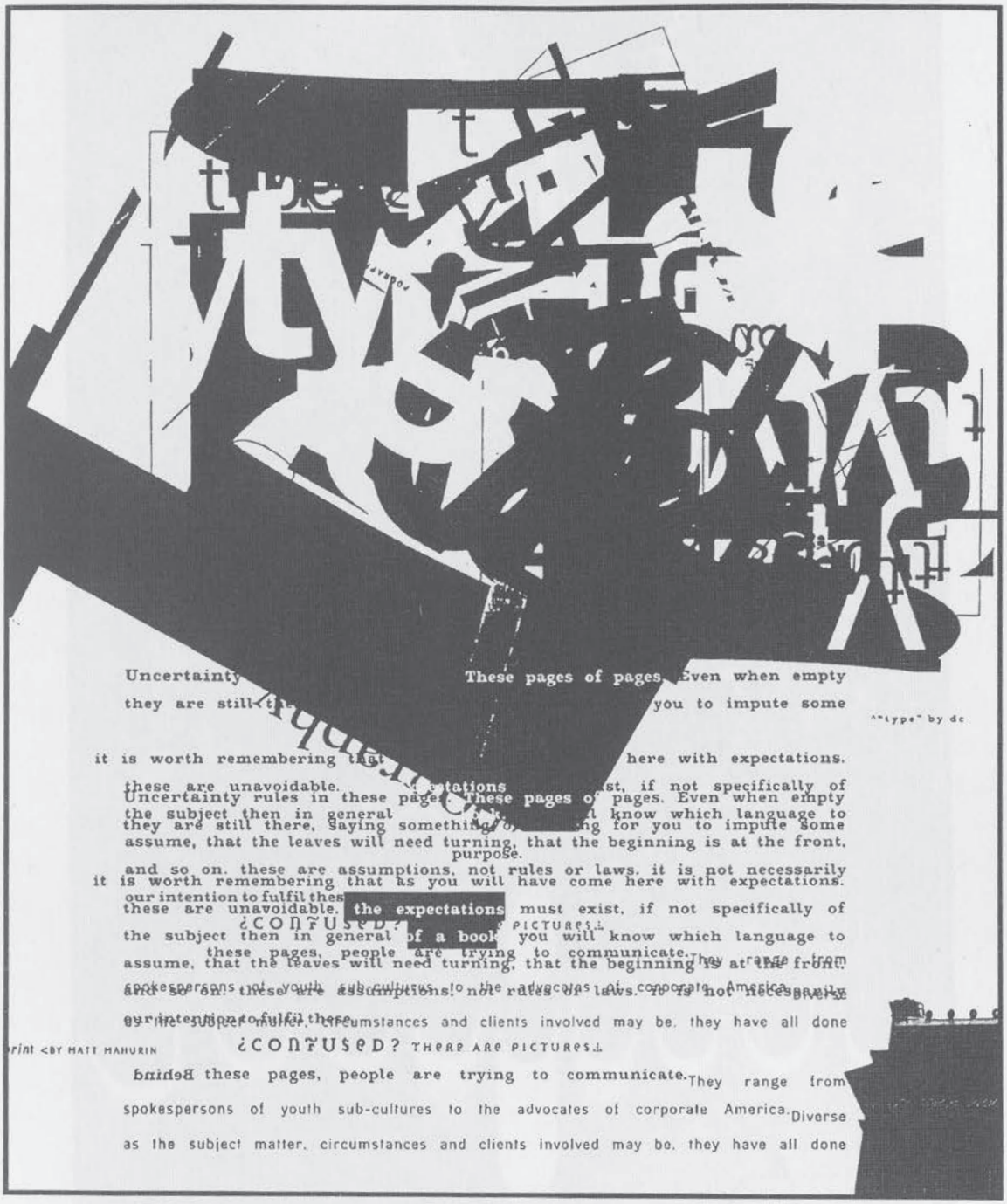


Figure 18
David Carson: Design type layout.
(Carson 1995: pages unnumbered)

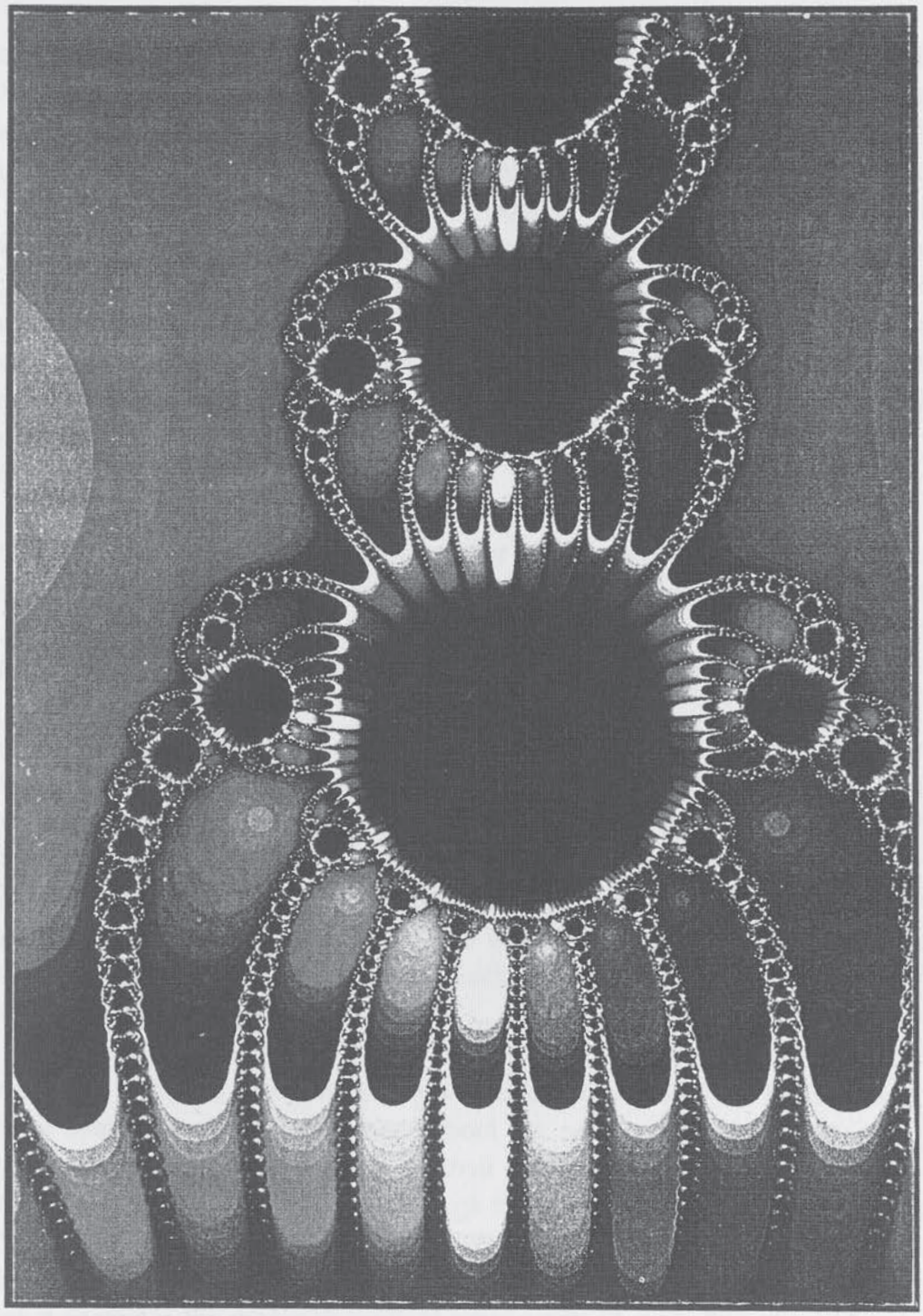


Figure 19
Mandelbrot Set.
Mathematical modelling of random complex shapes found in nature have been accomplished by fractal geometry, another field utilizing computers. Fractal geometry of nature was developed from 1975 to 1980 by Beniot Mandelbrot, a mathematician at the IBM Thomas J. Watson Research Centre. The system was based on the model of 'self-similarity' replicas of 'identical units' mathematical shapes resulting from the dynamics of simple formulae in 3-dimensional space. Through nature, Mandelbrot identified natural forms which exhibited self-similarities which he termed fractal dimensions. Dimensions which existed between two and three dimensions.
(Briggs 1992:150)

Computers do embody values, in their costs, material make-up, design and the fact that they exist in our economy as a commodity. Similarly, we humans relate to a computer as if it were 'alive' and personify it as a being, giving it life-like qualities. 'Silly Computer!', 'My computer is having a bad day, a break down!', 'My computer has bombed, dead to the world ...', 'I can't compute that ...'. The naming of one's files and drives through associations to people one knows, reflects upon a psychological stance. Therefore, when we talk about a computer we are not just referring to a box filled with various kinds of electronic switches, motors, etched motherboards and transistors which perform particular tasks according to encoded sets of instructions. According to Chapman (in Bender & Druckrey 1994) a computer is a social artifact that mediates a series of social interactions, a model which has been conceptualized by human beings. Chapman (1994:153) goes on to say:

'We're taught to view computers as machines that perform various tasks involving symbol and numerical analysis, and we're taught that computers sometimes "make mistakes", but we aren't taught that the models according to which they're programmed reinforce corporate, military, and class power–as do all other human-made artifacts.'

Artists in all eras have used whatever tools were at hand to make their art, learning how to adapt new technologies to their needs, often making important innovations which led to the development of new tools and art forms. The artist usually did not manufacture these tools, tools that were embedded with meaning—social, economical and/or historical elements. Works of art reflect upon a complex of interacting ideologies, between an artist's visual and theoretical ideology and that of the viewer. According to Lovejoy (1989:21), *'The eye of any age is the mind of that age.'* Each age reflects its own sense of time and space through various disciplines.

Therefore, when using the computer in the art production process, the tool is linked to a wider value system, making a statement about our socio-economic society. As Wolff (1984:129) says, artworks which utilize external devices contain and express meaning which extend beyond the producer, even though the voices of the 'text' do 'originate' from the author's hand. In addition, Miller states (1971:13) with reference to McLuhan's statement, *'The medium is the message'*, that the medium exerts an effect over and above that which it carried in the message itself. In other words, the medium should be viewed as a non-transparent framework in which the content of the artwork is transmitted.

According to Scheridan (in Lovejoy 1989) tools, whether manual, mechanical, photographic or electronic, relate to the notion of time and space and reflect on the nature and structure of artistic production. Their marks reflect its time period and are direct influences in the production and dissemination of artworks.

With reference to the issue of authorship, the author can be said to be split and fragmented, as the artist is dependent on a variety of external forces for the production of his/her artworks. Images can no longer be disassociated from the tools used to produce them. That is not to say that the artist who created the work cannot take credit. The artist utilizing the computer medium in the creative process is like the painter utilizing his/her canvas and brushes. However, such a comparison is but slightly shortsighted as when utilizing the computer there is much more complexity and technical knowledge needed in knowing how to utilize the various software applications and equipment.

When working with the computer one deals in numerous layered dimensions—the visual space in which the work is seen, a screen which simulates and generates the imagery and text through a mathematical space of numeric information and binary systems. Being an instrument of simulation, that of digitally encoded mathematical algorithms and binary notations, the computer-programmed software transforms and merges these two modes of description, the numerical/abstract into visually simulated imagery.

One is therefore no longer dealing with the real but a simulation, a vacuum of floating digits which 'magically' transform into 'the recognizable': visual data. The computer programs reveal the images and text on the screen, yet at the same time conceal their true algorithmic form within the memory chips found embedded in the motherboards (RAM and ROM). Therefore, computer tools have hidden elements far more complex than those found in non-electronic art tools (brushes, canvases, marble, wood).

When using the computer the artist does not have total control over all forms of visual production as she/he is dependent on those tools for the execution of the work and his/her knowledge of how to utilize such software, as well as the safe-keeping of the data which is saved onto various types of disks—stiffies, floppies, zip, jazz, optical, tape, benulli, all in which data can be easily corrupted and destroyed via magnetic forces and heat sources, creating an unstable environment in which to work. As a result, backup copies are an essential part of the process in securing the safety of one's work and frequent daily 'saving' of one's work prevents the loss of data due to network crashes and power failures.

One of the major differences between traditional Fine Art materials and utilizing the computer medium is the physicality and tangibility of substance. When working with the computer, the tangibility of substance is abandoned and replaced with the materiality of keyboard punch keys, mouse and various other input and output plastic, glass and metal devices. In addition, an invisible, non-materiality of digital pulses flow through the wire-

buses and output the information onto the computer screen as images which are visually displayed in the form of pixels. These works can then be printed onto paper, film or fabric—a process which can lead to frustration as each outputting device can alter the image quality depending on the machine's colour cartridges, resolution and materials used. The printout can cause initial disillusionment as often what is shown on the screen is not truly represented on paper/fabric due to the different light sources by which colour is perceived and printed. Such issues the traditional fine artist need not concern him/herself with, as the painting or sculpture is the final art object of viewing.

Within the production process, the artist's contact with the work is that of detachment. *'You love things that are your own marks. In some primitive way, marks are marks .... I can lose this piece of paper in the street and if [a day later] I walk on the street and see it, I'll know that I drew it. With a drawing that I do on the computer ... I might not even know that it's mine.'* (Turkle 1995:64) Turkle goes on to say that there is only the visual on computers, all tactility is stripped away and all you have is the finished product. The tactile experience is lost, the physical process which is as important to the artist as the finished product is lost. These feelings of detachment are evident when utilizing the computer as a medium within which to work. Connection is generally only achieved through input and output devices, creating a physical and a psychological distance between the artist and the artwork. Such disconnection can lead the artist to initial feelings of alienation and detachment when working on such systems.

Technology does not inhibit creativity, it simply adds a different dimension. Technology is not a force unto itself but rather a set of inventions by humans who are responsible for their use and abuse. New technologies do not always replace old ones, they simply 'expand' (and/or restrict, depending in which context they are analysed) the range of possibilities for expression and perception. Similarly, the invention of new visual media increase the possibilities for aesthetic experiences by opening up new forms and broadening the forum of art and its representative capabilities.

The following section will give a brief Art-historical development of the use of the computer medium during the 1950s till the 1990s.

Section four

Early Computer Art and its developments: 1950s to 1990s

According to Goodman (1987) early 'Computer Art' of the 1950s and 1960s was based mainly on ideas drawn from European Constructivists. Traditional geometric structures, found within constructivism lent to the rigours of computer programming as limited shapes such as lines, rectangles, ellipses and triangles were amongst the few computer capabilities. This is exemplified by the work of A. Michael Noll, who attempted to capture the characteristics of Piet Mondrian's structural forms by applying them in his computer programs (*Figures 20a to 20d*). Other examples of early computer-related work can be seen in the works of Barbadillo, Ness, Nake, Csuri and Stand (*Figures 21a to 21e*).

In 1952 *electronic abstractions* or *oscillons* were created by mathematician Ben F. Laposky and artist Charokee Lowa (*Figures 22a and 22b*). These were considered to be the first graphic images generated by an electronic machine. This work was produced by the manipulation of electronic beams across the fluorescent face of an oscilliscope's CRT, which was then recorded with the use of high-speed film and special camera lenses. Laposky used an analog system whereby patterns were achieved by modifying the basic electric wave forms. During the same year, Herbert W. Franke created his own oscillograms.

The late 1950s and 1960s saw a software explosion. In 1963 Fortran IV was introduced, a standardized language suited to scientific and engineering applications, while Algo 1 (Algorithmic language) was developed to deal with algebraic functions. Other languages such as Sparta (program designed to draw line drawings by Leslie Mezei), Comp Art Er56 (programmed by Frieder Nake), G1 G2 G3 (George Ness) were introduced. Some Computer analysts assumed that language could be like mathematics, purified. They saw language as an abstract system of manipulating symbols whereby meaning came from its application. Users were expected to engage in this strange form of written communication.

In 1960 William A. Fetter, a researcher with the Boeing Company in Washington, coined the term 'Computer Graphics' to describe his purely technical computer-generated plotter drawings of an airplane cockpit which were produced for scientific purposes (*Figure 23*). Thereafter, any graphic work produced with the assistance of a computer was grouped under this confusing misnomer, a catch phrase. Little distinction was made by scientists and mathematic works between those later produced by artists and designers.

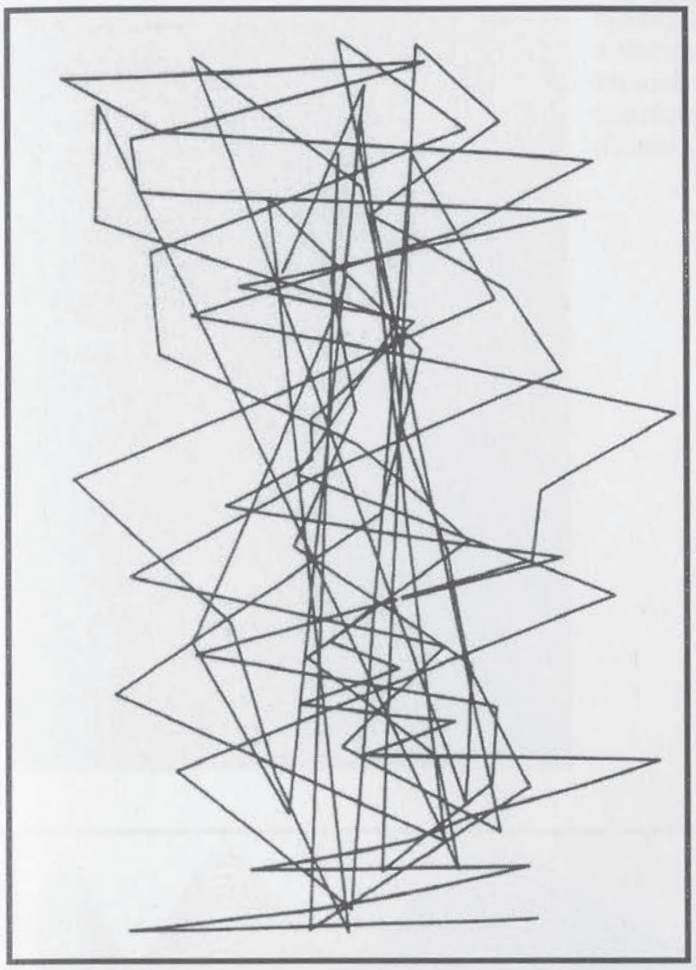


Figure 20a
A. Michael Noll: *Gaussian Quadratic* 1965.
Photograph 11 in x 8 1/2 in.
Hardware: IBM 7094 Computer, General Dynamics SC-4020 microfilm plotter.
Software: A. Michael Noll.
(Goodman 1987:24)

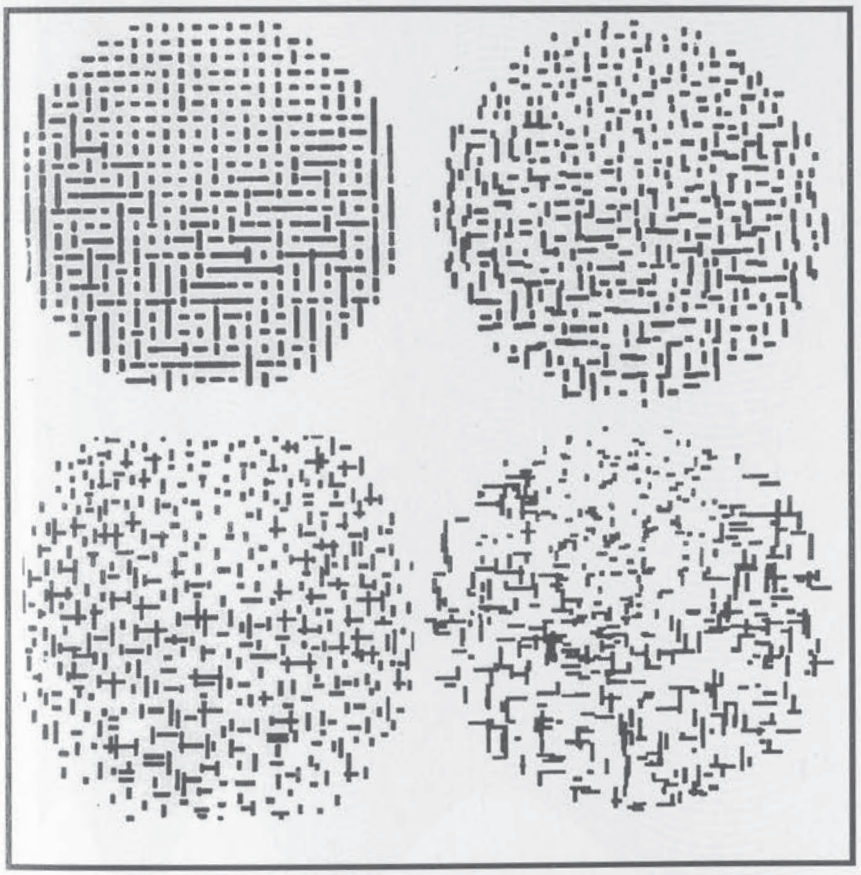


Figure 20b
A. Michael Noll: *Computer Composition with lines* 1965.
Hardware: IBM 7094 computer, General. Dynamics SC-4020 microfilm plotter.

Software: A. Michael Noll.
Influenced by Piet Mondrian's *Composition with Lines* 1917, below left.
(Franke 1971:111)

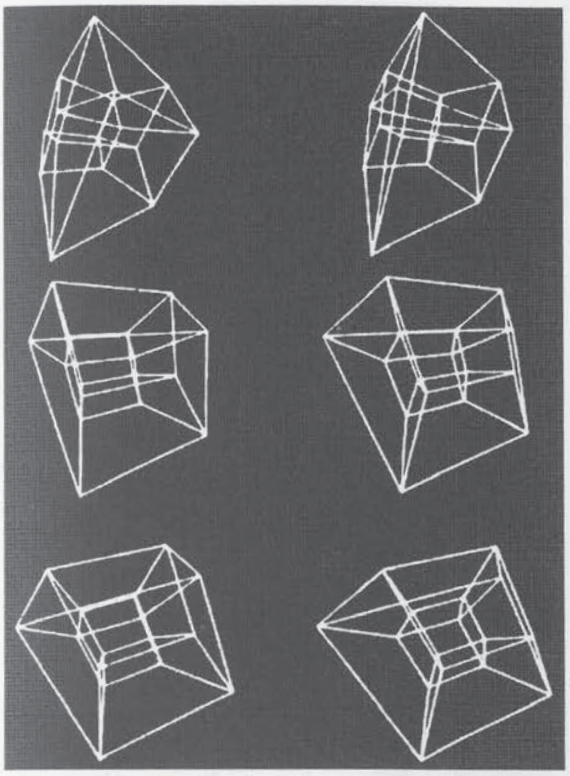
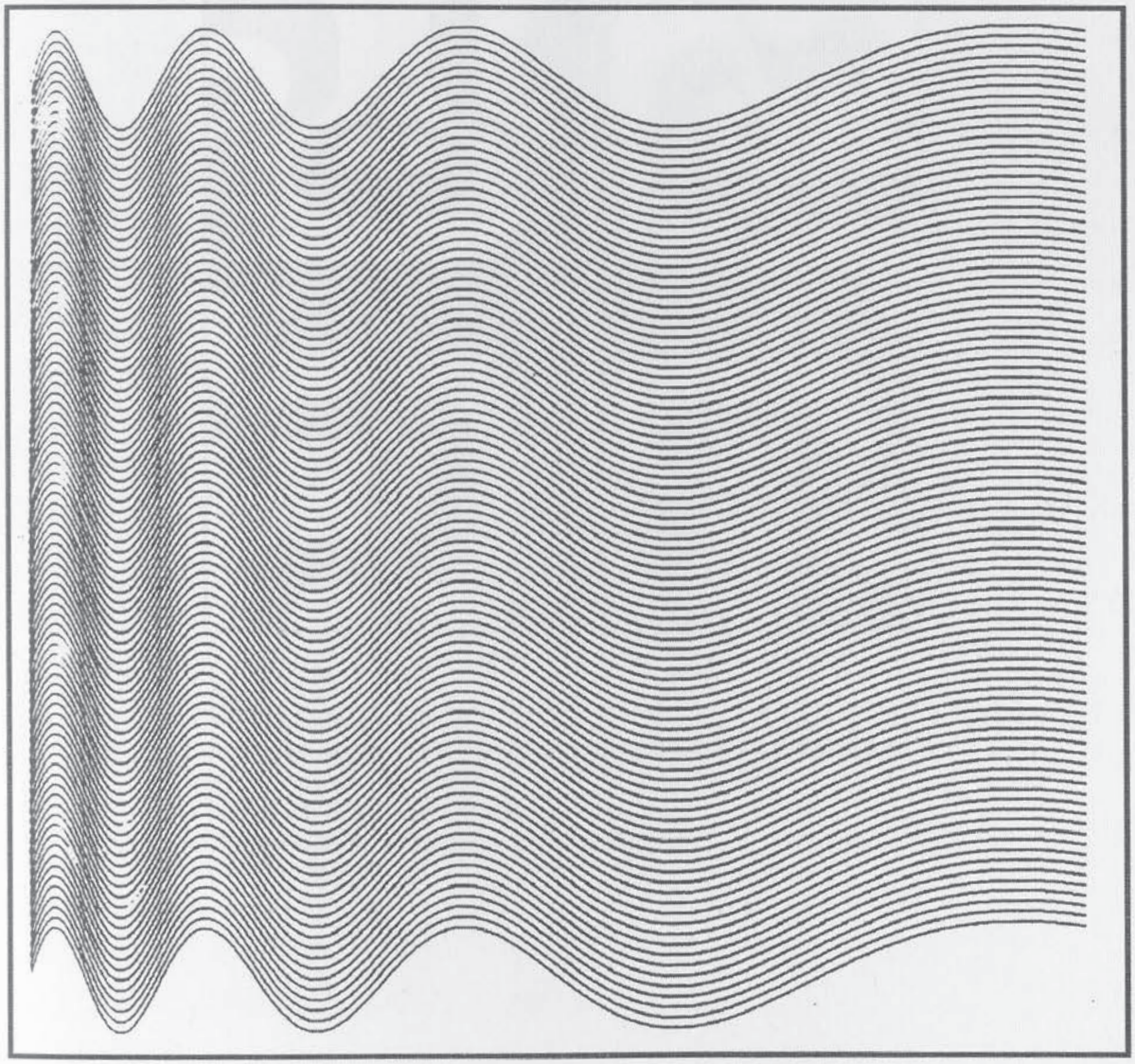


Figure 20c
A.Michael Noll:
Three-dimensional projection of a four-dimensional cube. 1960s.
(Franke 1971:37)

Figure 20d
A. Michael Noll: *Waveforms* 1965.
Repeated line patterns echoing the manner of Op Art.
(Franke 1971:67)



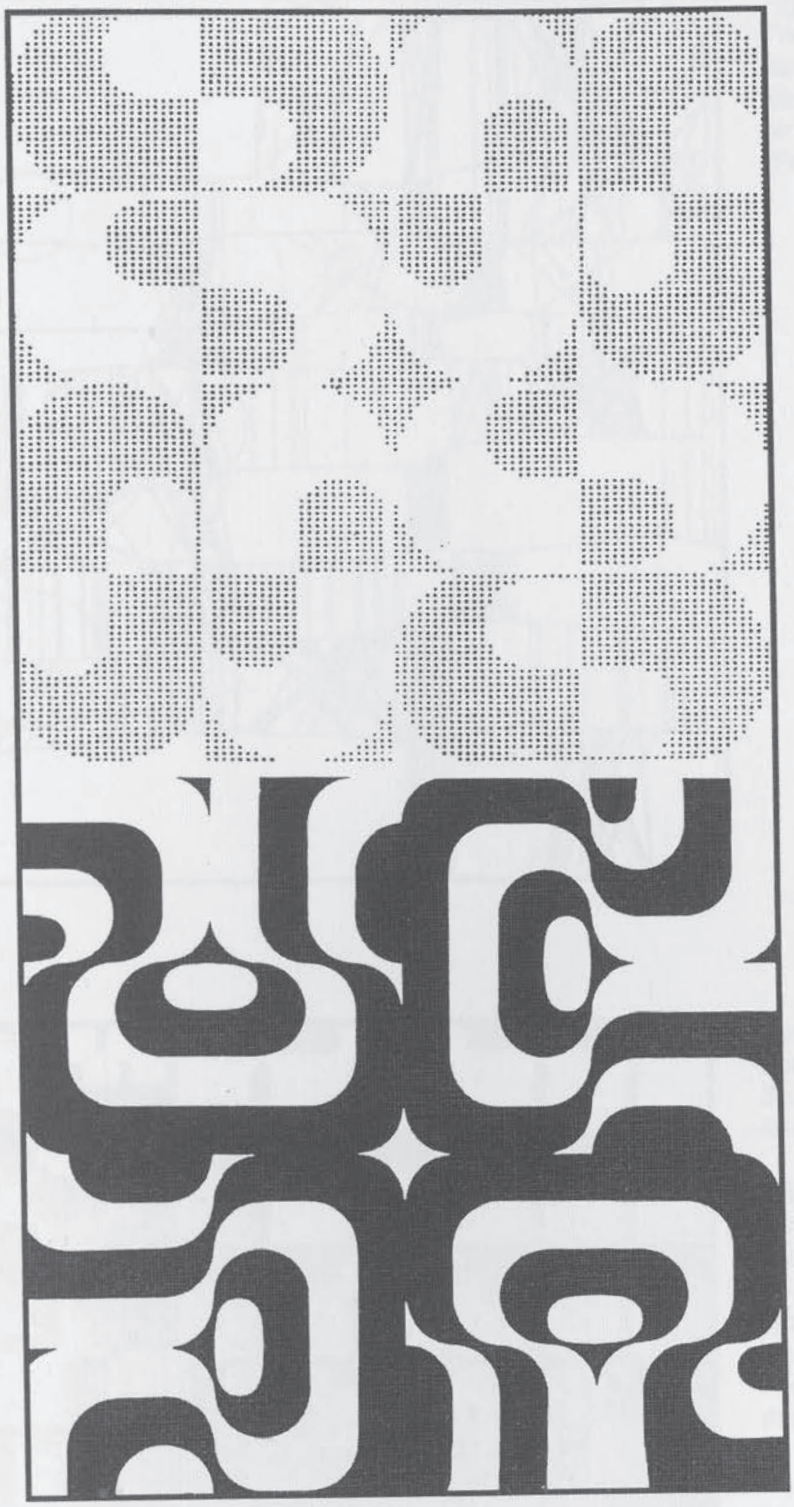


Figure 21a
M. Barbadillo: *Arseya* 1976.
Acrylic on canvas 40 in x 40 in Computer original is depicted, used in the making of the painting.
Hardware: IBM 7090 computer.
Software: By the artist and Lorenzo Carbonell.
(Franke 1971:81–82)

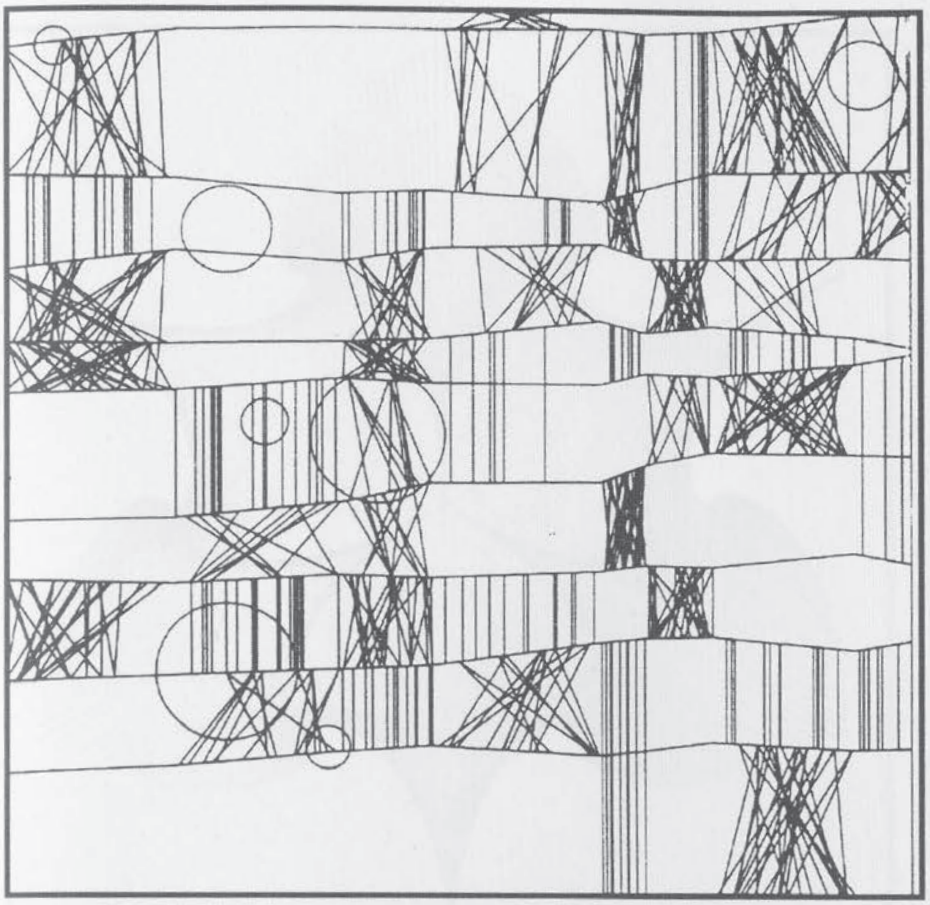


Figure 21b
Frieder Nake: *Klee*
date not given (1970s).
Starting point was a picture by Paul Klee.
(Franke 1971:112).

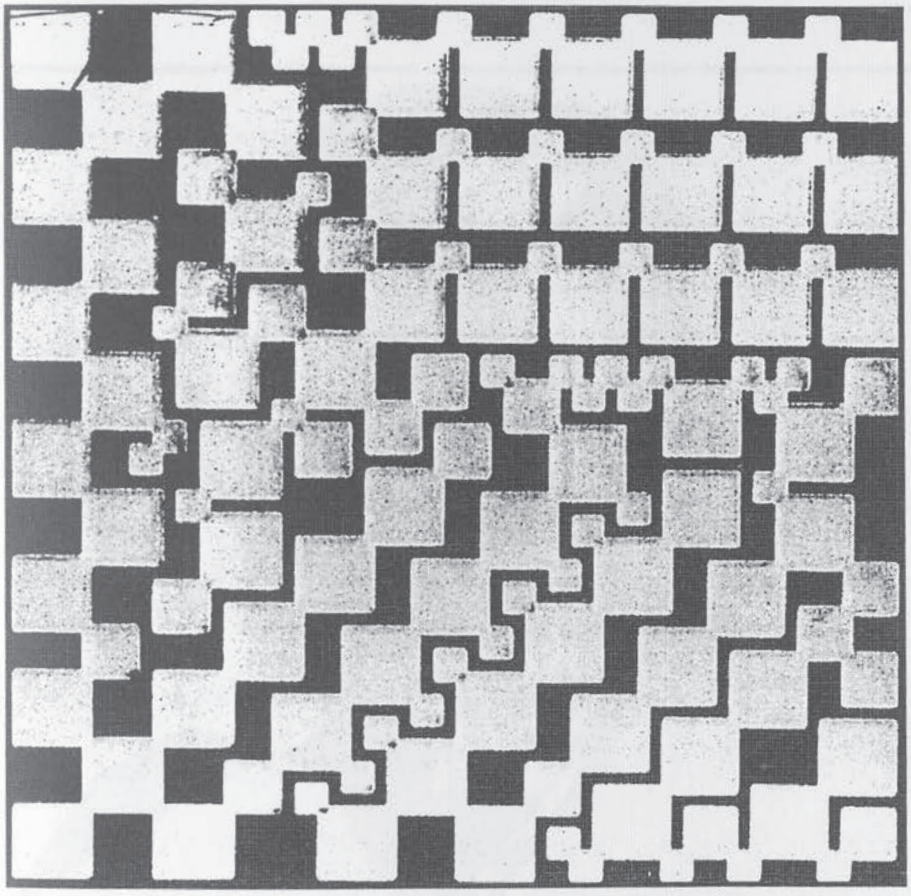


Figure 21c
George Ness: *Computer Sculpture* 1969. Aluminum 40 in x 40 in x 1 1/2 in.

This relief was cut out of aluminum by a computer-controlled milling machine, following the instructions of a program written by George Ness. It was one of the first works of art made in this manner.

Hardware: Siemens 4004 computer.
Software: by the artist.
(Goodman 1987:23)

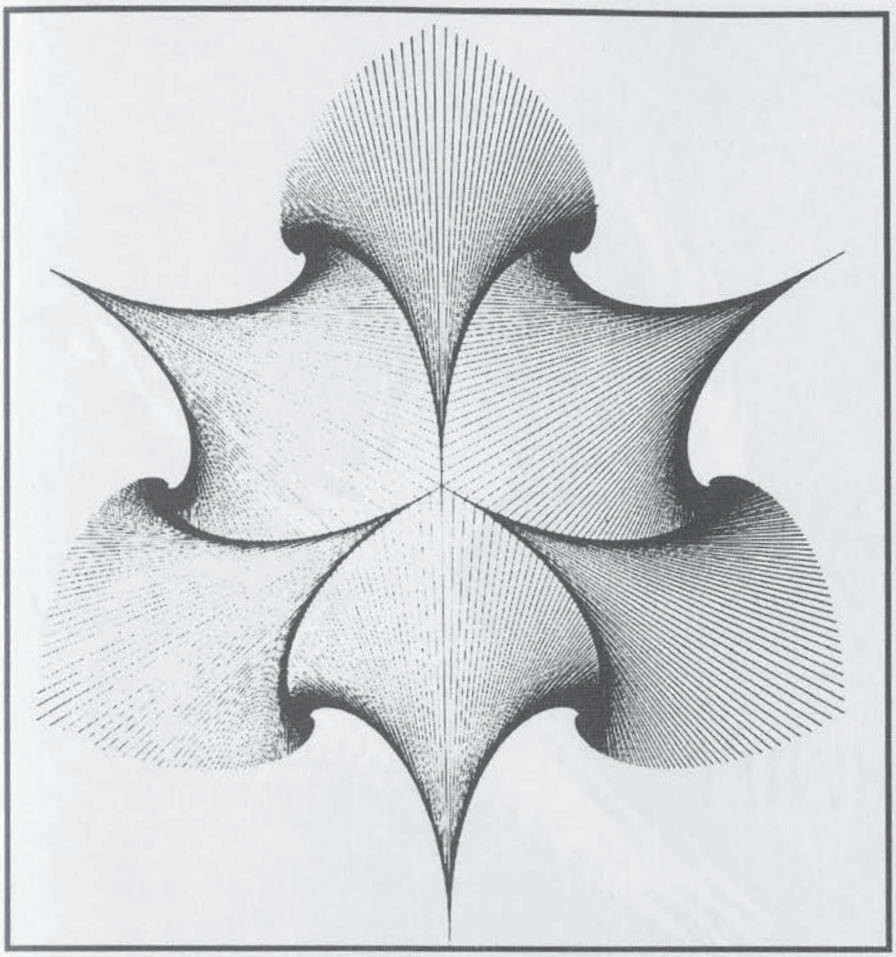
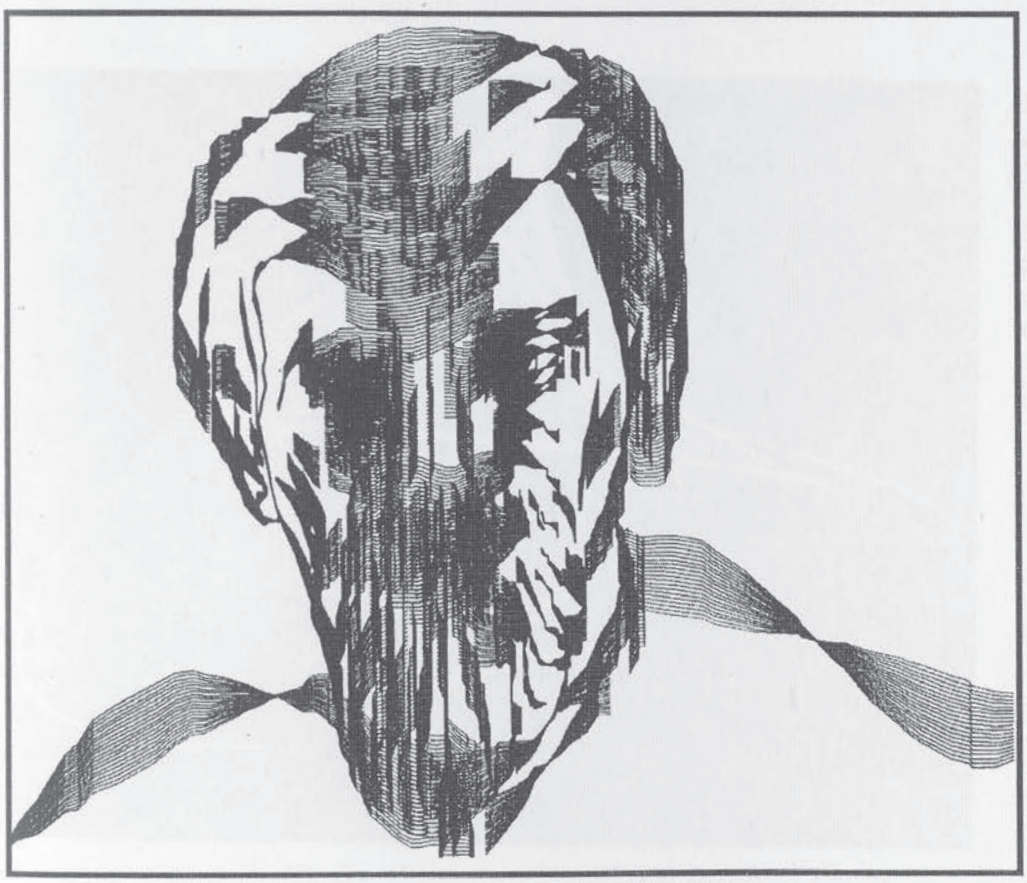


Figure 21d
Kerry Strand: *Crest* 1968.
Hardware: CalComp-770.
System: Drawn on drum plotter type 763.
(Lewell 1985:14)

Figure 21e
Charles Csuri: *Sine-Curve Man* 1966.
Silkscreen on plastic
36 in x 40 in.
Hardware: IBM 7094 computer. CalComp graphics drum plotter.
Software: Csuri and James Schaffer.
(Goodman 1987:33)



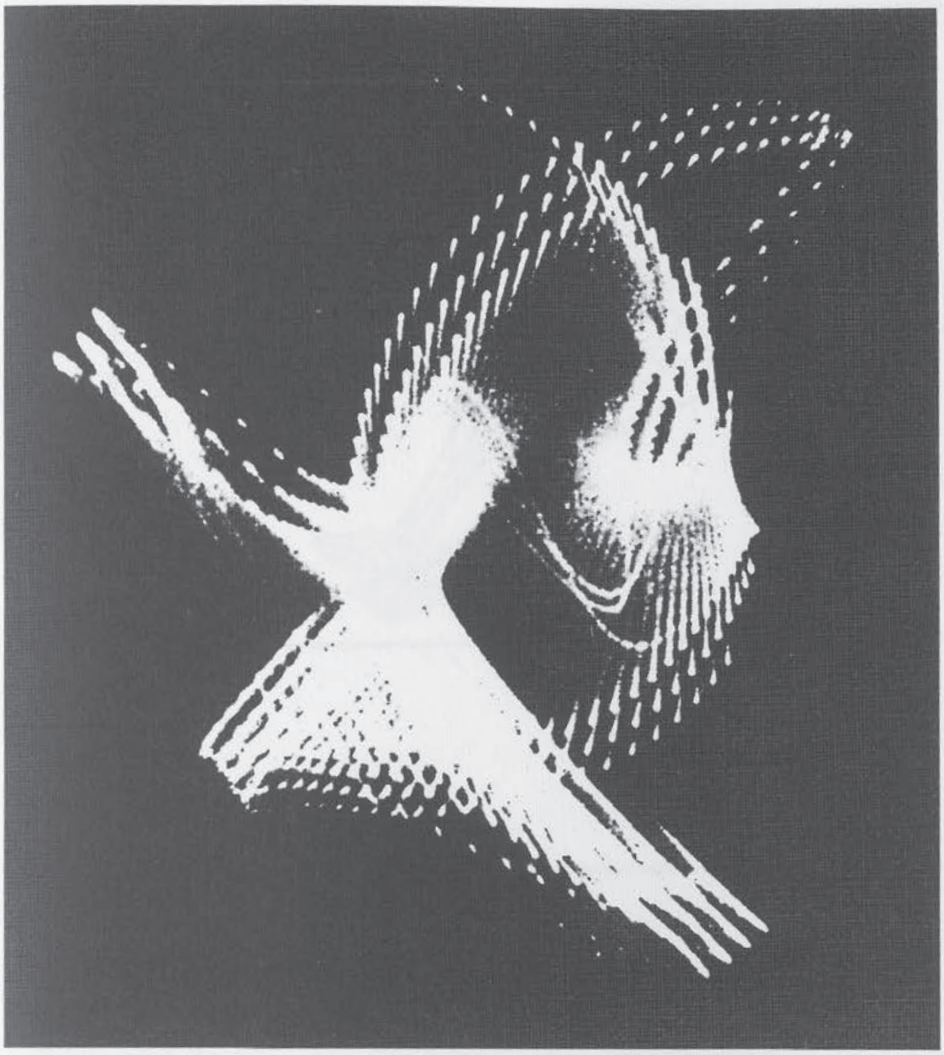


Figure 22a
Ben F. Laposky: *Oscillon Number Four—Electronic Abstraction.* 1950.
Photograph
10 in x 8 1/4 in.

Hardware:
Oscilloscope with sine-wave generators.
(Goodman 1987:19)

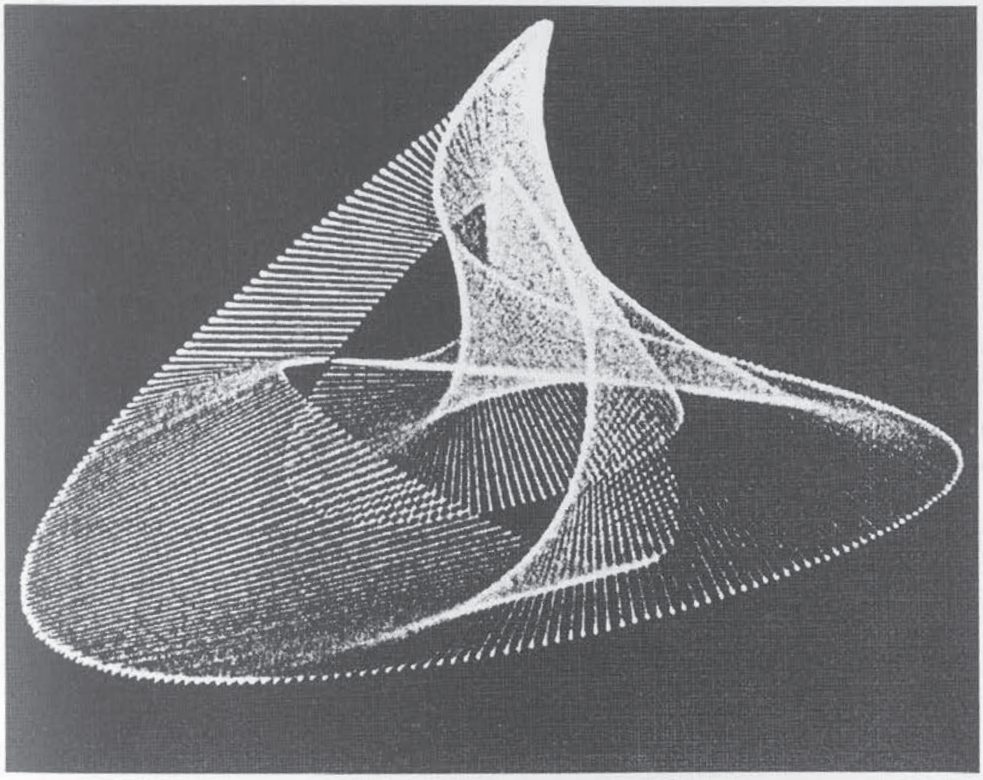
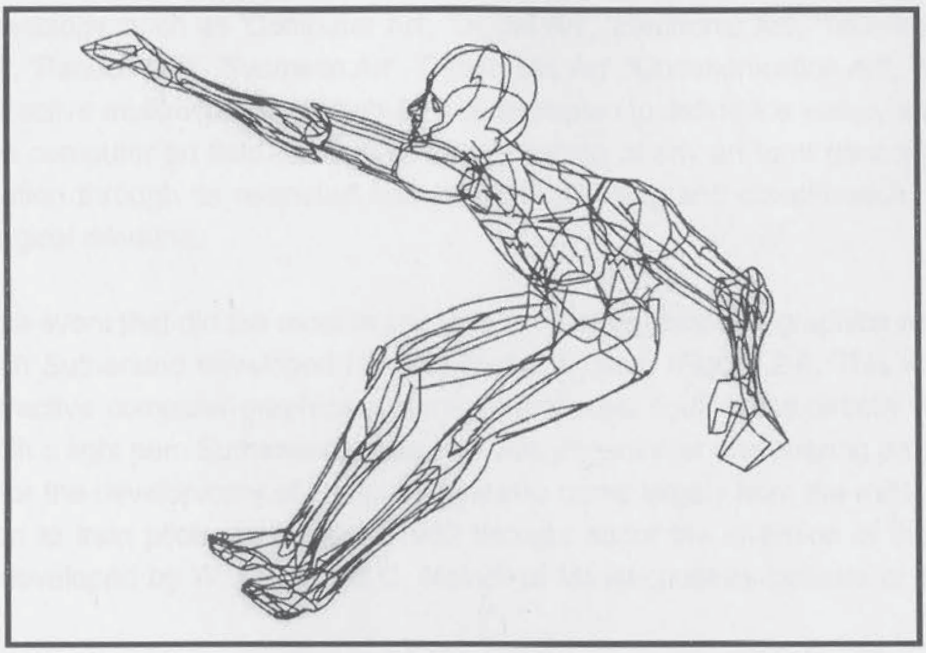


Figure 22b
Jack P. Citron: *Digital graphics* 1950.

Produced from a curve-generating program on the screen of an electronic visual display unit.
(Franke 1971:24)



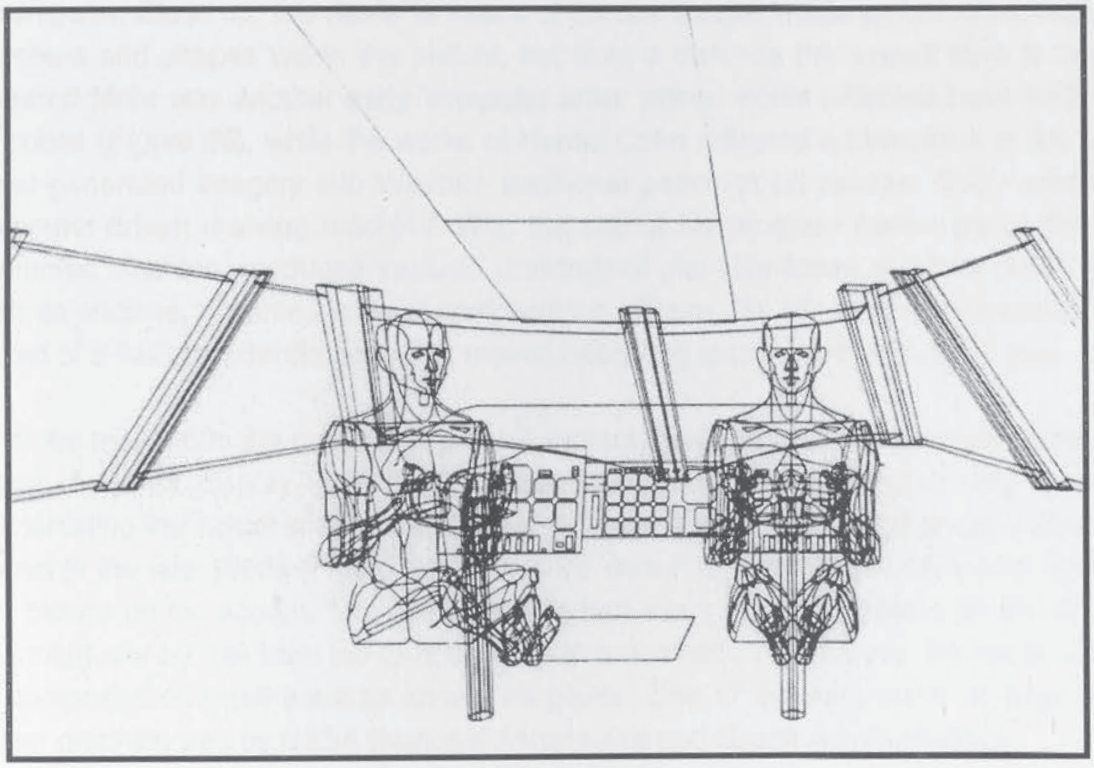


Figure 23
William A. Fetter: Drawings on an aeroplane cockpit design 1960.
(Franke 1971:68, 55)

Sub-terminology, such as 'Computer Art', 'Digital Art', 'Electronic Art', 'Technological Art', 'Data Art', 'Random Art', 'Synthetic Art', 'Cybernetic Art', 'Communication Art', 'Information Art', 'Interactive multimedia' and 'Web Art', all attempted to define the variety and diversity within the computer art field. Generally, categorization of any art form generally limits its interpretation through its restricted framework of labelling and classification, creating a terminological dilemma.

The single event that did the most to promote interactive computer graphics was in 1962, when Ivan Sutherland developed his 'Sketchpad' System (*Figure 24*). This was the first truly interactive computer-graphics system, where users could draw directly on the tube (CRT) with a light pen. Sutherland's research was primarily for engineering purposes, and funding for the development of computer systems came largely from the military for flight simulation to train pilots. In addition, 1962 brought about the invention of the first work station, developed by W. Clark and C. Molnor of Massachusetts Institute of Technology (MIT).

The works of Leon Harmon and Kenneth C. Knowlton reflected computer-generated pictures during the 1960s (*Figures 25a and 25b*). Each image began as a photograph of an object in the real world. A 35 mm transparency was made of the photograph and scanned by a machine. The electronic signals were converted into digital information processed by a computer. Close up, the viewer is aware of the tiny images made up of hearts, crosses, numbers and shapes within the picture, but from a distance the overall form is visible. Manfred Mohr was another early 'computer artist' whose works reflected basic elements of cubes (*Figure 26*), while the works of Harold Cohn reflected a translation of his computer-generated imagery into Western traditional paintings on canvas. Cohn created a computer-driven drawing machine. With the use of his program Aaron, he or the programmed machine, produced 'realistic' drawings of plant life forms and the human body with an endless, variable series of compositions (*Figure 27*). His machine/computer consisted of a flexible extended arm that moved freely and made marks with a felt pen.

Until the mid-1960s the majority of graphic systems were based on the use of vector displays. A vector display consisted of an electric beam which recorded only the lines demarcating the actual image, the wire frame image. Raster (bitmap) displays were introduced in the late 1960s (*Figure 28*). The word 'raster' referred to the manner of drawing the picture on the screen. The beam visits in turn every possible position on the screen, scanning row by row from top to bottom: as in a domestic TV receiver, the whole screen is composed of small squares known as pixels. One of the early uses of large-scale raster graphics was by NASA (National Aeronautics and Space Administration).

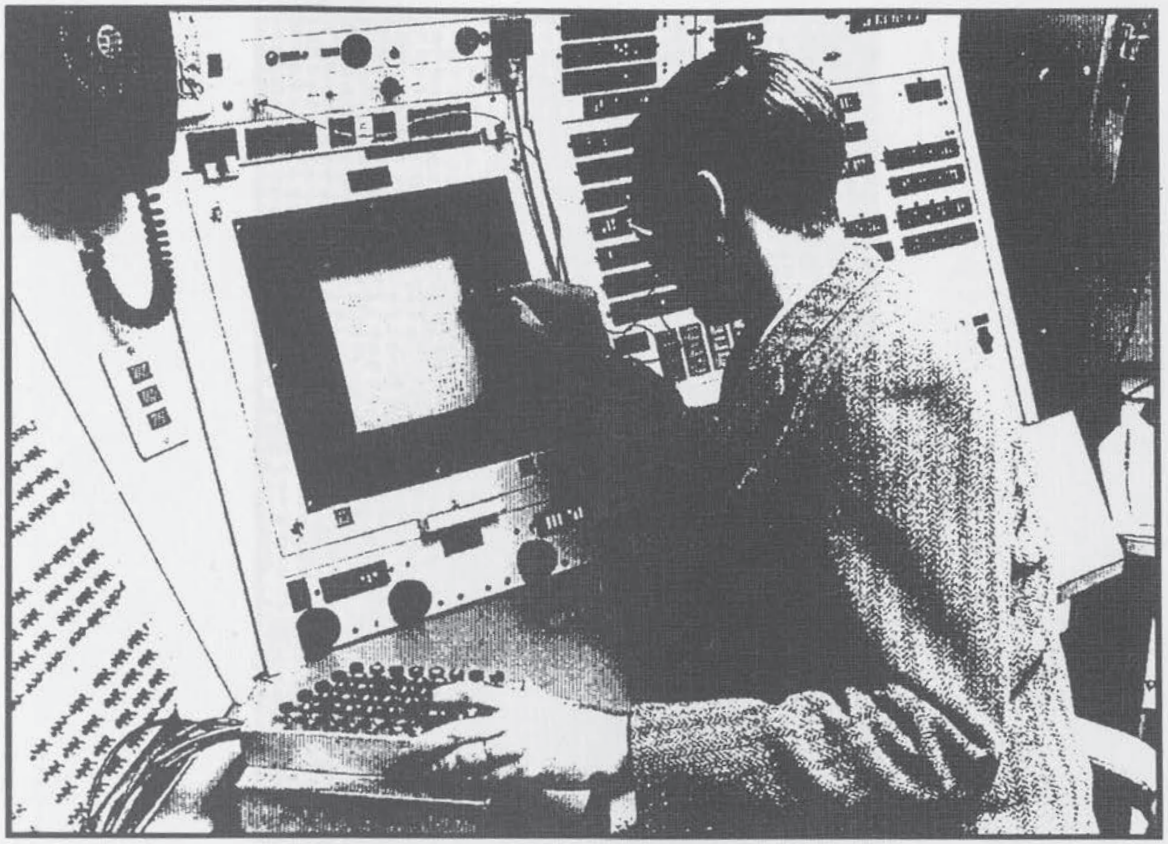


Figure 24
Ivan Sutherland 1963.
First truly interactive computer graphic system.
(Goodman 1987:22)

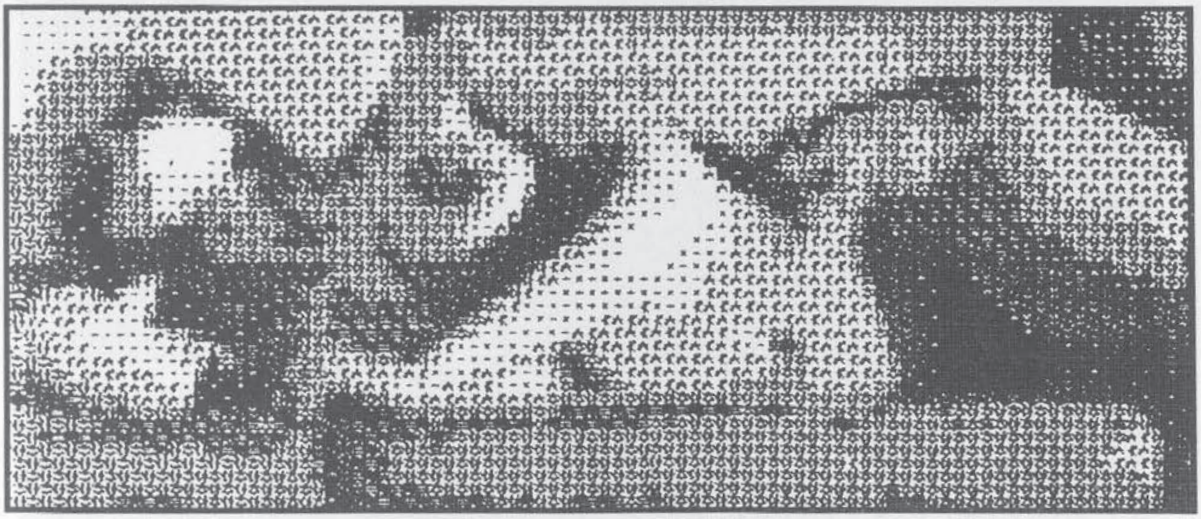
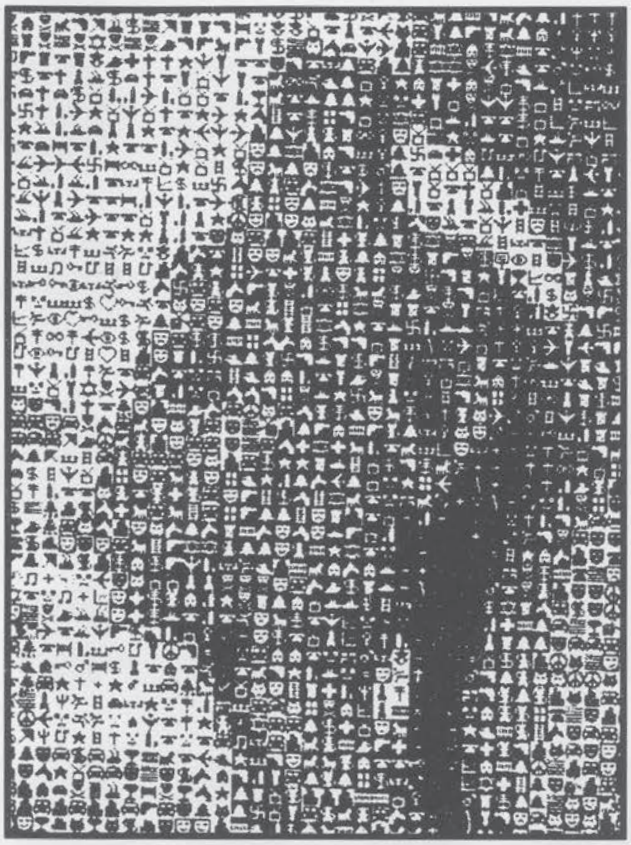


Figure 25a
Leon Harmon and Kenneth C. Knowlton: *Studies in Perception* 1966.
Photograph 281/2 in x 701/2 in.
Hardware: IBM 7094 computer, Stromberg Carlson 4020 microfilm recorder.
Software: Kenneth C. Knowlton.
(Goodman 1987:34)



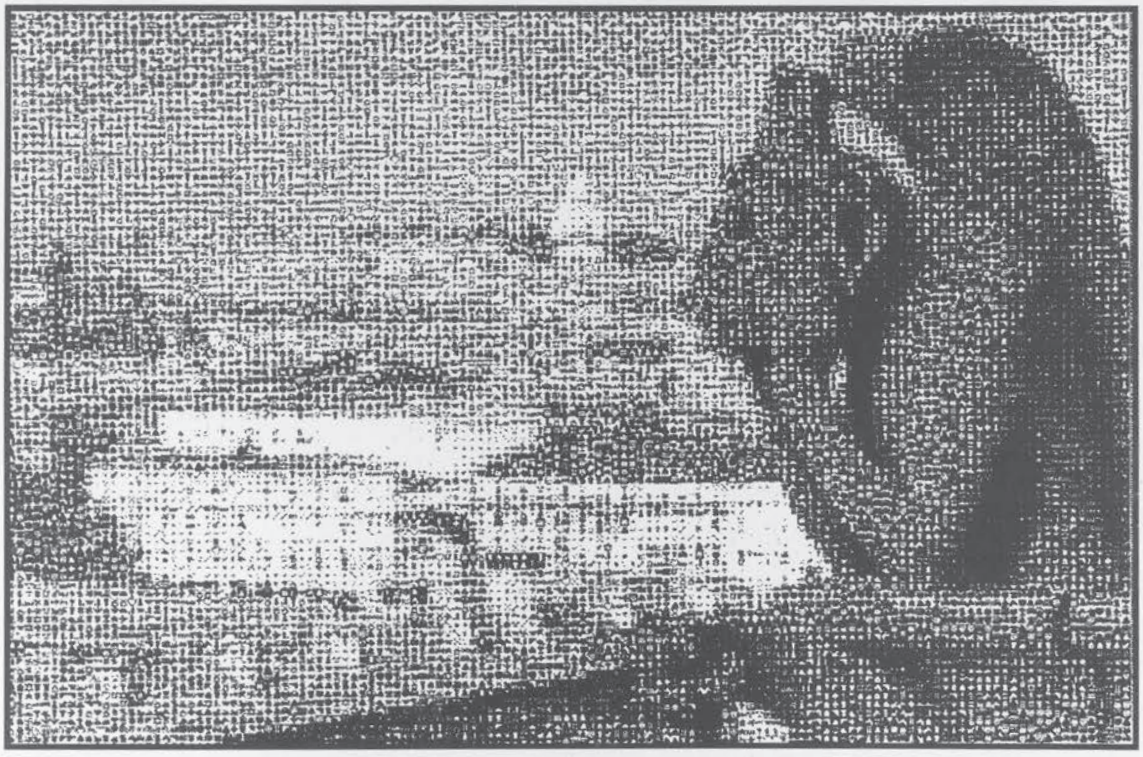


Figure 25b
Leon Harmon and Kenneth C. Knowlton: *Studies in Perception: Gargoyle* 1967.
Photograph 8 1/2 in x 11 in, above detail.
(Goodman 1987:189)

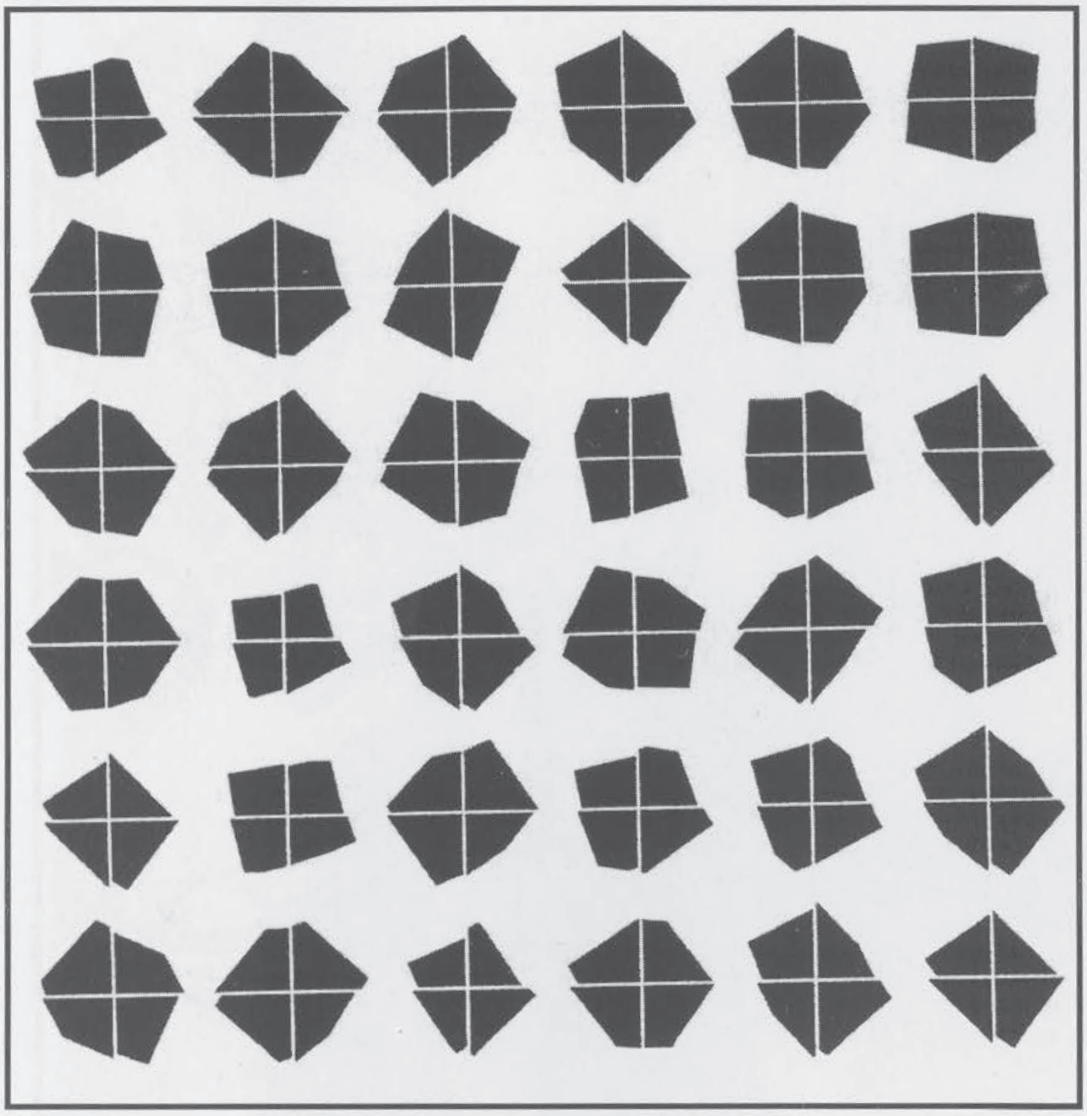


Figure 26
Manfred Mohr P-304B 1980.
Plotter drawing: ink on paper 24 in x 24 in.
Hardware: Digital Equipment corporation PDP 11\23 Computer, Alphameric plotter.
Software: Manfred Mohr
(Goodman 1987:54)



Figure 27
Harold Cohen: *Untitled* 1986.
Oil on canvas 100 in x 67 in.
Translation of his computer-generated imagery into traditional painting on canvas.
Hardware: Digital Equipment Corporation Micro Vax II.
Software: Aaron by artist.
(Goodman 1987:61)

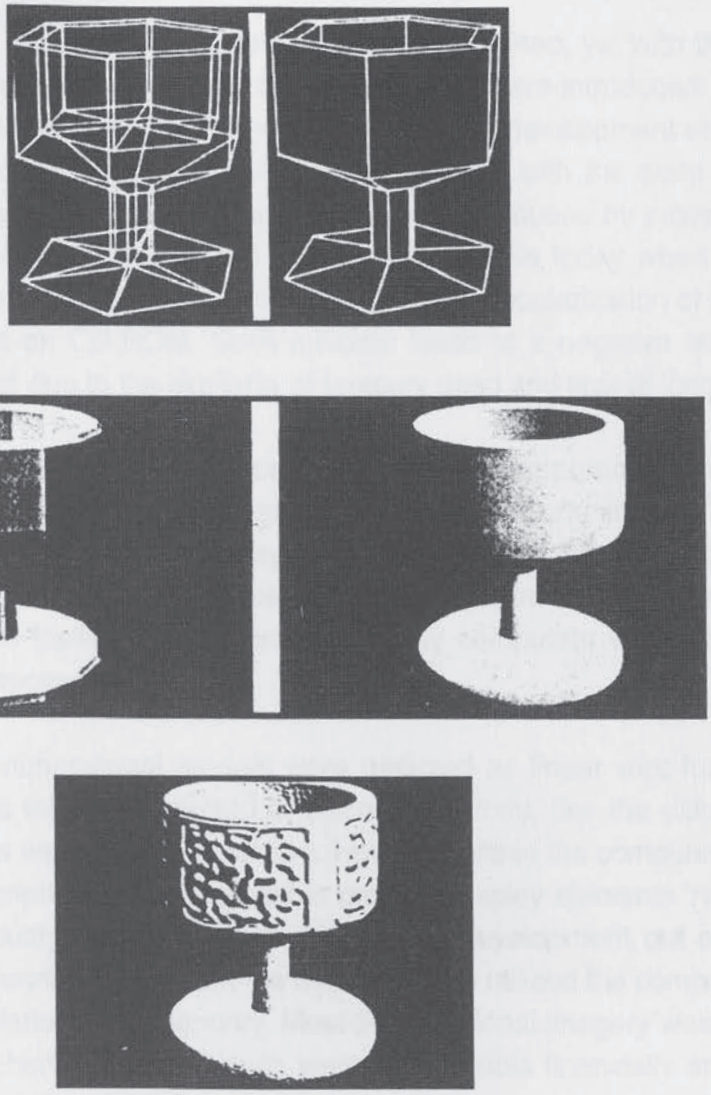


Figure 28
Five images depicting the computer graphic technique of bump mapping by Dr James F. Blinn and Jet Propulsion Laboratory.
(Lewell 1985:63)

During the late 1960s access to computers was still very limited, yet with the increasing availability of commercial software, 'user-friendly' systems were introduced. The user no longer had to program a specific graphic software. With the development of commercialized software and hardware, a period of 'disenchantment' with the state of computer graphics took place, where repetitive imagery was being produced by those with access to similar programs and equipment. This attitude still prevails today when 'images' are criticized as being neutralized and standardized due to the popularization of software, clip art and photo libraries on CD-ROM. Such criticism leads to a negative attitude toward computer-related works due to the similarity of imagery used and lack of 'original' work.

When imaging capabilities of personal computers began to approach the larger public, individuals, with or without artistic background, had the opportunity to experiment as 'artist', 'publisher' and 'film director'. Today, the majority of the 'state-of-the-art' pictures are still being produced by the large systems that only governments, and industrial and commercial production facilities can afford, but slowly computers will become another household utility and necessity.

Until the 1960s all 3-dimensional models were depicted as linear wire-frame pictures. Certain conditions are taken for granted in the natural world, like the diffusion of light, reflection, refraction as well as surface texture. However, within the computer, sophisticated mathematical descriptions were required in order to display elements 'realistically' on the screen. As previously stated, the computer was a development out of the military womb, as most of its funding came from the military, which utilized the computer functions for realistic flight simulation and weaponry. Most 3-dimensional imagery was produced by scientists and researchers; the tools which were inaccessible financially and technically for the larger public and Fine Art field.

In 1963 Lawrence G. Roberts at MIT developed the removal of 'hidden lines' through algorithms, which was followed by the development of modelling solids by computer scientists Gourrand and Edwin Catmil at Magi Syntha Vision. Early researcher James F. Blinn, defined a set of algorithms for bump mapping creating the illusion of texture on the surface of 3-dimensional objects (*Figures 29*). Turner Whitted developed ray-tracing, which produced complex models describing the reflection of light from surfaces. As a Utha scientist, Whitted created a lighting model, providing the effect of realistic illumination from a direct light source. During 1979 Jet Propulsion Laboratory used Blinn's computer graphic software program to produce simulations of the *Voyager* spacecraft as it passed Jupiter. The 'artistic' application of Blinn's program was developed by David Ems (*Figure 30*), whose space-age look of images may be attributed to the fact that the pro-

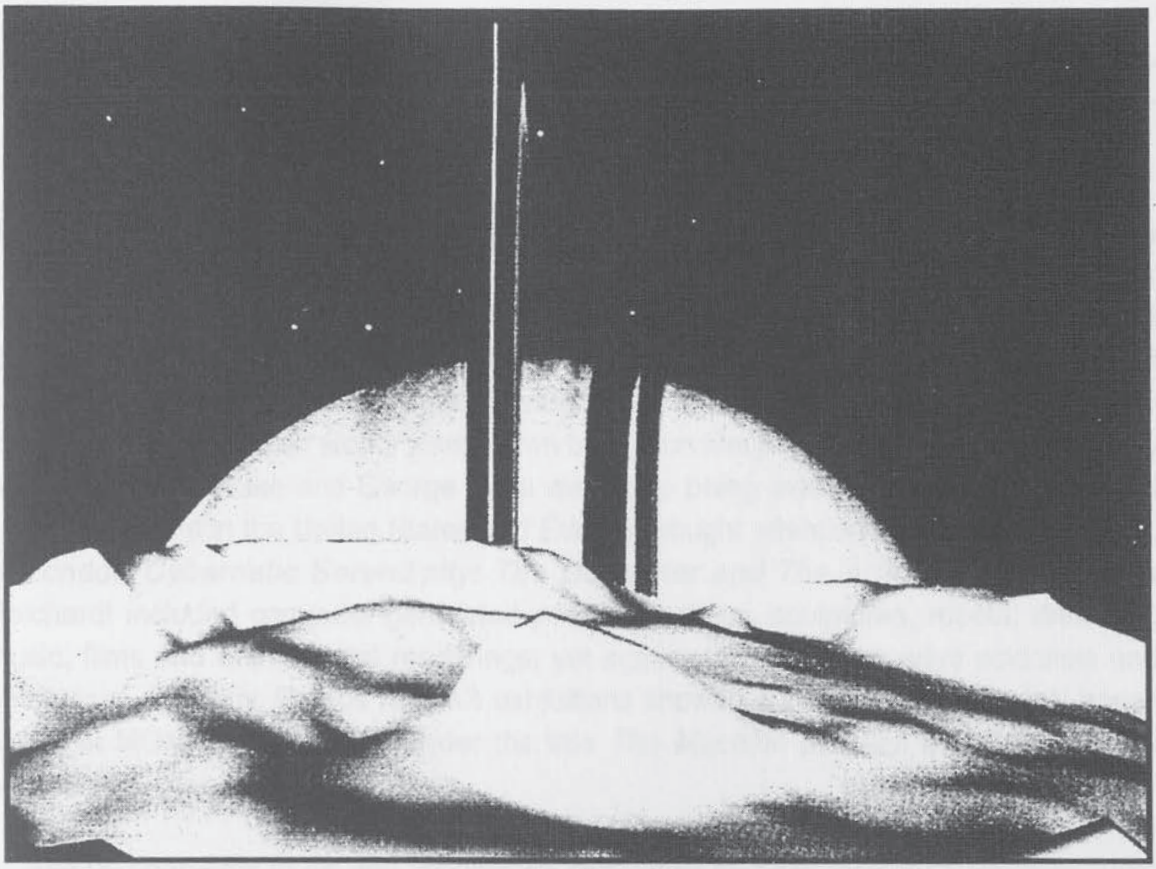
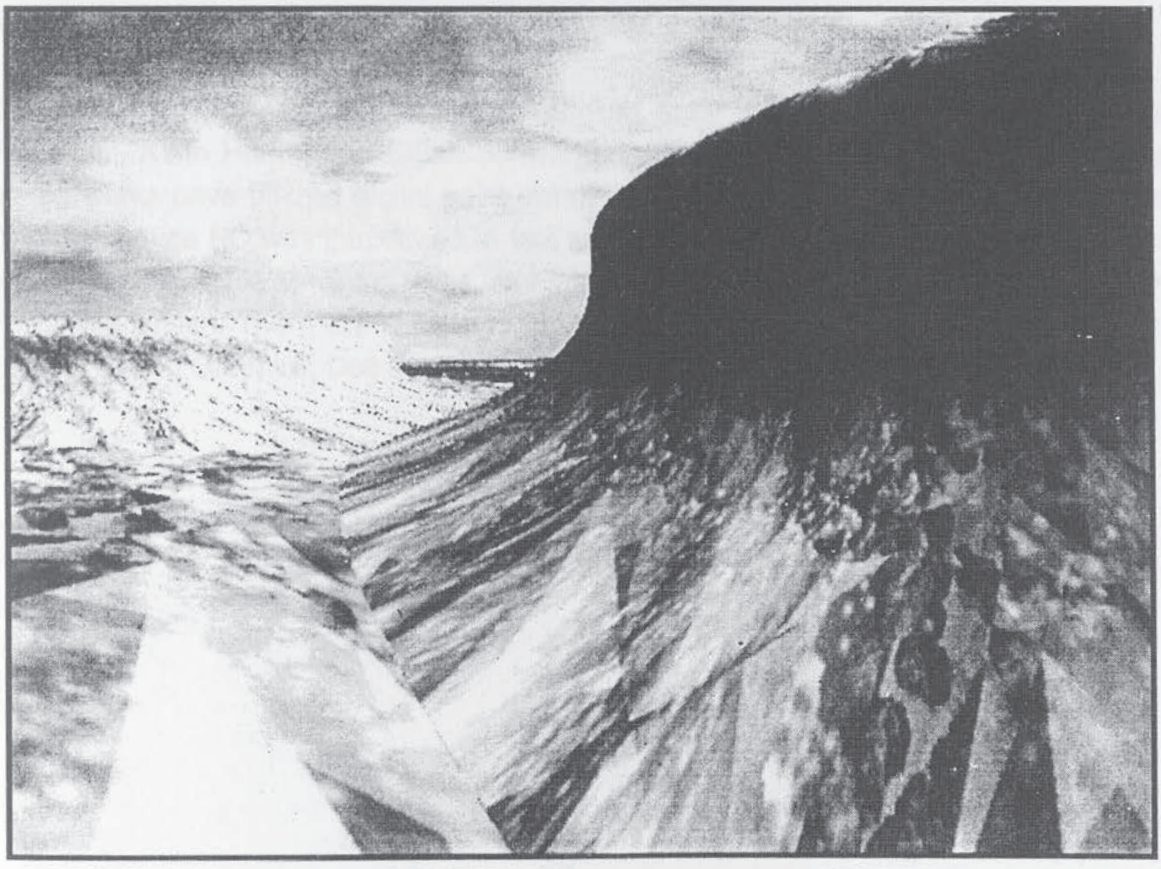


Figure 29
James Blinn: *Mimas Day* 1981.
Still frame from film. Computer Graphics Laboratory, Jet Propulsion NASA
Hardware: Digital Equipment Corporation Vax II/780 computer
Software: James Blinn.(Goodman 1987:102)

Figure 30
David Ems: *The Far Away* 1986.
Cibachrome print 30 in x 40 in.
Hardware: Digital Equipment CorporationVAX II/780 Computer.
Software: James Blinn.
(Goodman 1987:103)



grams he used were not developed for art purposes but for scientific research, primarily for NASA. Melvin Prueitt, like Ems, utilizes the mathematical capabilities of the computer to produce 'Surrealistic' landscapes (*Figures 31a and 31b*).

By 1965 Computer Art began to receive general public attention. In West Germany the first exhibition of computer-generated art at the Tecnbische Hochschule in Stuttgart took place. Similarly, in the United States the first exhibitions of digital graphics appeared at the Howard Wise Gallery in New York, showing works of A. M. Noll and B. Julesz. That the exhibitors at this exhibition were scientists and not artists was as revolutionary at the time as the fact that their works were drawn by a microfilm plotter instead of by hand. The works of Frieder Nake and George Ness were also being exhibited. Between 1968 and 1970 exhibitions in the United States and Europe brought attention to art and technology. In London *Cybernetic Serendipity: The Computer and The Arts*, curated by Jasia Reichardt included computer-generated poetry, paintings, sculptures, robots, drawings, music, films and architectural renderings; yet again most exhibitors were scientists and not 'artists'. Similarly, Pontus Hulten's exhibitions showed numerous technological-based works at MOMA in New York under the title *The Machine as seen at the End of the Mechanical Age.*

In 1966 Experiments in Art and Technology (EAT) was founded by Robert Rauschenberg and Billy Kluver, a physicist in laser research at Bell Labs, to promote a collaboration between artists and scientists. This foundation existed until 1968. Rauschenberg himself created artworks in which technological objects, such as radios and fans, were activated by various electronic systems (*Figure 32*). Similarly, the works of Paolozzi referred to the use of mechanical objects (*Figure 33*). In 1967 the founding of CAUS—the Center for Advanced Visual Studies—was established by MIT.

David Hockney, Larry Rivers, Howard Hodgkin, Andy Warhol, Nam June Paik, Philip Pearlstein, Keith Haring and Lillian Schwartz, to mention but a few, are all fine artists whose works have utilized digital paint systems (*Figures 34a to 34l,* 12 illustrations). In 1985 the Amiga PC was introduced, a tool which Andy Warhol embraced and utilized in his works. The Apple Macintosh was later introduced and then further developed into the Power Macintosh. There are numerous other platforms used in the computer field such as IBM, Silicon Graphics, Dec to mention but a few.

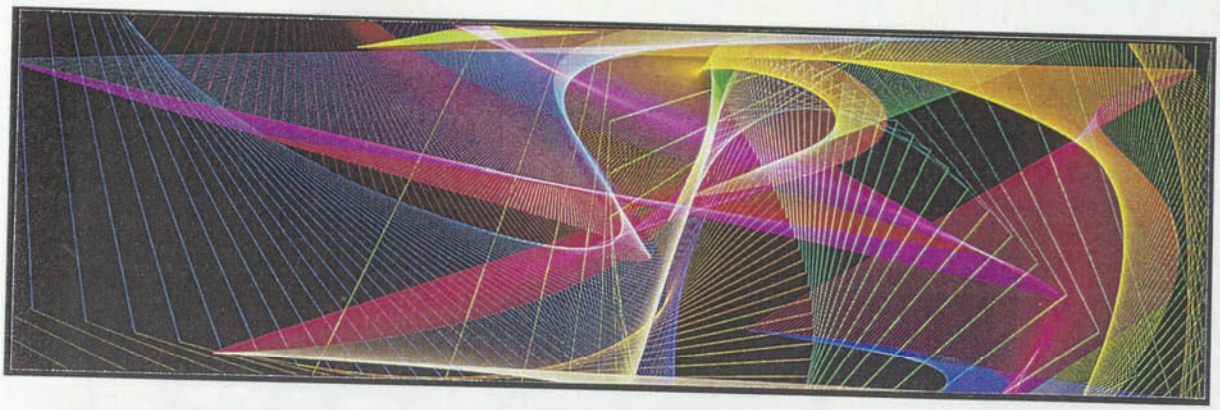


Figure 31a
Melvin L. Prueitt: *Elation* 1980.
Ektachrome Print, Motion Picture Group Los Alamos National Laboratory.
Hardware: Control Data Corporation 7600 Computer Information International, Inc. FR80 film recorder.
Software: M.L. Prueitt.
(Goodman 1987:112)

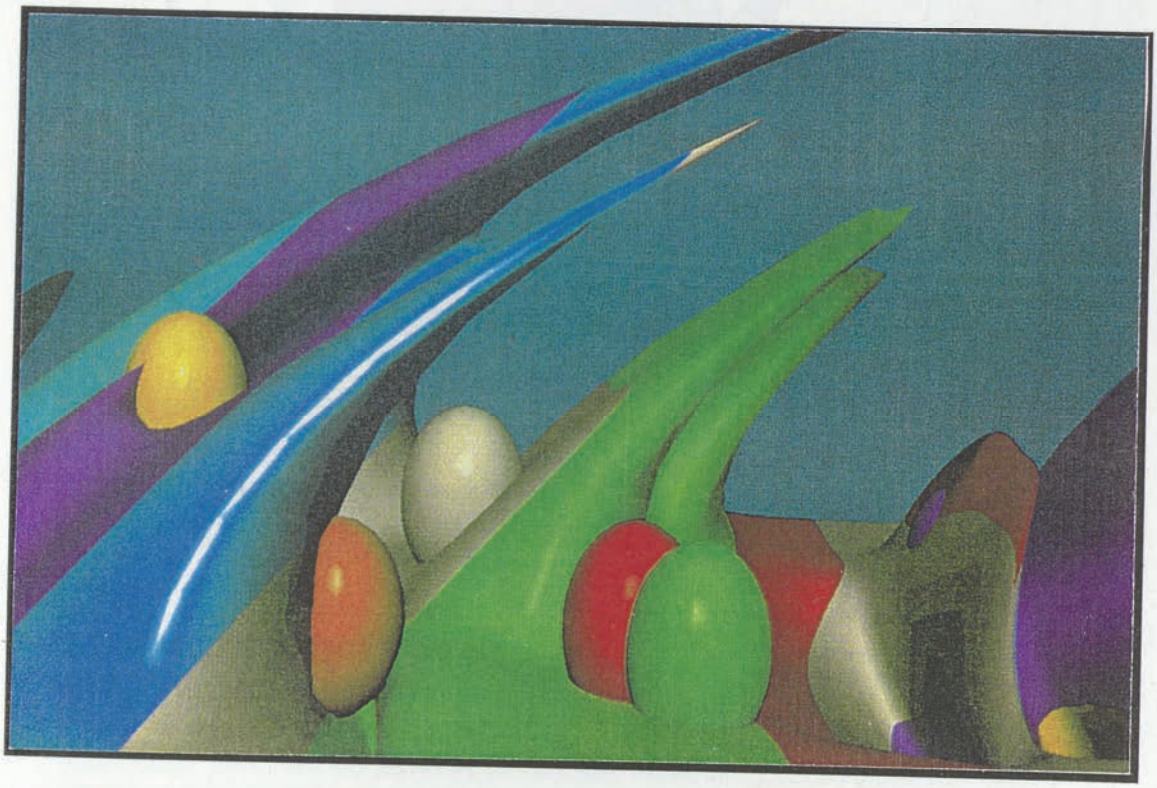


Figure 31b
Melvin L. Prueitt: *Manifold and Curvilinear* 1983.
Ektachrome Print, each 12 in x 40 in, Motion Picture Group Los Alamos National Laboratory.
Hardware: Control Data Corporation 7600 Computer Information International, Inc. FR80 film recorder.
Software: M. L. Prueitt.
(Goodman 1987:113)

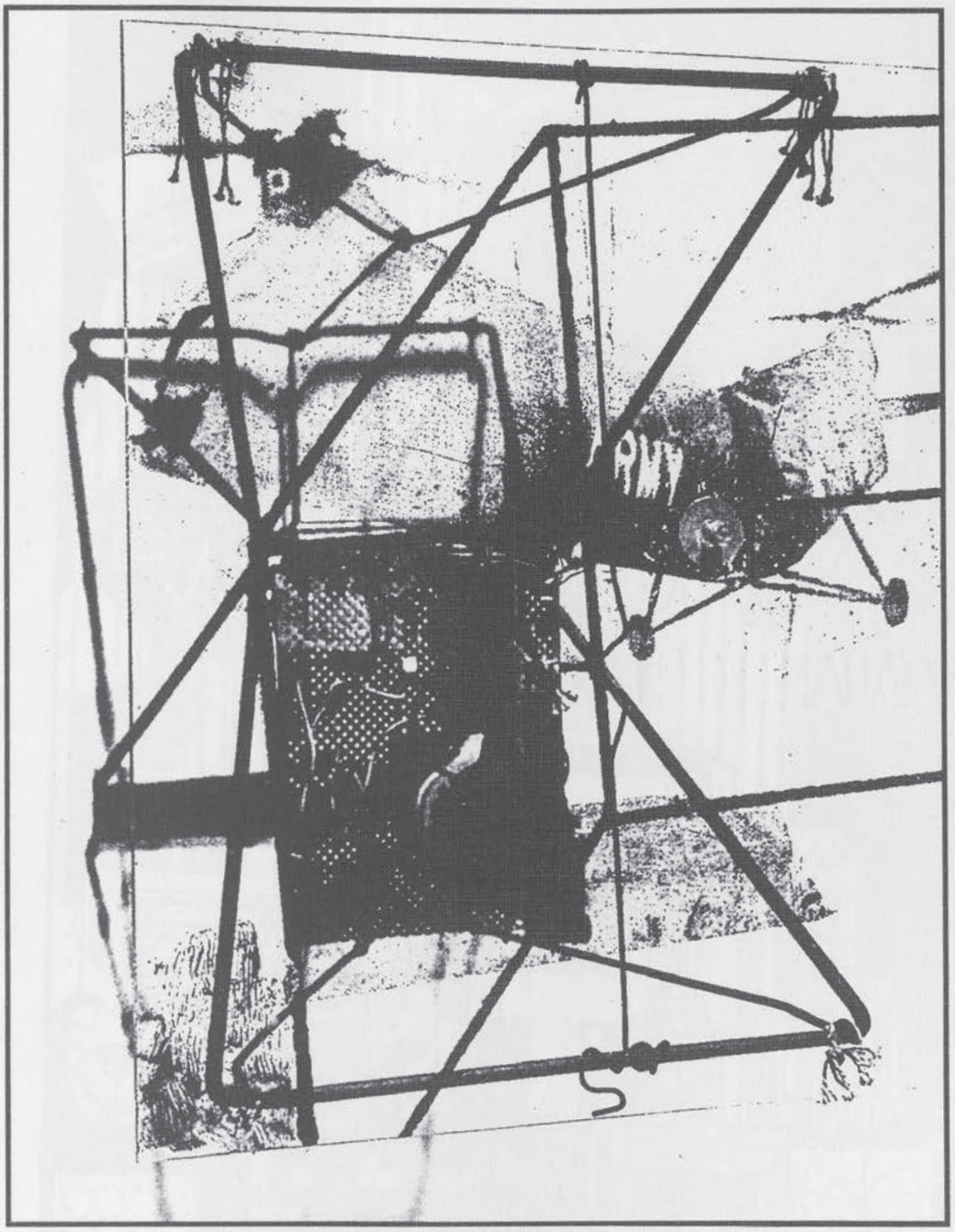


Figure 32
Robert Raushenburg: *Dry Cell* 1963.
Assemblage: silkscreen, ink and paint on Plexiglas; metal, string, sound transmitter, wire, circuit board, motor and batteries 15 in x 12 in x 15 in.
(Goodman 1987:28)

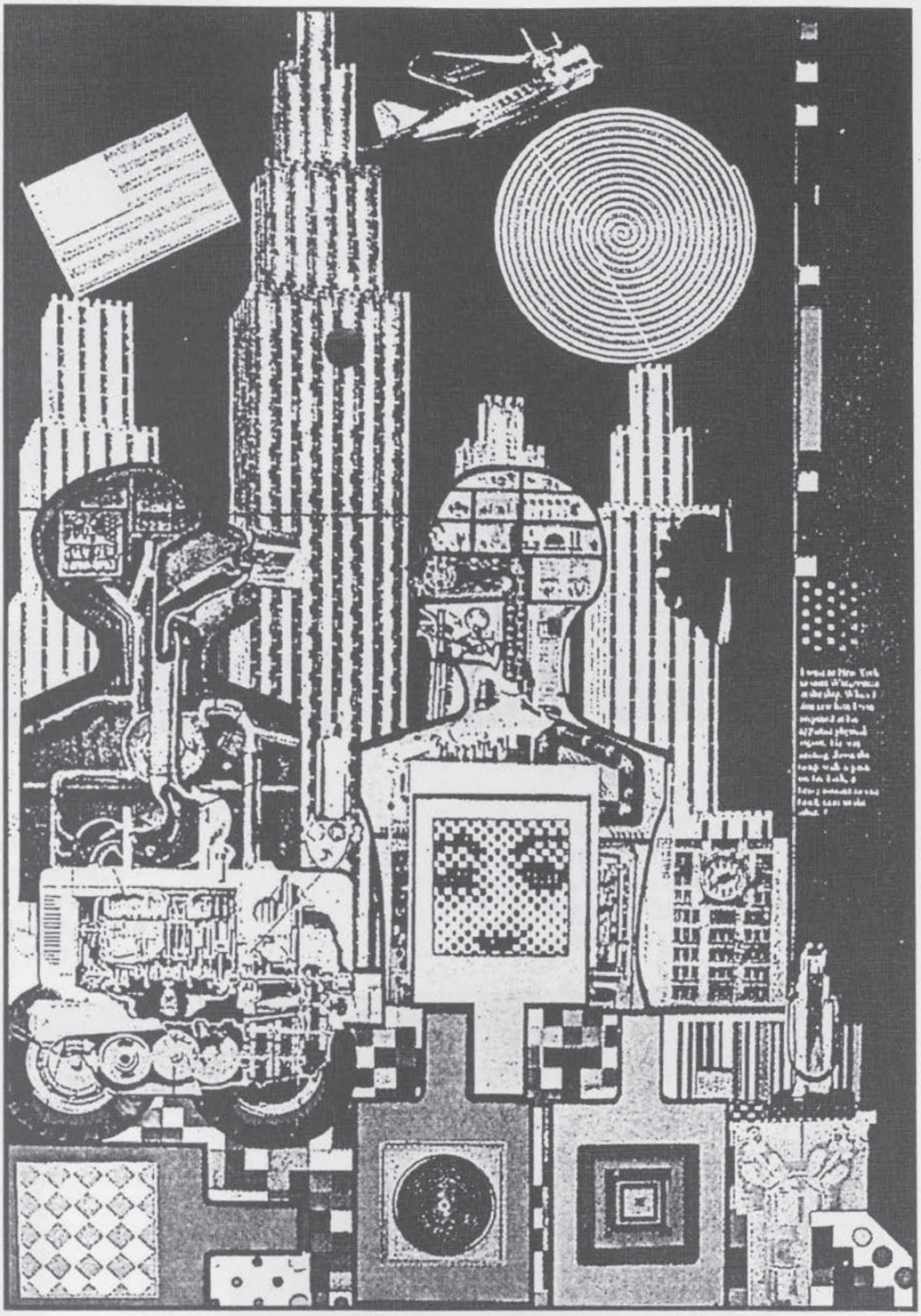


Figure 33
Paolozzi: *Wittgenstein in New York* 1970.
Screenprint from *As Is When* 1965
32 in x 22 in.
(Paolozzi 1970:7)

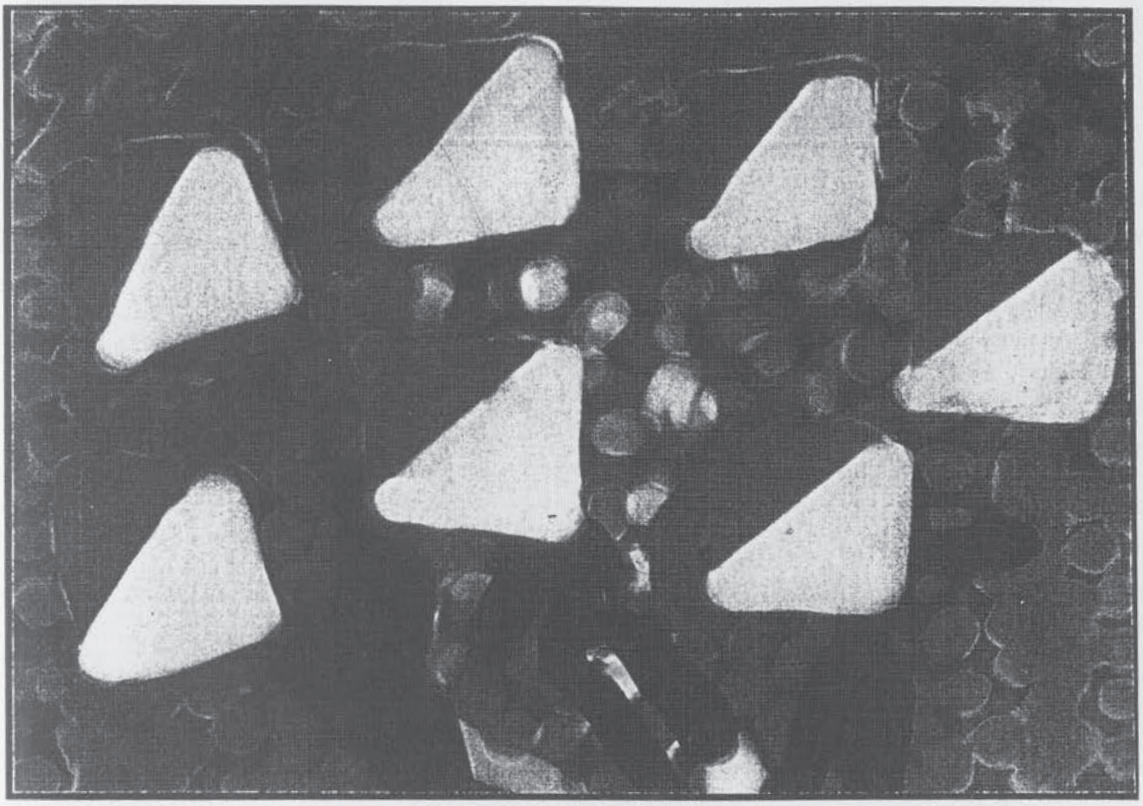
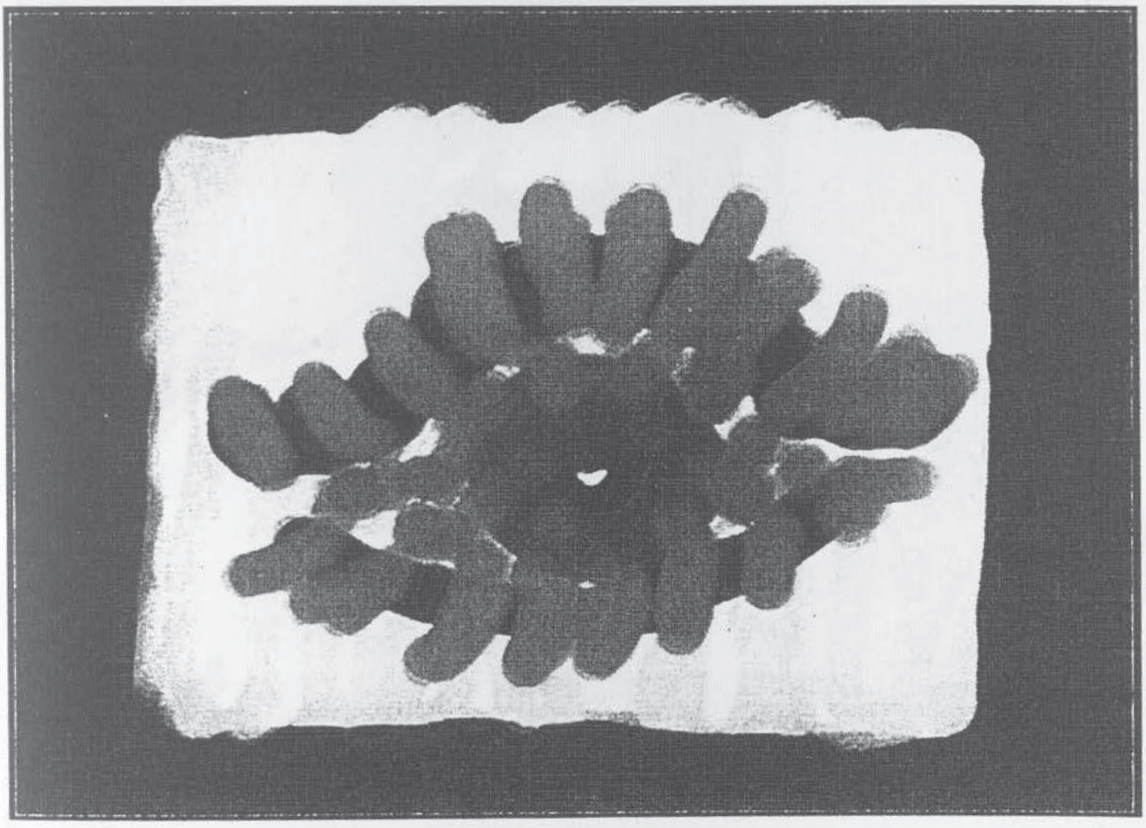


Figure 34a
Howard Hodgkin: Set Design for *Pulcinella* 1986.
Frame from videotape.
Hardware: Quantel Paintbox.
Software: Quantel Paintbox.
(Goodman 1987:69)

Figure 34b
Howard Hodgkin: Set design for *Pulcinella* 1986.
Frame from video tape.
Hardware: Quantel Paintbox.
Software: Quantel Paintbox.
(Goodman 1987:68)



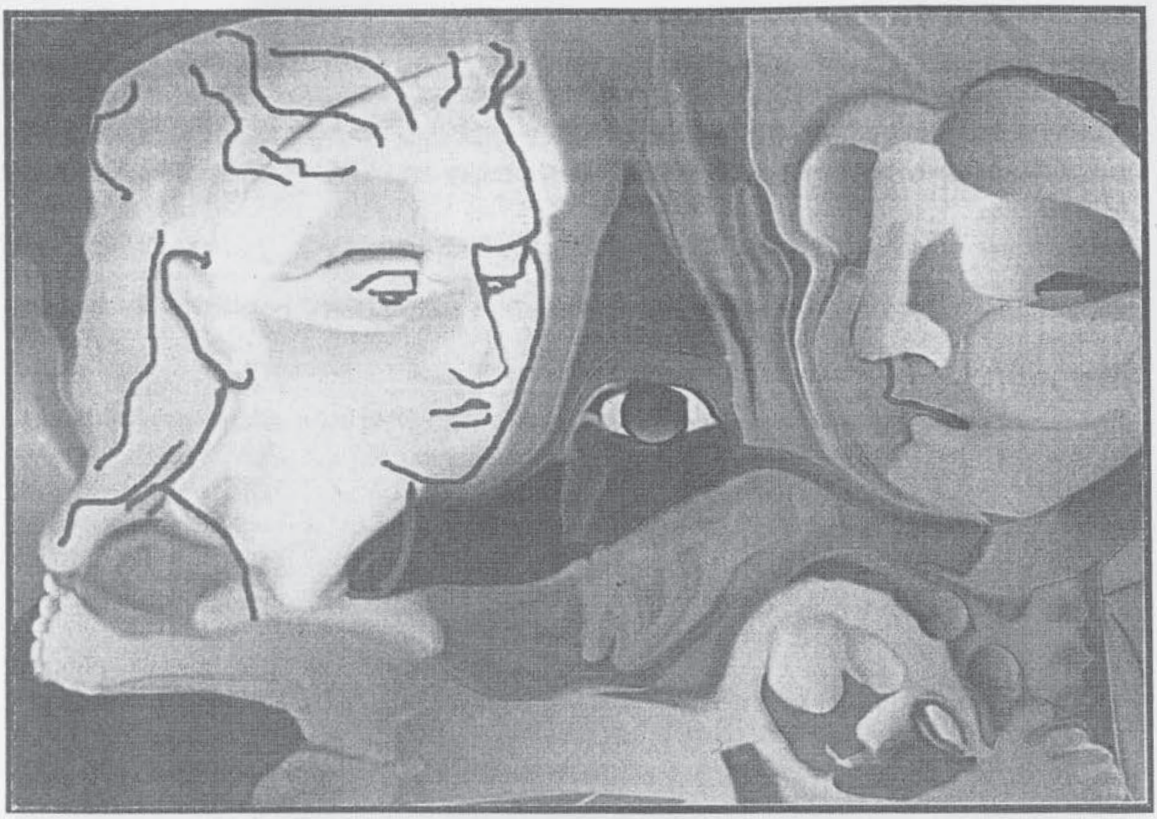


Figure 34c
Lillian Schwartz: *After Picasso* 1986.
Cibachrome print, 50 in x 67 7/8 in.
Hardware: Symbolics 3600 computer.
Software: Symbolics.
(Goodman 1987:79)

Figure 34d
Larry Rivers: *Green* 1986.
Frame from video tape.
Hardware: Quantel Paintbox.
Software: Quantel Paintbox.
(Goodman 1987:72)



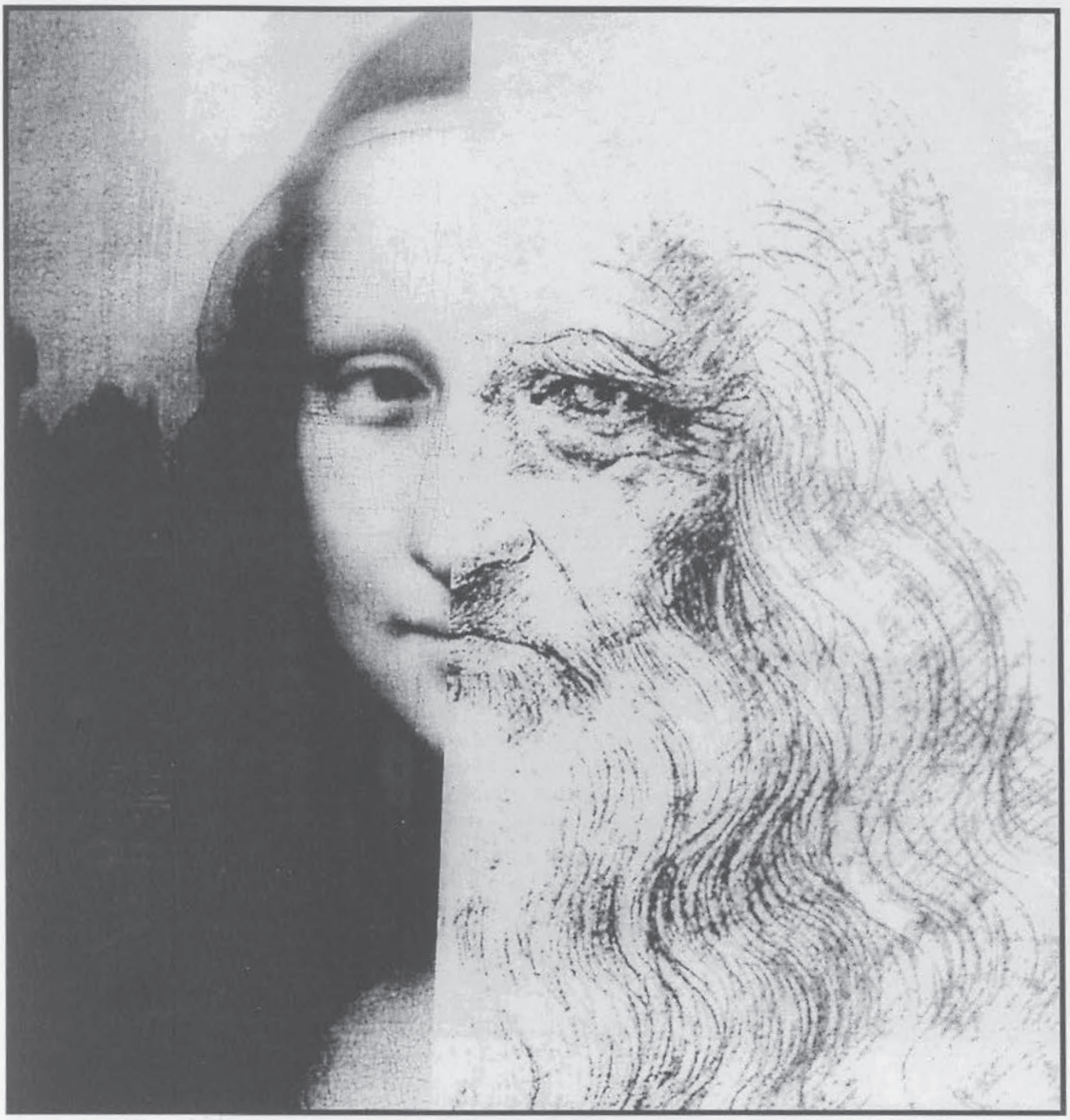


Figure 34e
Lillian Schwartz: *It Is I* 1987.
35mm slide.
Hardware: Symbolics 3600 computer.
Software: Symbolics.
(Goodman 1987:83)



Figure 34f
Keith Haring: *Untitled* 1983.
35mm slide.
(Goodman 1987:71)

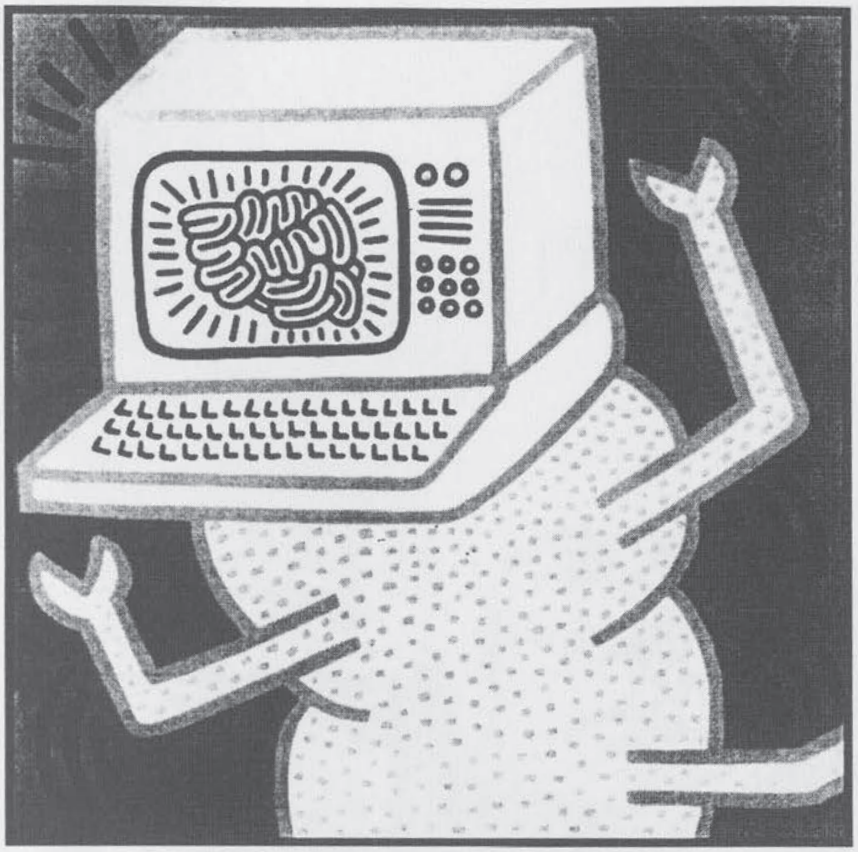
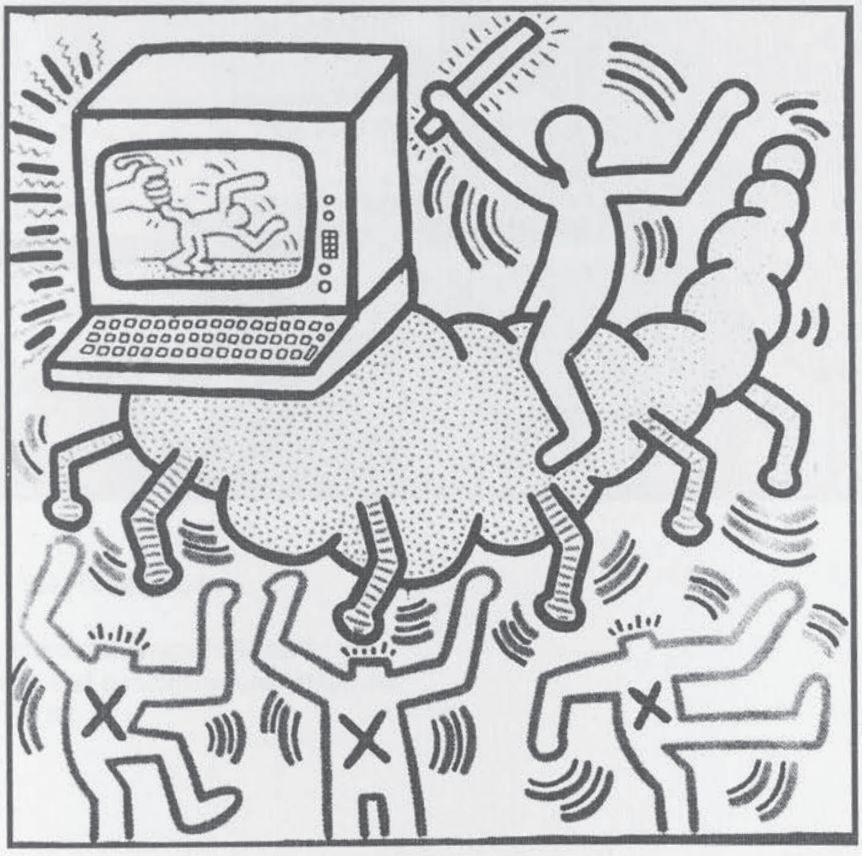


Figure 34g
Keith Haring: *Untitled* 1984.
Acrylic on canvas 5 in x 5 in.
(Lovejoy 1989:141)

Figure 34h
Keith Haring: *Untitled* 1983.
Vinyl paint on vinyl tarp 10 in x 10 in.
(Lovejoy 1989:98)



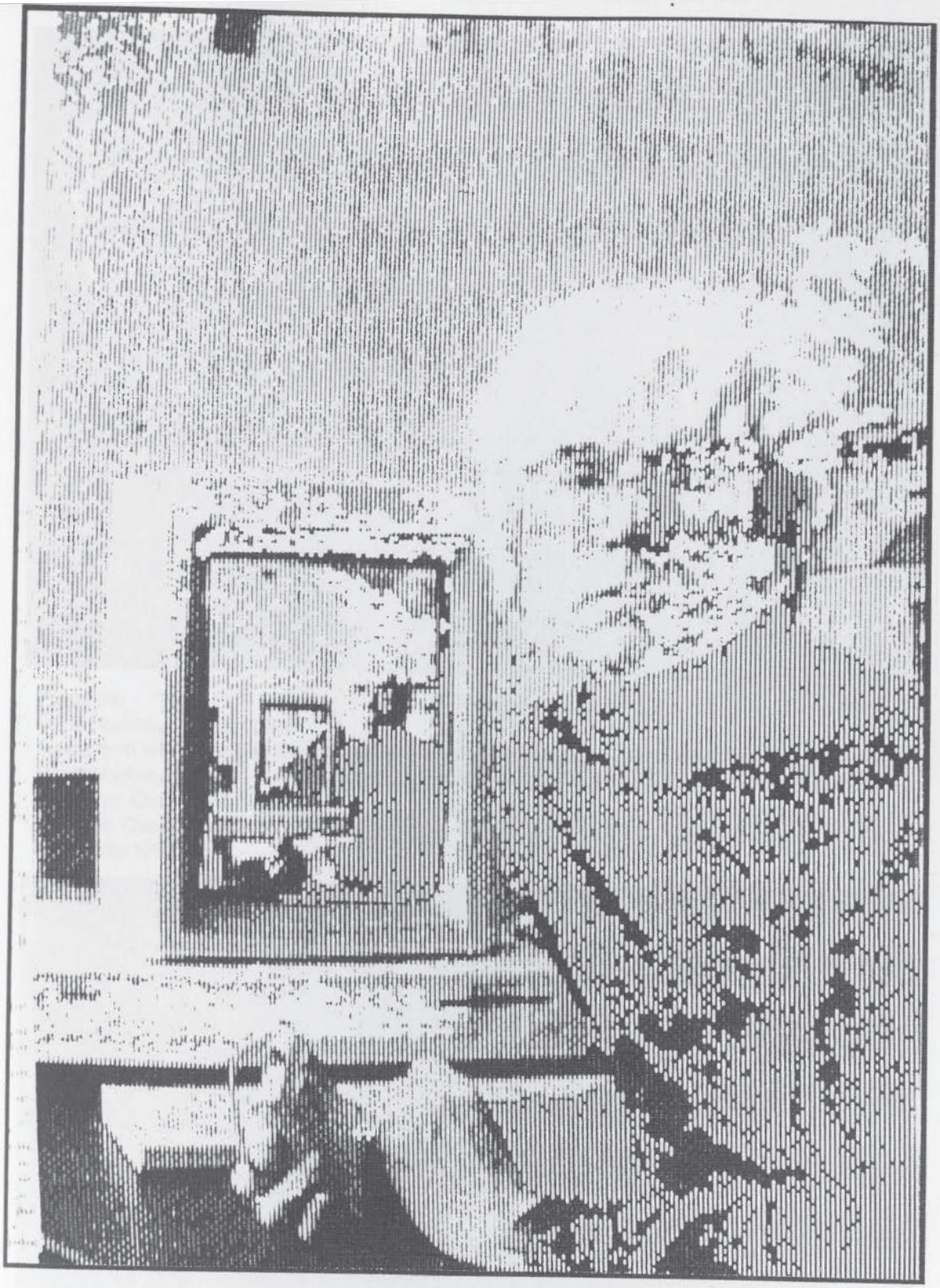


Figure 34i
Andy Warhol: *Self Portrait* 1986.
Photograph.
Hardware: Commodore Amiga 1000 computer.
Software: Graphicraft by Commodore Amiga, Inc.
(Goodman 1987:88)

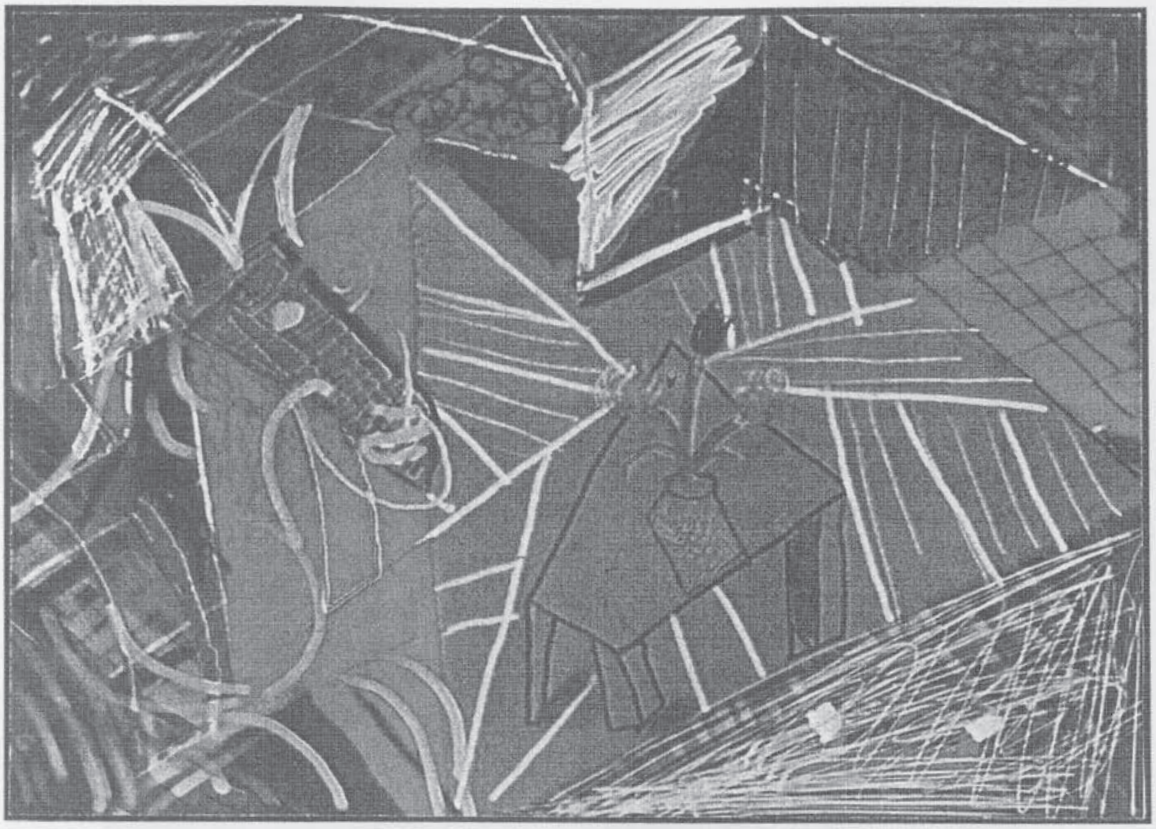


Figure 34j
David Hockney: *Untitled* 1986.
Frame from videotape, *Painting with Light: David Hockney*.
Hardware: Quantel Paintbox.
Software: Quantel Paintbox.
(Goodman 1987:66)

Figure 34k
Philip Pearlstein: *Hands and Feet* 1983–1984.
Frame from Philip Pearlstein Draws the Artist's Model.
Hardware: Images I System, Computer Graphics Laboratories.
Software: Images I.
(Goodman 1987:65)



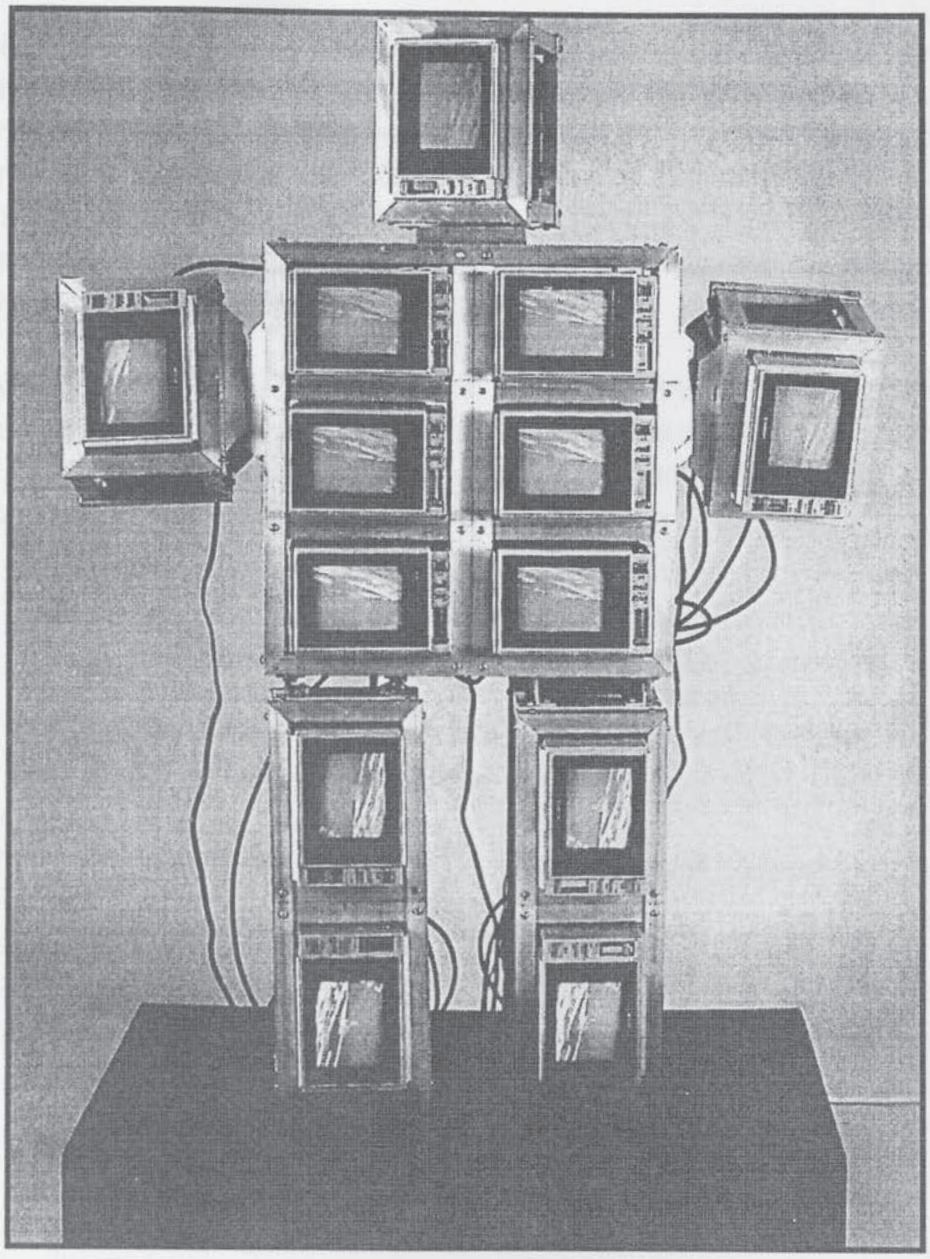


Figure 34l
Nam June Paik: *Family of Robots: Baby* 1986.
Thirteen television sets, half-inch VHS player, and half-inch minute tape (Heart Channel for Robot) 52 1/2 in x 38 in x 13 1/3 in.
(Goodman 1987:166)

Since 1985 eleven years have passed and the technological developments have opened up new avenues of interactive multimedia for users all over the world. Artists, designers, publishers and numerous other types of individuals and industries have explored the computer facilities at home, at their business and now on the Internet, promoting various exhibitions, advertisement campaigns, research facilities and numerous forms of visual imagery and text (see examples of various selected computer-assisted images, *Figures 35a to 35n,* 14 illustrations).

The following section discusses the historical and metaphorical relationship between the human brain, body and mind to that of the machine/computer, a theme which has developed out of the various readings I have researched, a theme which embraces the relationship between humanity and computer technology.

This section consists of 19 pages of various examples of computer-related work by Fine artists and commercial designers.

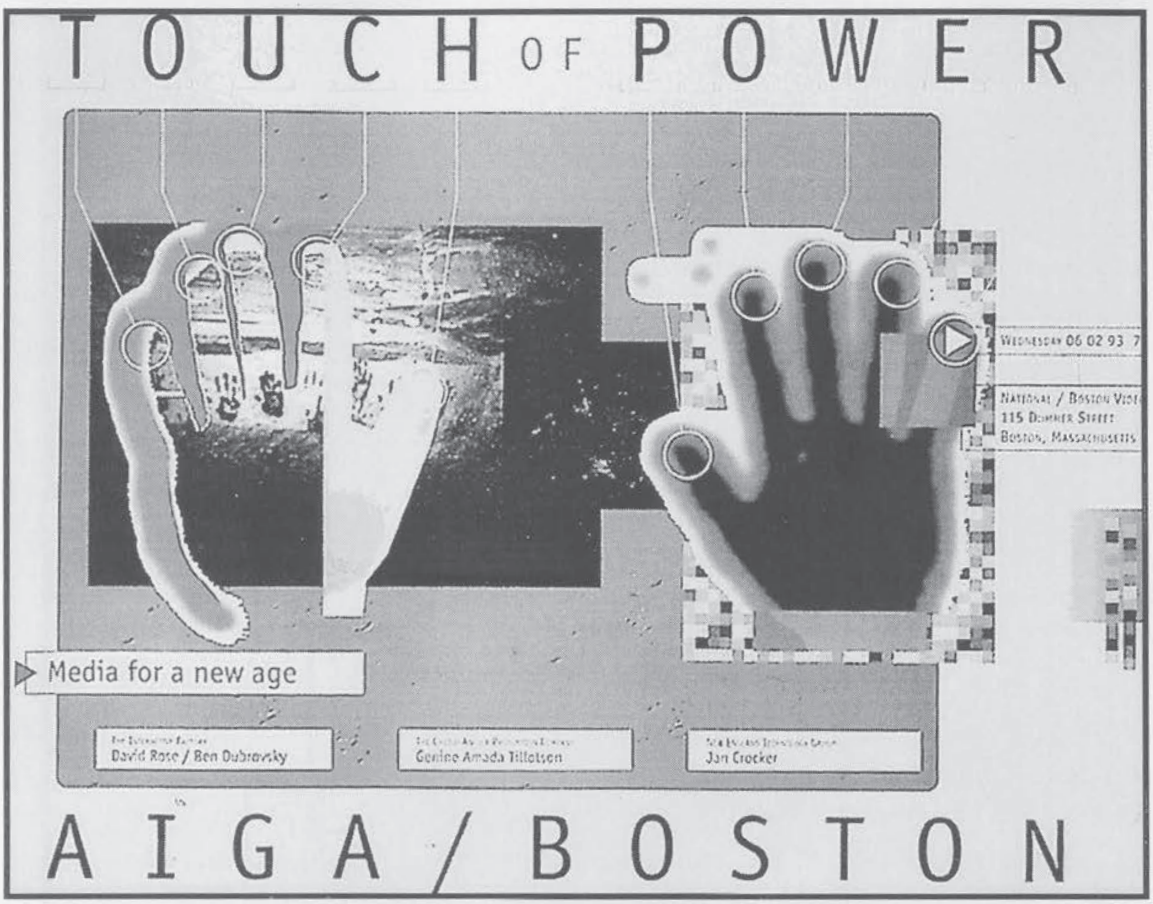


Figure 35a
Marc English
Software: QuarkXpress, Adobe Photoshop.
Hardware: Macintosh Centris 650
(*Computer Graphics 2* 1994: 37)

Figure 35b
Joseph Nechuatal: *The Informed Man* 1986.
Computer/robotic-assisted, acrylic paint on canvas
82 in x 160 in. Hardware: 3-M scanamural.
(Goodman 1987:99)



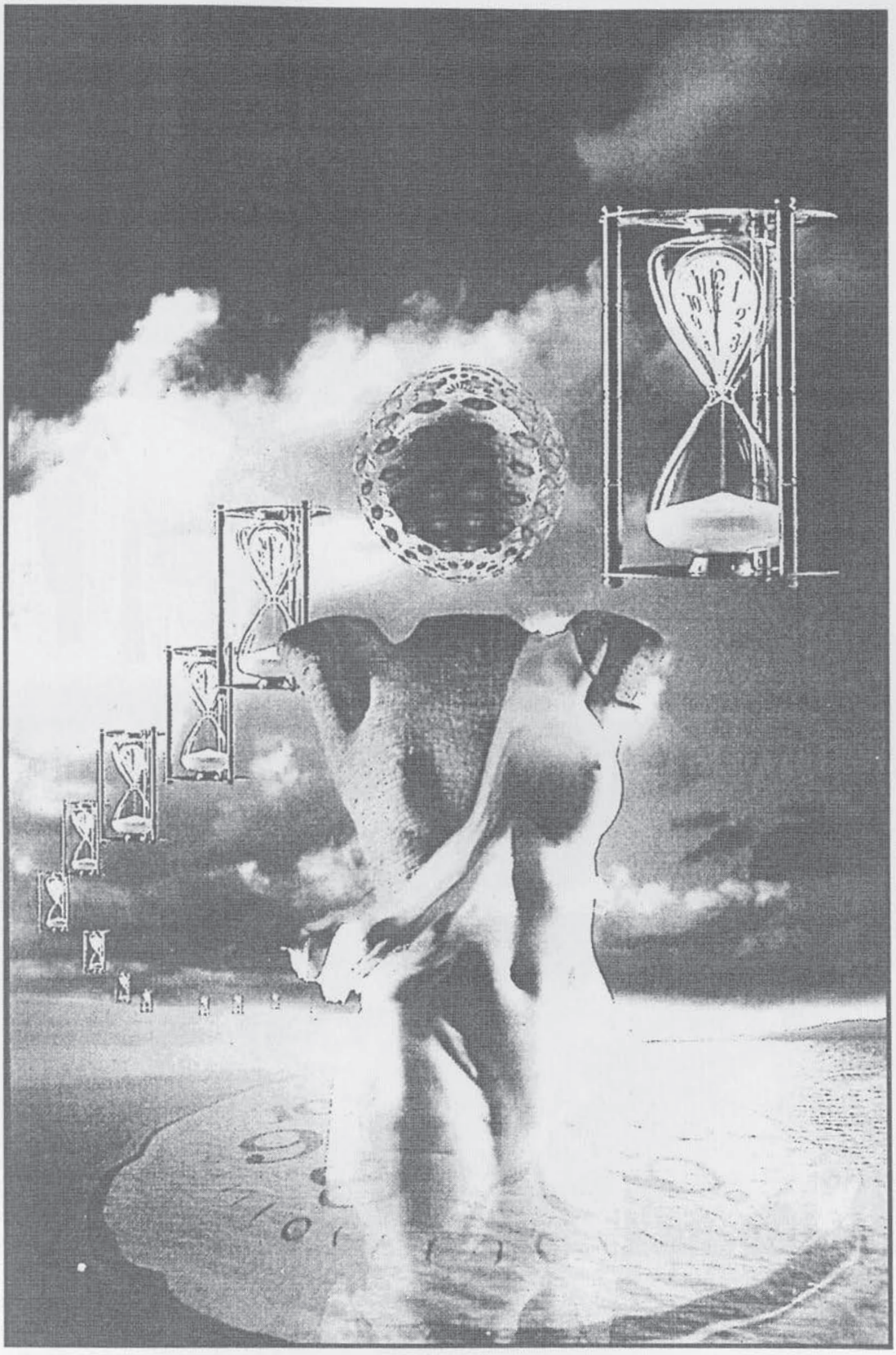


Figure 35c
Barry Blackman: *Untitled* 1993.
Hardware: Silicon Graphics workstation.
(*Computer Pictures* September/October 1993:21)

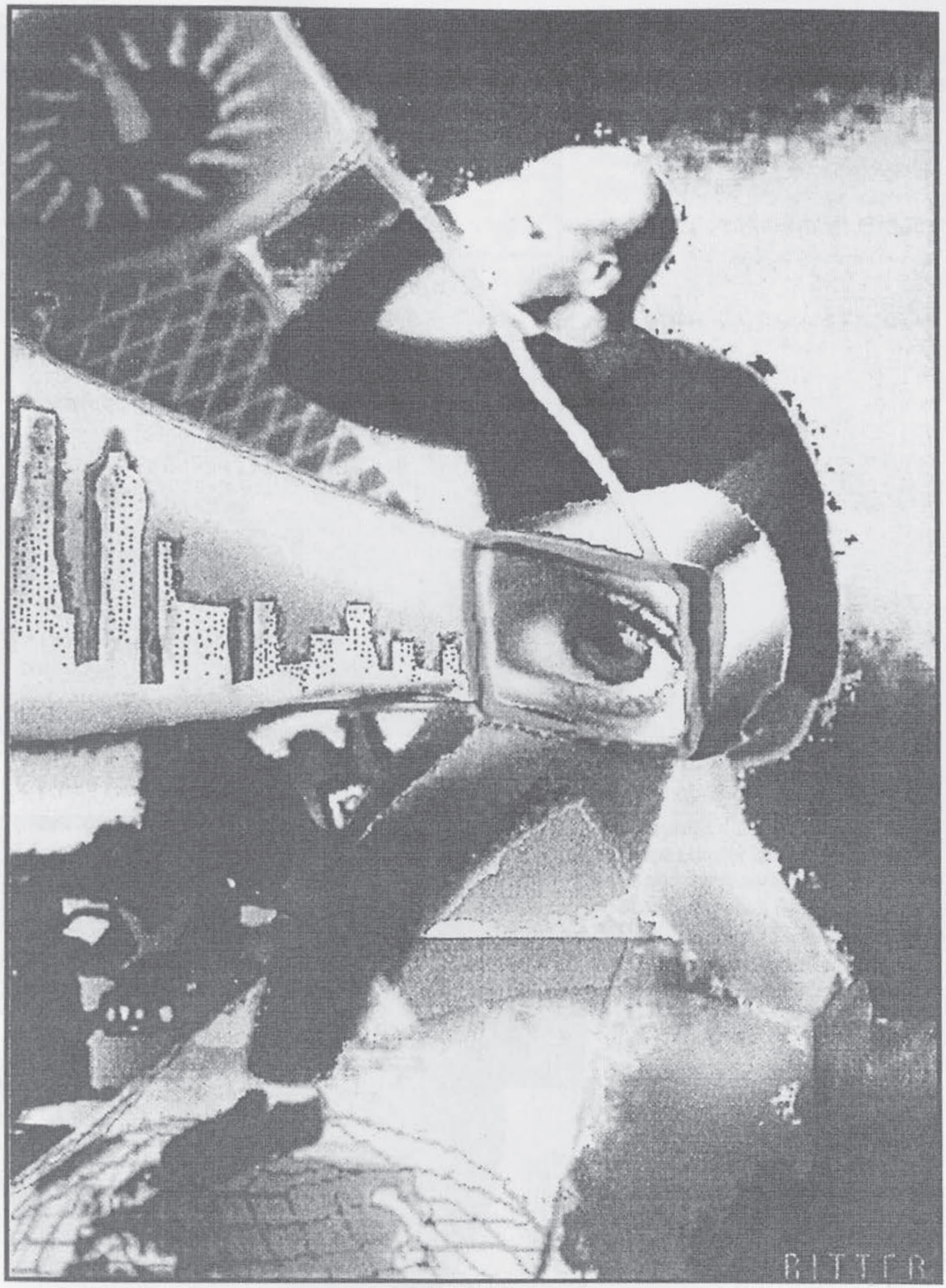


Figure 35d
John Ritter: *Untitled* 1993.
Software: Adobe Photoshop 2.5.
(*Computer Pictures* September/October 1993: 24)



Figure 35e
Glenn Mitsui: *High-speed Modems* 1993
Macworld magazine: Editorial Illustration.
Software: Adobe Photoshop 2.5.1,
Aldus Freehand 3.0, Fractal Design
Painter 2.0, Kai's Power Tools.
(Sparkman 1995:65)

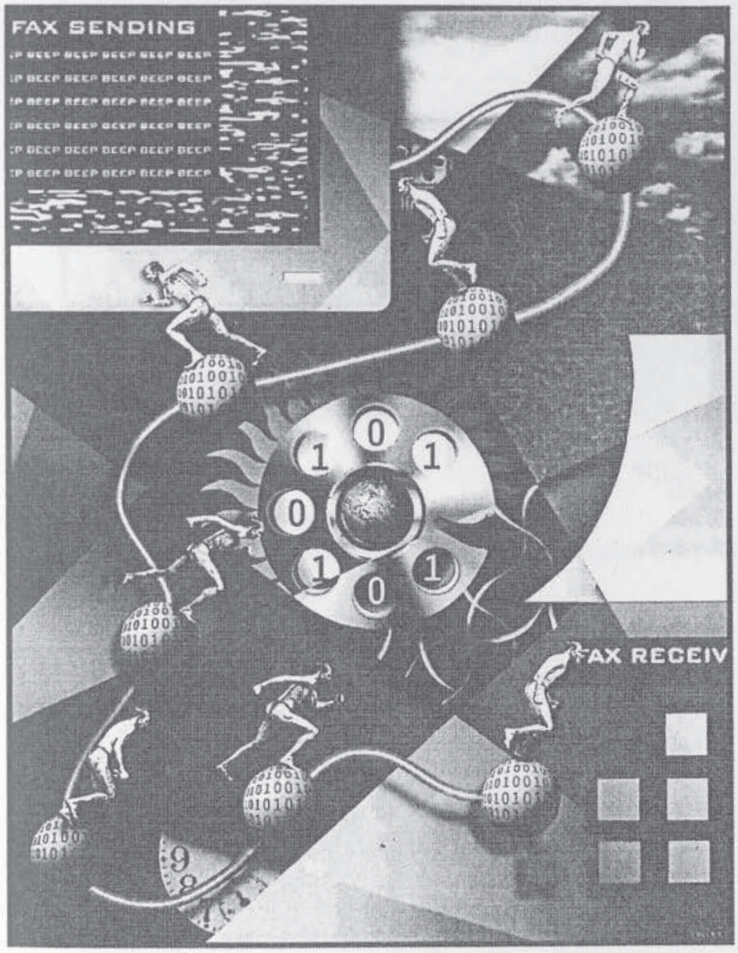


Figure 35f
Diane Fenster IDG.
Bookcover Illustration 1993.
Software: Adobe Photoshop 2.5.1.
Hardware: Mac IIfx, Nexus fx accelerator.
(Sparkman 1995:49)



Figure 35g
Jeff Brice: I.D.E.A. 1993.
Software: Fractal Design Painter 2.0, Fractal Design ColorStudio1.5
Hardware: Mac II.
(Sparkman 1995:89)



Figure 35h
Mark Zimmer, President of Fractal Design Corporation created this Van Gogh-like image in 1 and 1/2 hours using his firm's Fractal Design Painter software.
Hardware: Macintosh IIfx with 20 MB RAM, Wacom tablet.
(*Computer Pictures* May/June 1992:34)

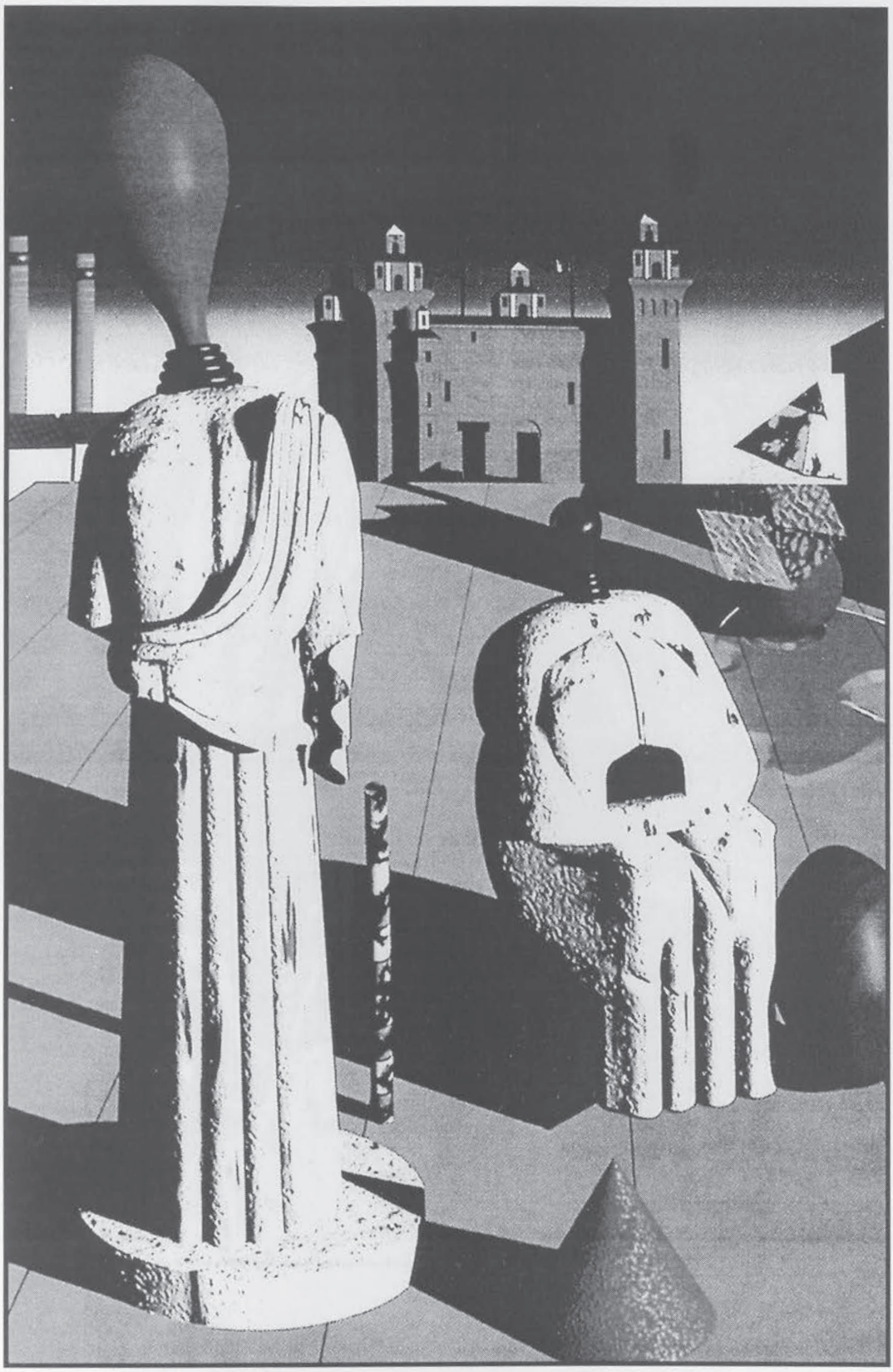


Figure 35i
A computerized re-creation of Giorgio de Chirico's 1925 painting *The Disturbing Muses,* entitled *Digital de Chirico.*
Designed with Presenter Professional.
(*Computer Pictures* May/June 1992: 3D–8)

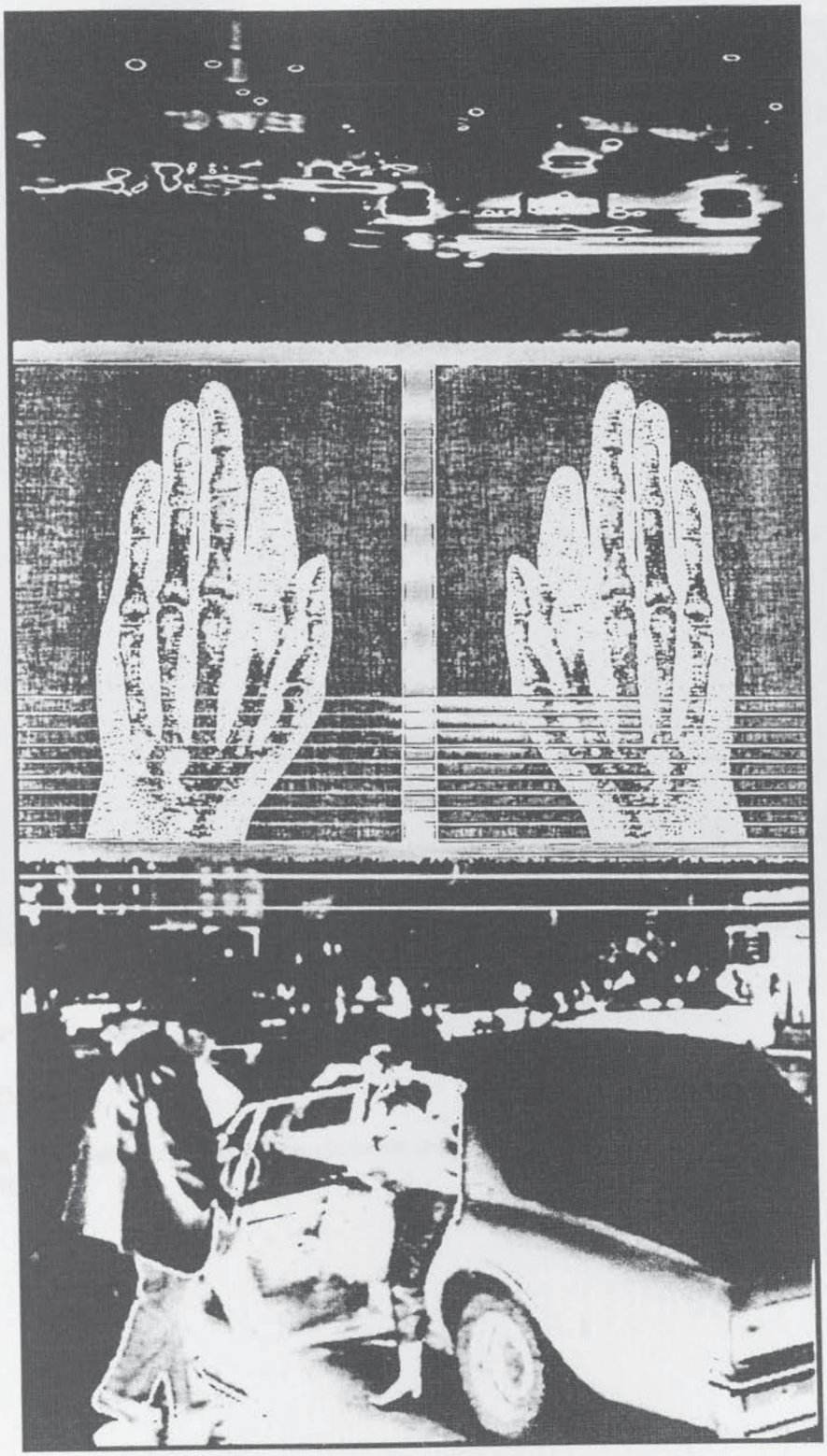


Figure 35j
Diane Fester: *Night Six* 1992.
(*Aperture* 1994:51)

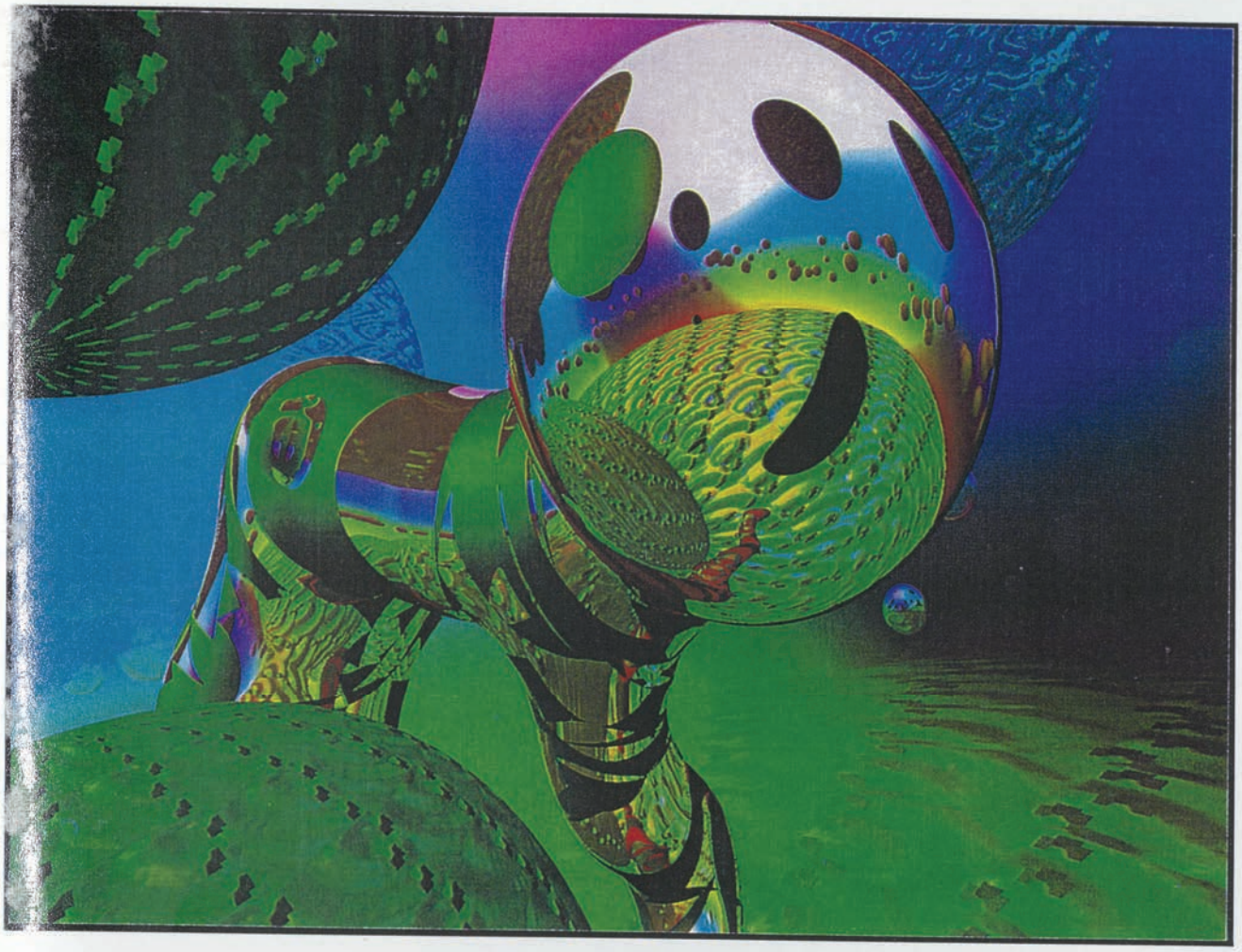


Figure 35k
Yoichiro Kawaguchi: *Ocean* 1986.
Frame from film.
Hardware: Links 1 Computer.
Software: Arts.
The artist's interests lay in metamorphosis of organic forms and the use of iridescent colours.
(Goodman 1987:165)

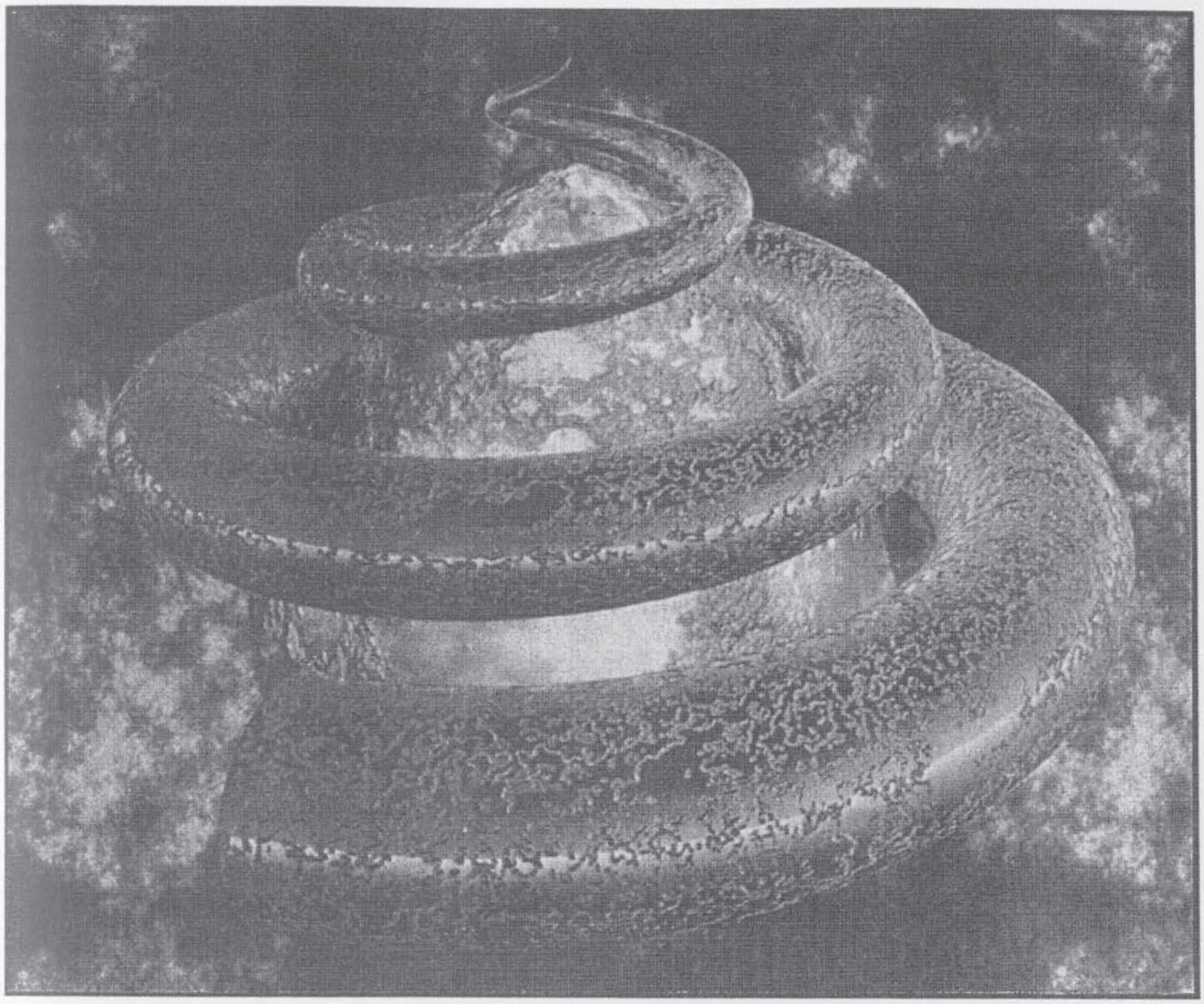


Figure 35l
Andy Kopra: Los Angeles *Fire* 1988.
(*Computer Graphics World* October 1988: 95)

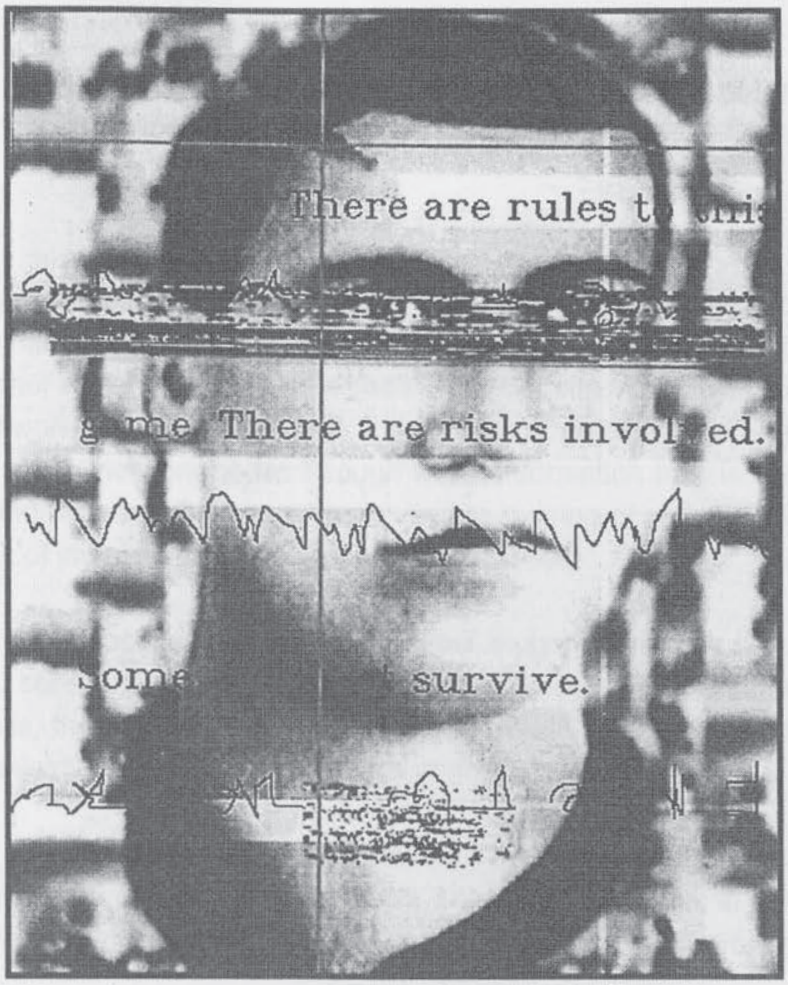
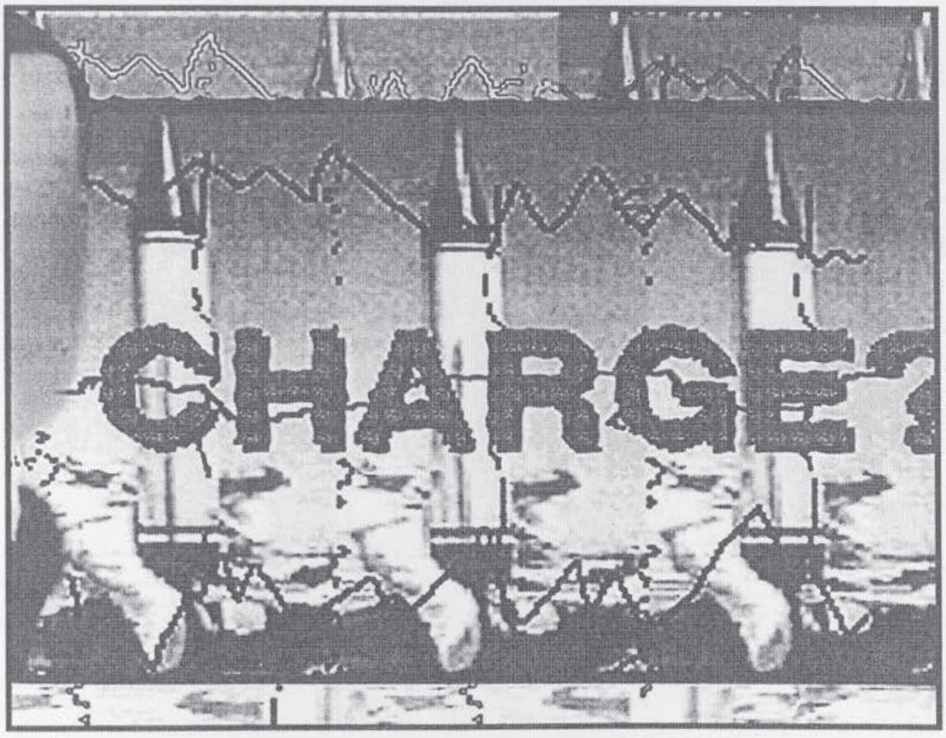


Figure 35m and 35n
Carol Flax: *Casey* 1991.
Carol Flax: *Who's in Charge?* 1992.
(in Druckrey & Stainback 1993:103, 105)



Section five

The human–computer paradigm: An investigation of the metaphorical relationship between the human body, mind and technology

A. Definition of the brain

The brain has traditionally been perceived by various theorists in terms of the prevailing technology. It has been metaphorically related to a mechanical water clock, hydraulic pump, telephone, switchboard, a liquid-cooled parallel supercomputer, and now a communication network—the Internet, which is seen as a large brain where people and computers are its neural network nodes through which information travels. Such a metaphor is over simplified as humans cannot be reduced to a string of codes (DNA), as it carries the serious risk of impoverishing our sense of humanness.

The human brain is approximately one and a half kilograms of living tissue consisting of blood vessels, some membranous lining, some fluid-filled cavities, and many billions of specialized cells, the most important of which are about fourteen billion neurons. These form a communication network of unmatched complexity.

The brain has no sensation of its own existence. *'I never see my own brain ... I can't feel its functioning like the pulse beat of my heart, I can't even squeeze it, pinch it ... It is the most hidden and the most unobtrusive part of my body.'* (Harth 1982:15)

It is a delicate substance of grey matter, which we are very far from understanding: how information is filtered in through our senses, how information is 'processed', how memories are stored and recovered, skills learnt and decisions made, how our muscles, glands and all vital functions are controlled. Many people believe that we use only 10% of our brains, a belief based on psychologist William James's assertion in 1910.

Brain research has many remote areas of investigation—cognitive psychology, psychoanalysis, behaviourism, cybernetics, artificial intelligence, symbolic processes, neuronal mechanism, all questioning the notions of intelligence, conscious, non-conscious entities and the representation and processing of information—a vast field of complex theoretical literature. Today we still know relatively little about this one and a half kilograms of tissue.

B. Early historical misconceptions of the mind and thought

During the Middle Ages, some people believed that the human brain consisted of a 'control room' in which a *homunculus,* or 'a little person' (Latin for 'little fellow') explained how we thought. The *homunculus* metaphor suggested that subsystems of little people in the brain were sending messages back and forth, asking for help, making decisions, obeying and volunteering non-conscious bits of organic machinery. The fallacy of the *homunculus*-in-the-brain idea is that it leads to an infinite regress, for what is inside the brain of the *homunculus*? A yet smaller *homunculus*? (*Figures 36a and 36b*) Interestingly enough, today the term *homunculus* still exists as a definition of a specific area of the brain.

The brain itself has not always been recognized as the seat of our mental activities. According to Homeric legend the location of the mind was in the belly, specifically the diaphragm. As early as the fifth century BC Alcmaeon of Croton and Hippocrates ascribed emotional activities and mental faculties to the brain. In Greek antiquity, Plato and Aristotle viewed the head and the heart respectively as the chief contending sites. Aristotle believed that mental life emanated from the heart, being the centre of the nervous system, where the brain helped cool down the body. In contrast, Plato postulated that the spiritual mind, the rational soul, resided in the head (Blakemore 1977:12).

'Tell me, where is fancy bred—or in the heart or in the head' (Shakespeare in Magoun 1963:4).

Six centuries after Hippocrates, another Greek physician, Galen (CAD 130–200), studied the sensory pathways that led to the brain. He identified the brain as the nervous centre and described the nerve bundles that proceeded from the peripheral sense organs (eyes) as conductors for sensory information to the brain (*Figure 37).* Being puzzled over the nature of the flow of signals, he concluded that an invisible fluid, pneuma, was transported through these nerves. He theorized that the nerves were hollow and that invisible fluid, 'animal spirits', flowed through them from the brain, producing sensation, movement and thought. These theories were later echoed in Rene Descartes' book *Traite de L'Homme*, illustrating this notion of 'animal spirits' (*Figure 38)* (Wilson 1968:32). Descartes claimed that as the spirits reached the ventricular cavities they were reflected like rays of light to appropriate motor channels (*Figure 39*).

In 1413 an unknown anatomist indicated the regions which were considered responsible for the three brain functions *imagination or fantasy*, *guessing or thinking* and *memory or common sense*. All the sensory inputs to the brain were believed to converge at a single

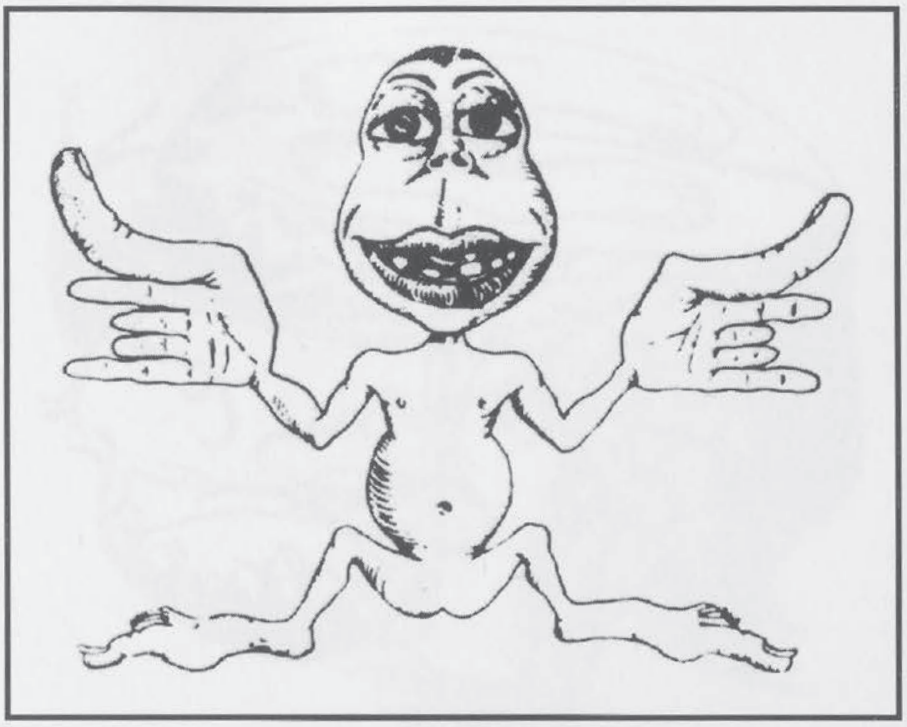


Figure 36a
Penfield's somatic-sensory *homunculus* is redrawn as a complete body, showing the over representation of certain parts of the skin surface.
(Blakemore 1977:80)

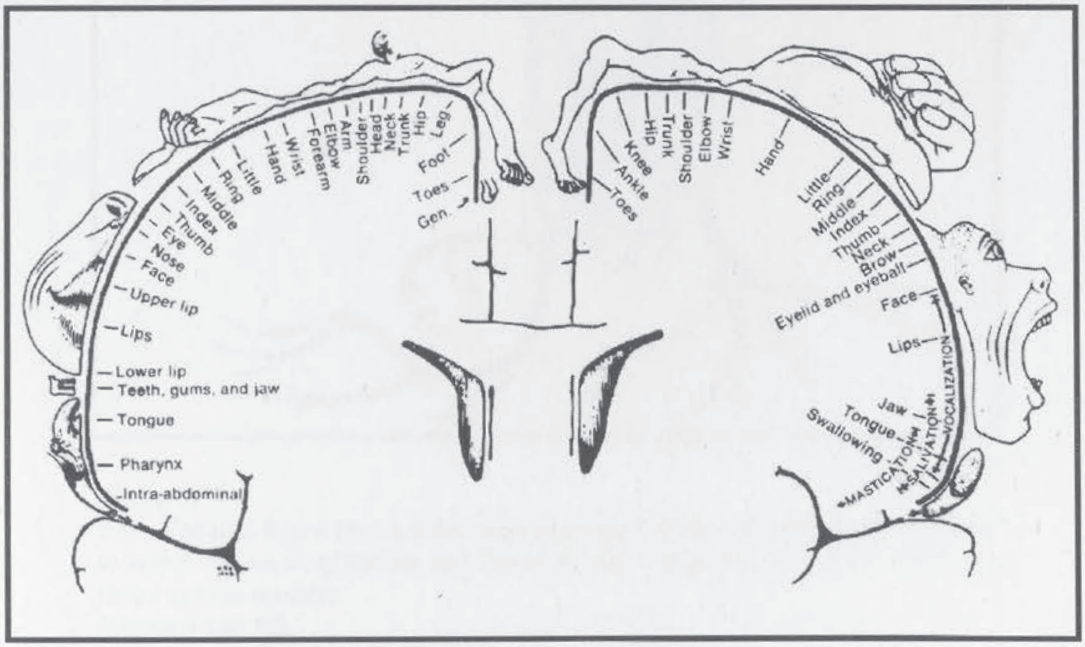


Figure 36b
A map which showed the *homunculus* modified from Penfield's image
The motor *homunculus* was first discovered by John Hughlings Jackson. The cartoon of the body shows the order of representation of the muscles and the relative amounts of space devoted to each part. Jackson, a neurologist working in London during the 1860s, discovered the motor cortex, a strip of brain tissue representing the muscles on the opposite side of the body.
(Blakemore 1977:79)



Figure 37
Early Vesalian figure showing the Galenic division of the brain into an interior part, to which the sensory nerves are attached, and a posterior part, from which the motor nerves emerge.
(Magoun 1963:6)



Figure 38
Animal Spirits Move a Foot.
Taken from Rene Descartes' book *Traite de L'Homme* .

This wood engraving of 1664 illustrates his theory of the workings of reflex action. The long fibre running from the foot to the cranial cavity is 'pulled' by the heat of the fire. The tug releases 'animal spirits' in the cavity. The fluid spirits rush to muscles throughout the body.
(Blakemore 1977:23)

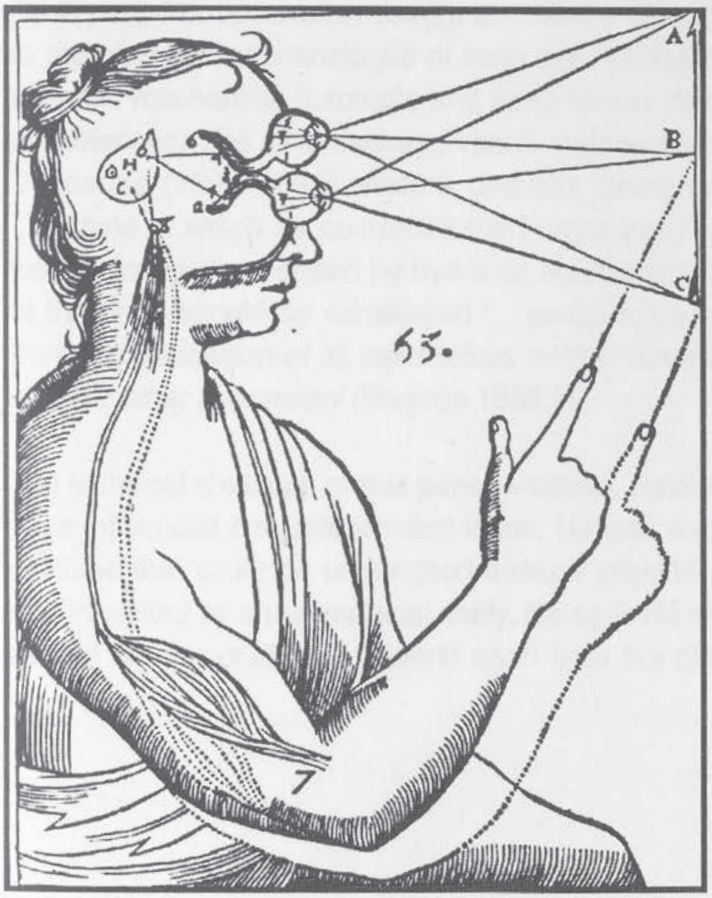


Figure 39
Descartes: *Treatise on Man* 1677.
(Magoun 1963:8)

common location, the sensus communis (*Figure 40*). These three distinct brain functions were expressed again about a hundred years later by the Carthusian monk Gregor Reisch in a sketch showing three prominent ventricles, or brain cavities: sensus communis, fantasia and imaginativa; cogitativa and estimativa; and memorativa (*Figure 41).* This concept was further developed during the 17th century by English physician and inventor Robert Fludd, who theorized that the mind of a human being was a universe in miniature, and that it composed of a corresponding trinity: intellect, imagination and sensation (*Figure 42*).

Many Renaissance painters learned their anatomy first-hand from dissection. Leonardo da Vinci's anatomical sketches reveal his study of the human head/brain that incorporated the classical ventricular scheme, with the nerves from the eyes connecting to the sensus communis in the first chamber (*Figure 43*). In 1519, Lonrez Phyries' (Fries) book *Spiegl der Artzny* depicted a woodcut representation of the thoracic and abdominal viscera, with dissections of the skull contents (*Figure 44*). Other depictions of the brain are found in the works of Dryander. In 1537 his diagram of brain 'cells' from his book *Anatomiae* conveyed ideas as to how the brain worked, deriving its concepts of the localization of imagination, common sense and memory found within the three ventricles (*Figure 45*). Similarly, the works of Andreas Vesalius (1514–1564) depict engravings of detailed physical representations of the brain (*Figure 46*).

Each period in succession sought to model a description of the brain which was likened to the most complex analogue of each age. During the 17th and 18th century analogies between mechanical automata and living bodies developed from advances in the physical sciences. The 17th-century French mathematician, philosopher and scientist Rene Descartes (1596–1650) wrote a detailed theory on body movement called *Traite de L'Homme* in which he compared the human body's mechanisms with that of life-sized mechanical dolls operated by hydraulic mechanisms. Descartes urged that the functions of the brain should be considered *'... as following altogether naturally, in this machine, from the disposition of its parts alone, neither more or less than do the movements of a clock or other automaton'* (Magoun 1963:7).

The technical creations of that period—clocks, watches, water mills—can thus be seen to have influenced his philosophical ideas. He was convinced that the human body was a machine that could be understood through physical laws applied to the brain, except it was inhabited by a non-material entity, the soul. He viewed the mind and all things mental as that which constituted a world apart from the physical system and obeyed dynamic

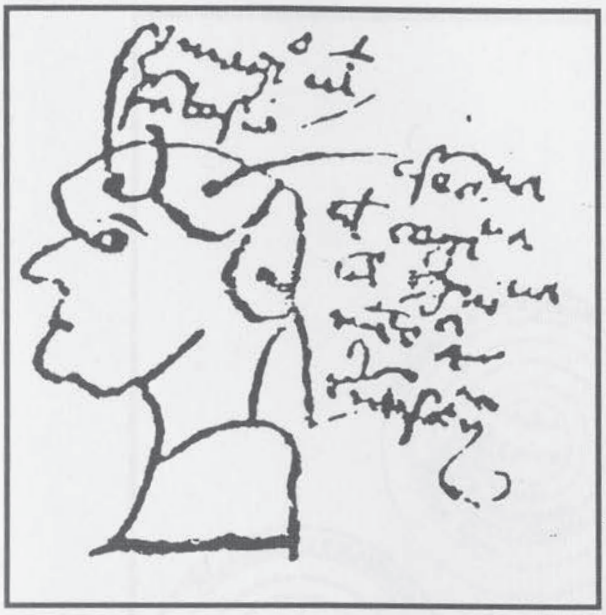


Figure 40
Sketch dated to 1413 showing three human brain functions in *Cod. lat. Monacensis.* (Harth 1982:39)

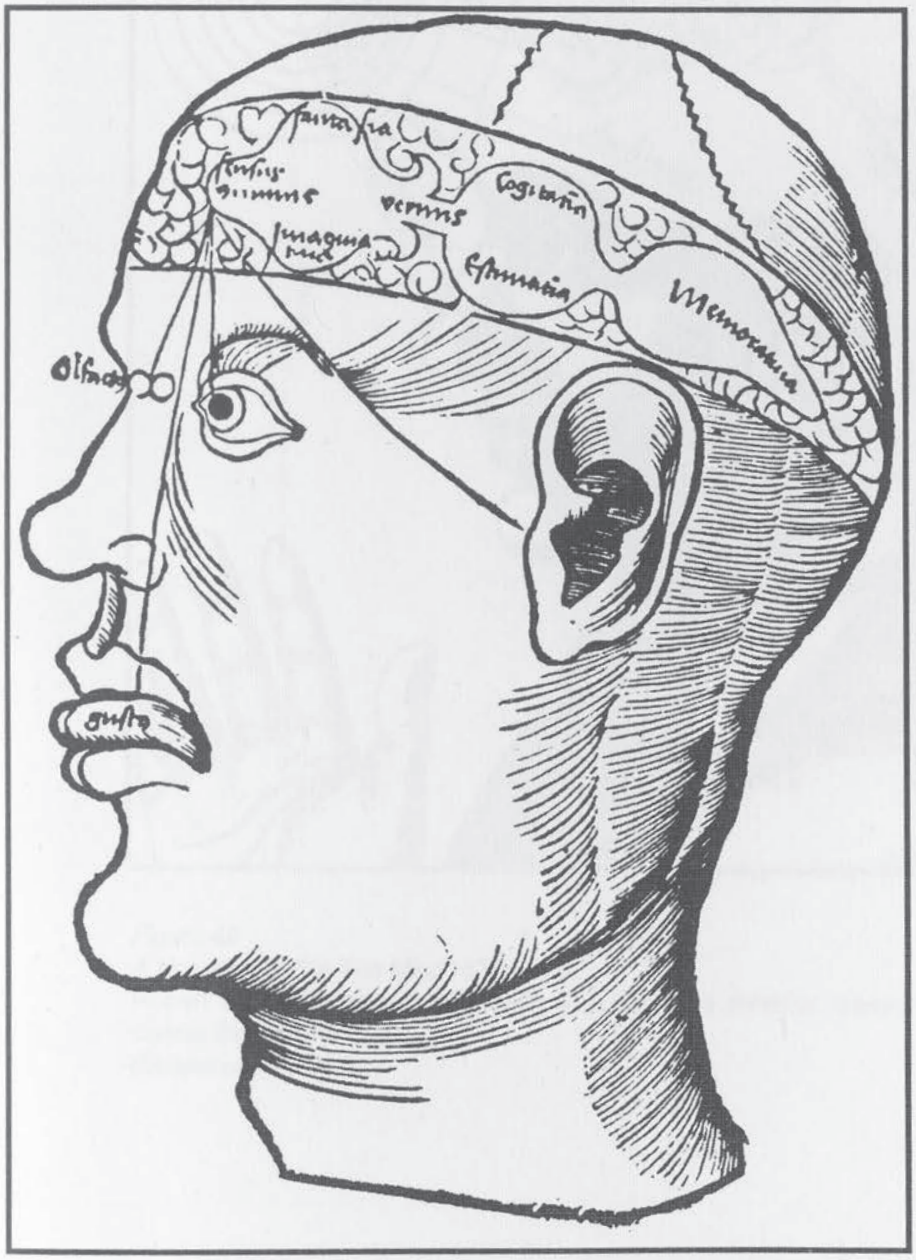


Figure 41
Early printed woodcut. Brain functions according to Gregor Reisch (C A D 1467–1525). Margarita Phiosophica, G. Reisch, Heidelberg 1504.

This illustration depicts the location of sensory information at the connection of the eye, ear, tongue and nose, all converging to common sense, in front of the brain. (Harth 1982:40)

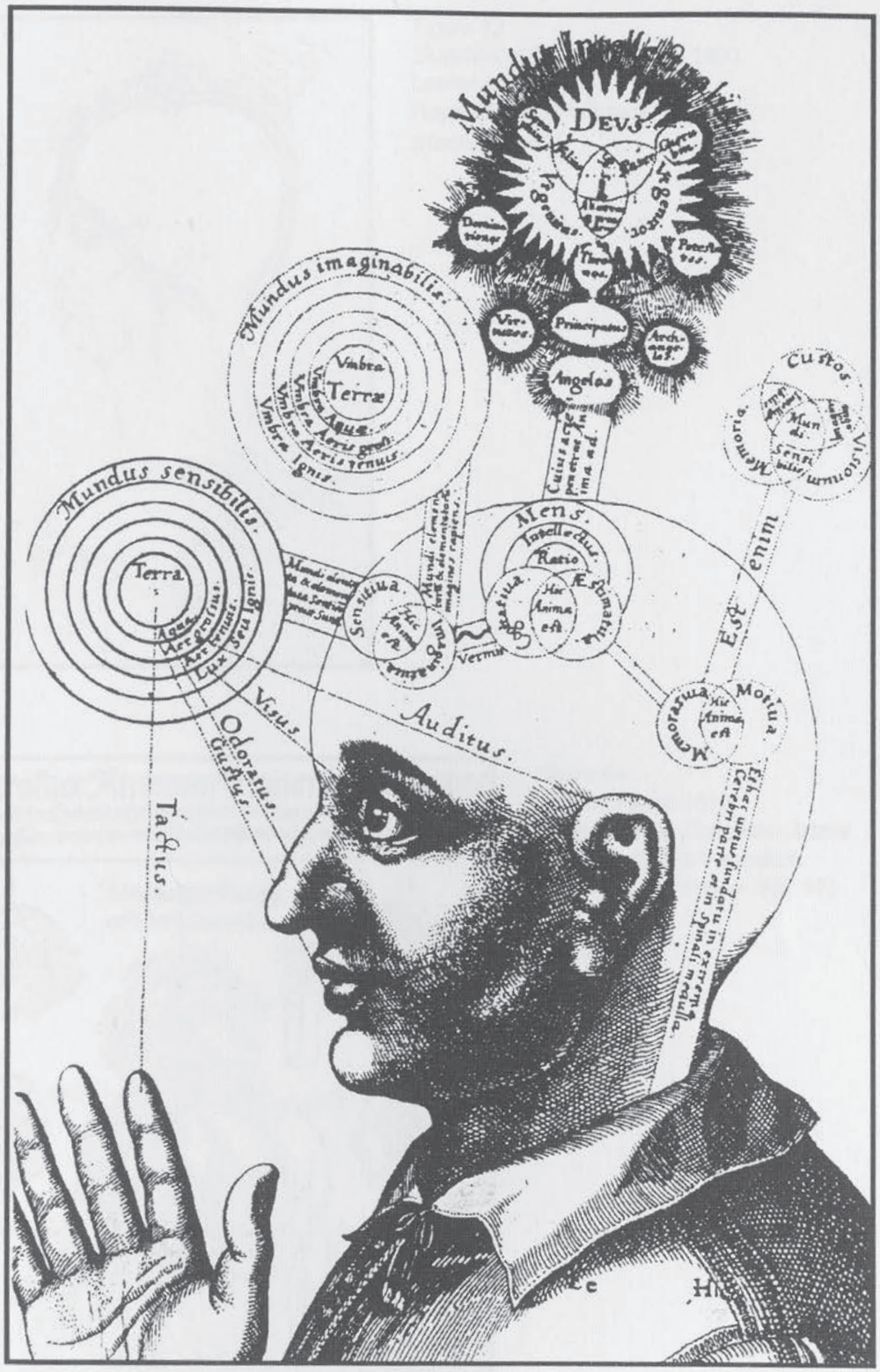


Figure 42
A Universe Within The Mind 1574–1637.
Robert Fludd, 17th-century English physician and inventor, based this image on the classic three-cell model.
(Blakemore 1977:18)

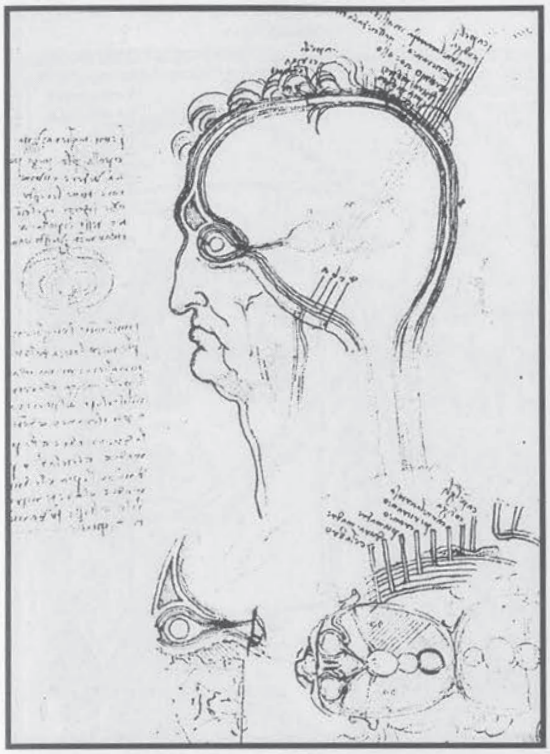


Figure 43
Sketches of the human brain 1490.
Leonardo da Vinci.
Royal Library of Windsor.
(Harth 1982:43)

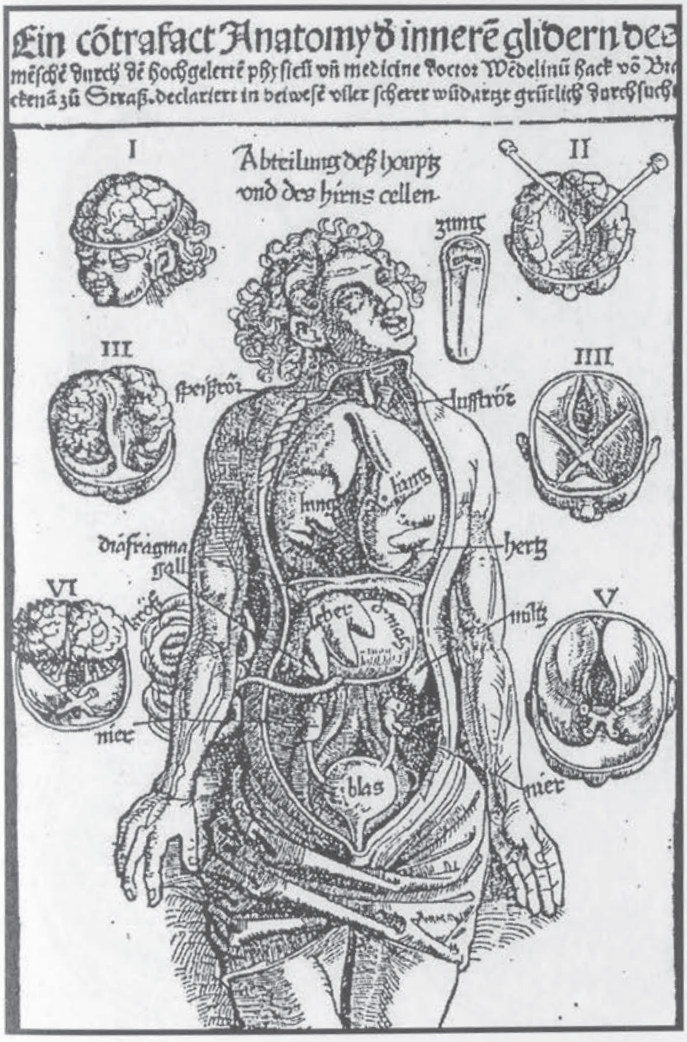


Figure 44
Visceral Figure 1519.
Lorenz Phyries *Spiegl der Artzny.*
19,3 cm x 13,8 cm woodcut.
(Roberts & Tomlinson 1992:55)



Figure 45
Dryander: *Anatomiae* 1537.
Diagram of brain 'cells' or ventricles.
(Roberts & Tomlinson 1992:85)

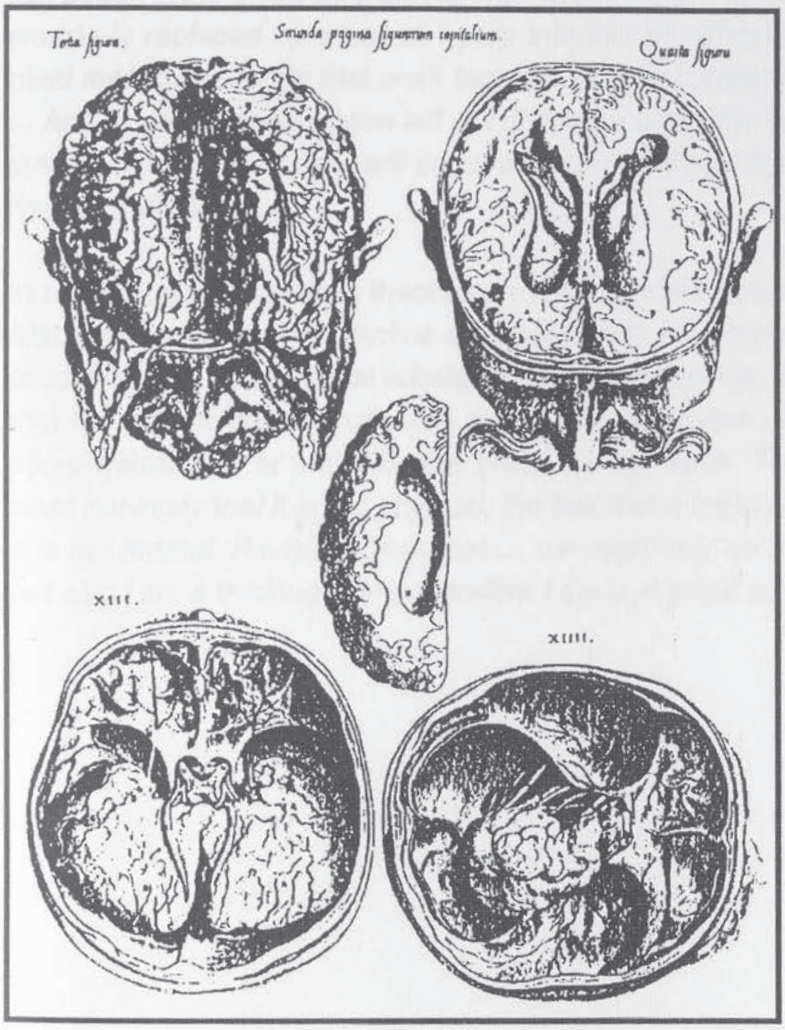


Figure 46
Andrea Vesalius: *De Humani Corporis Fabrica* 1543
16th century Anatomist, seventh book on anatomy.
(Roberts & Tomlinson 1992:161)

laws of their own. These two realms, soul and body, were seen as quite distinct, except that they interacted at one point which he believed to be the pineal gland, a small cone-shaped gland at the base of the brain (*Figure 47*).

From these theories Descartes postulated two separate existences, a dualistic concept of mind and body as separate entities. The Dualist, maintained that mind and matter were separate substances, the mind had no mass, no physical energy—perhaps not even a location in space. Dualism defined the mind as conceptual but not spatial, while the body was equated with substance, defined as spatial but not conceptual. From this, two schools of thought emerged: the epiphenomenalists who stated that the mental event had no affect on physical events, and the interactionists who stated it had affect on the physical brain (Smullyan in Hofstadter & Dennett 1982:388). Crary & Kwinter (1992:48) state that Cartesian theory goes back to Aristotle, who compared the movement of our limbs to mechanisms, as did Plato in the *Timaeus*, where he compared the movement of vertebrates to hinges or pivots. For Aristotle the soul was the principal of all movement; desire moved the body and desire was explained by the soul.

The Cartesian outlook viewed the body as an object which projected its energy into a totally mechanistic structure, designed to carry out complex productive activities—a body which was dissected, fragmented into parts, a parcel of physical movements. *'The biological body—understood as a unit of organs directly or indirectly interfacing with the outside world—is replaced by a set of tightly interlocked, smooth-running and, hopefully, well-oiled mechanical parts that work together as a component of a larger productive system ... And since desire has been left out of this schema, the isomorphism is all the more convincing, no symbolic debt will come due and bankrupt the analogy.'* (Deleule in Crary & Kwinter 1992:218)

In opposition to Descarte's theories, in 1747 La Mettrie published a book called *L'Homme Machine,* based on his practice as a physician. He proposed a theory of the mind and cited evidence that physical substances affected thinking, diet, pregnancy, thereby stating that the psychological processes are in fact processes of the physical brain and not a non-physical soul or mind. Searle (1992 14–15) adds *'The fact that a feature is mental does not imply that it is not physical; the fact that a feature is physical does not imply that it is not mental. Revising Descartes ... we might say not only "I think, therefore I am" ... but also I am a thinking being, therefore I am a physical being.'*

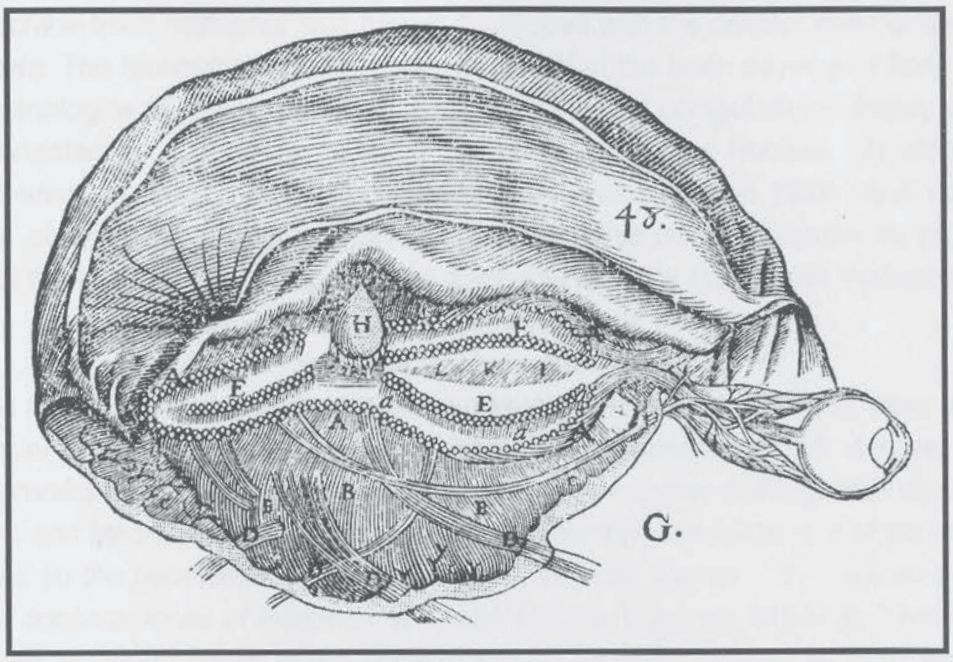


Figure 47
Figure from Descartes' *Treatise on Man* 1677.
Shows the brain ventricles lined by the pores of the nerve. The central pineal body (H) is strategically located to influence the course of the spirits within the ventricular chambers.
(Magoun 1963:8)

This machine-brain metaphor was further developed with the development of technology-computers. The technological/computational model of the brain developed from the 17th-century analogies to clocks and other automata. The first computational theory of thought was articulated by 17th-century English philosopher Thomas Hobbes. *'By ratiocination'*, he proclaimed in 1656, *'I mean computation.'* (in Brink & Haden 1989:18) A mechanical universe obeying the mechanical laws of mathematical reason became for Hobbes the model of the human mind: a mechanical rationality obeying the laws of mathematical reason.

'When a man reasoneth, he does nothing else but conceive a sum total, from addition of parcels; or conceive a remainder, from subtraction of one sum from another ... These operations are not incident to numbers only, but to all manner of things that can be added together, and taken one out of another. For as arithmeticians teach to add and subtract in numbers; so the geometricians teach the same in lines, figures ... the logicians teach the same in consequences of words ... ' (Hobbes 1651 in Wagman 1993:12). Thoughts were expressed as brain tokens, which Hobbes termed 'parcels'. Hobbes viewed reasoning as conducted according to methodical rules, a 'mechanical' process.

Scottish philosopher David Hume (1711–1776) was the first to spell out the mechanical conception of thinking in his *Treatise of Human Nature*. He wanted to discover the laws and forces by which ideas were governed and directed, to *'... discover ... the secret springs and principles by which the human mind is actuated in its operation'* (Brink & Haden 1989:22). Hume proposed mental mechanics, whereby impressions and ideas were basic pieces out of which all knowledge was composed, basic 'corpuscles' (particles) to which all the mental forces and operations applied (Brink & Haden 1989:22–23).

These metaphorical and philosophical theories of mental mechanics reflected philosophers' early preoccupations with the relationship between machine and humans, which later developed into the theories of artificial intelligence (AI). The following sub-section discusses the complex history of AI.

C. Introduction to the beginnings of artificial intelligence

People are thinking of themselves in computational terms.
(Turkle 1984:17)

It changes people's awareness of themselves, of one another, of their relationship with the world. It challenges our notion not only of time and distance, but of mind.
(Turkle 1984:13)

Man [sic] is still the most extraordinary computer of all.
(John F. Kennedy in Thimbleby 1990:31)

The field of artificial intelligence (AI) has a complex history. Its theories offer themselves as a mirror for contemplation over the nature of human identity. The history of AI consists of successes and failures, visionaries, new hardware and lots of programs. It is a story of a slow but steady acquisition of knowledge about how humans think. After all, the pursuit of AI means uncovering the complex layers of our own thought processes.

Crevier(1993: xi) raises philosophical issues: '*What will be the consequences for humans if researchers in AI succeed and force us to share the world with entities smarter than ourselves? Should we rely on these creations to make not only business and scientific decisions for us, but also social, medical, legal, and moral choices?*' But do we not depend on such creations—ATMs, electronic limbs, computer psychologists? This will be discussed further.

Humans have always yearned to understand what makes them think, feel and be, and have tried to re-create that internal life artificially. In the tradition of romantic and magical thought, life was believed to have been breathed into dead or inanimate matter by a person with special powers. To animate the inanimate has been recorded from Pygmalion's attempt to bring life to the perfectly sculptured Galatea, to Gepetto's desire that the wooden puppet Pinocchio be a real boy (Radin 1992:30).

An early 'man in the machine' was the statue of the god Amon in the city of Napata in ancient Egypt around 800 BC. Upon the demise of a pharaoh, eligible heirs were marched past the statue of Amon until the god made known his choice by extending his arm to grab the successor (Crevier 1993:1). The statue was controlled by levers and the priest uttered the sacred words. Radin (1992:31) stated that by bringing 'life' to inanimate

substances, these creations reflected human characteristics and they functioned as a mirror of ourselves. In 1649 Rene Descartes built an automaton that he called *'My daughter Francine'.* But on one of Descartes' trips, a superstitious ship captain was believed to have thrown the case and contents overboard after opening the case and seeing this life-like form and movement. At the beginning of the 20th-century Spaniard Leonardo Torres y Quevedo built a relay-activated automaton that played end-games in chess (Crevier 1993:3) Unlike the mechanical computing devices the philosophers Leibnitz and Pascal constructed centuries before, intended for addition and subtraction, a device that could play chess 'seemed' to have the ability to think.

'It is not my aim to surprise or shock you—but the simplest way I can summarize is to say that there are now in the world machines that think, that learn, and that create. Moreover, the ability to do these things is going to increase rapidly until—in a visible future—the range of problems they handle will be coextensive with the range to which the human mind has been applied.' (Herbert Simon 1957 in Crevier 1993:1)

The developments of AI raises basic issues about human intelligence, memory, the mind–body notion, information processing and symbolic reasoning. AI researchers, like alchemists of old who sought to create gold from base metal, seek to create thinking machines from bits of silicon oxide. However, many researchers were filled with empty promises and predictions.

In Section E I shall discuss the conviction of modern philosophers that our minds are essentially a product of the complex physical processes in our brain, which they believe to be 'similar' to the machine/computer. To what degree and how it will affect humanity's self-esteem, identity and survival is a question that needs to be addressed. Prior to this debate the following section shall address the historical calculating developments of computer technology, giving the reader an understanding of these 'thinking' and calculating devices.

D. A brief history of the development of calculating computer devices.

Stone-age calenders are the first evidence of the desire to rely on external mechanism to alleviate mental burdens. In the Orient, the abacus (2000 BC) helped out in numerical calculations; even before the invention of long-hand arithmetic it was one of the earliest calculating device which used movable beads strung on a wire. Yet manual calculations were soon developed into mechanical calculators by Leibnitz and Pascal. In 1642 Pascal (1623–1662) invented the 'Pascaline', an automatic desk-top machine that could add and subtract. It was a mechanical calculator made of brass, consisting of a set of toothed wheels/gears on which numbers were engraved. In 1671 German philosopher Gottfried Wilhelm von Leibniz developed the 'Stepped Reckoner', that could add, subtract, as well as multiply and divide. These early calculators could only perform one calculation at a time and could not be programmed. The first truly programmable device had nothing to do with numbers. Frenchman Joseph-Marie Jacquard invented such a device in 1805 to drive looms: removable punched cards let the same machine weave different patterns.

Forty years later British inventor Charles Babbage (1791–1871) picked up the idea of punched cards to feed instructions to his 'Analytical Engine'. Babbage was responsible for the evolution of the 'Difference Engine', invented in 1822, which was designed to compute polynomials, performing repeated calculations. His 'analytical engine' purpose computer was designed to solve arithmetic problems and consisted of a system with a processing unit, a memory, data recorded on punched cards, as well as an output device. Babbage worked with Augusta Ada, Countess of Lovelace, who was often credited with inventing computer programming.

By 1890 hand-driven mechanical calculators made an appearance, costing $100,000 in today's money terms. During the same year American Herman Hollerith invented for the United States government a tabulating machine that processed census data fed to it on punched cards. In 1896 he set up the tabulating machine company, which manufactured both the machine and cards, a company which eventually became IBM. Such machines were called digital calculators because they represented numbers by cogged wheels which could take only a fixed number of positions corresponding to the digits in the numbers they denoted.

During the first third of this century, calculators remained essentially mechanical. In 1931 Vannervar Bush at MIT developed the 'Differential Analyzer' which analysed results produced by a particular differential equation. In 1938 Bush hired a twenty-two-year-old

research assistant, Claude Shannon, who developed and improved upon the electronic mechanical relays of on/off switches. This was the beginning of computers using binary arithmetics. Early progress in using computers for arithmetic was truly breathtaking. In a few years technology went from mechanical calculators to machines that could perform thousands of operations per second. Researchers thought that computers would eventually be able to overtake humans. What they did not realize was that in activities other than pure logical thought, the human brain functions much faster than any computer yet devised. So fast that we are not even conscious of its workings.

Just before World War II, in 1944, Howard Aiken at Harvard built a calculator, *Mark 1,* that could calculate twelve times faster than a human being. This machine combined a punched-card input method with contemporary electrical mechanical technology. The year 1946 saw the development of *ENIAC* (the Electronic Numerical Integrator And Computer) by John W. Mauchly and John Presper Eckert. This was the first general-purpose electronic computer, which was meant to aid in firing ranges and paths of different types of artillery during World War II.

In 1949 John von Neumann introduced the stored program concept, whereby the instructions for the computer were coded as numbers and stored in the machine, written in binary notation which corresponded to the 'on' or 'off' nature of electronic components. Here von Neumann developed the notion of computer memory and the central processing unit (CPU). The EDVAC (Electronic Discrete Variable Computer) first embraced this architecture, followed by others—RAND, JOHNIAC, MANIAC.

John von Neuman was one of the first to suggest a comparison between computers and the human brain. At the end of his Silliman lectures at Yale in 1956, he concluded that the language of the brain is not the language of mathematics; yet Von Neuman's stance within his Silliman lectures were paradoxical, as he asserted that the language of the brain was not mathematical, yet in a later lecture series he stated that there was a statistical pattern to the brain, whereby the brain was viewed as a program. In addition, he claimed that the individual units found within the brain employed a kind of binary logic, a neuron[13] which was believed to either fire an action potential or not—an idea which was later developed by Neural Network models. Further discussion is in Section E.

By 1949 the Whirlwind Computer, a mainframe machine, was built at MIT with the assistance of Jay W. Forrester. This project involved the working of an 'airplane stability control analyzer' for the United States Navy. It was amongst the earliest digital computers to

13. The neuron is composed of a small nucleus—soma, a tree of small branches-dendrites which have many leaves (spines) and a long wire (axon) which make contact with neuron dendrites in other brain areas. The contact (synapses) are located on the spine ends. Neurons transmit information to other neurons along its axon. Depolarization pulses are generated at the soma which propagate along the axon releasing neurotransmitters which cause perturbations in the resting potentials of all postsynaptic cells. An attempt to formulate a complete detailed model of the brain is impossible, as we do not have enough quantitative information about the interactions between neurons (Baron 1987: 9–15).

have a display screen—a cathode-ray-tube (CRT) similar to the one used in a television. It consisted of a light pen which allowed a degree of interaction with the displayed pictures. This computer was a 'number cruncher' that performed lengthy calculations for physicists and missile designers. It was used to train pilots as well as to test the aerodynamics of aircraft designs.

For several years computers were generally perceived as devices for manipulating numbers and straightforward items of data such as names in a telephone directory. During that period people began to question the notion of cognition as computation—could the computer that manipulated symbols, as specified by the program, perhaps be said to 'think' ?

Mathematician George Boole (1815–1864) developed the Boolean algebra which reduced logic to binary notations, values of 1 and 0, which he applied to his writings on human thinking in the 'The laws of thought'. Hobbesian mechanical rationality was extended upon by the workings of Alan Turing whose writings embracing artificial intelligence and human intellect alike.

The following section will discuss the various debates found in the field of artificial intelligence during the 1950s till our present day, commenting on the philosophical conviction that the brain was a metaphor for the computer.

E. Historical and theoretical developments of AI and its reference to human intelligence: Turing Machine, Cybernetics, Cognitive Science, Emergent AI.

Turing Machine

The works of Alan Turing and Alonzo Church suggest that the brain may be understood as a computer. In 1936 Alan Turing set up the Turing Test, which became known as the Universal Turing Machine. The Turing Test[14] reflected upon the notion of 'thinking machines', asking the question: can machines think in the manner humans do? Turing believed that through his Turing Machine Test, a correspondence between the input-output functions of computers and humans could be found. Suppose an interrogator is communicating by keyboard with a series of entities that are concealed from view. Some entities are human and others computers, the interrogator has to guess which is which, to the extent that if a computer fools the interrogators, it is said to think. However, midway through his essay Turing wrote: *'The original question, "Can machines think?" I believe to be too meaningless to deserve discussion',* and yet he still added*: 'I believe that at the end of the century the use of words and general education opinion will be altered so much that one will be able to speak of machines thinking without expressing it be contradictory.'* (in *Time* 1996:44). With the century's end, no machine has consistently passed the Turing Test. However, during the 1980s the founder of AI, Marvin Minsky, stated that: *'If you are not a machine what makes you an authority on what it feels like to be a machine .'*[15] (in Thimbleby 1990:93) (*Figure 48*)

'Long before we became concerned with understanding how we work, our evolution had already constrained the architecture of our brains. However, we can design our new machines as we wish, and provide them with better ways to keep and examine records of their own activities—and this means that machines are potentially capable of far more consciousness than we are.' (Minsky 1987:160)

14. Turing's Imitation Game investigated a hypothetical situation. A man and woman go into separate rooms and can be interrogated by a third party via a teletype set-up. The third party can address questions to either room and has no idea which sex is in which room. The interrogator must discern in which room the woman is by the answers received. The Turing Test expanded upon this investigation by substituting a human being for a computer. This time the interrogator had to discern which was the human being.

15. Marvin Minsky (1987), the founder of the Artificial Intelligence Lab at MIT, presented a view in which the minds consisted of many 'agents' whose abilities were quite circumscribed. Each agent taken individually operated only on a small scale or on 'toy' problems. The task was to organize the 'agents' who operate in these specific domains into effective, larger systems. Although inspired by a fresh look at the brain, this is a model of the mind, not of neuronal networks. The details of such a programmatic view are debatable as the overall picture suggests that there is a unified, homogeneous entity, when the workings of the mind/brain is in fact a disunited, heterogeneous collection of processes

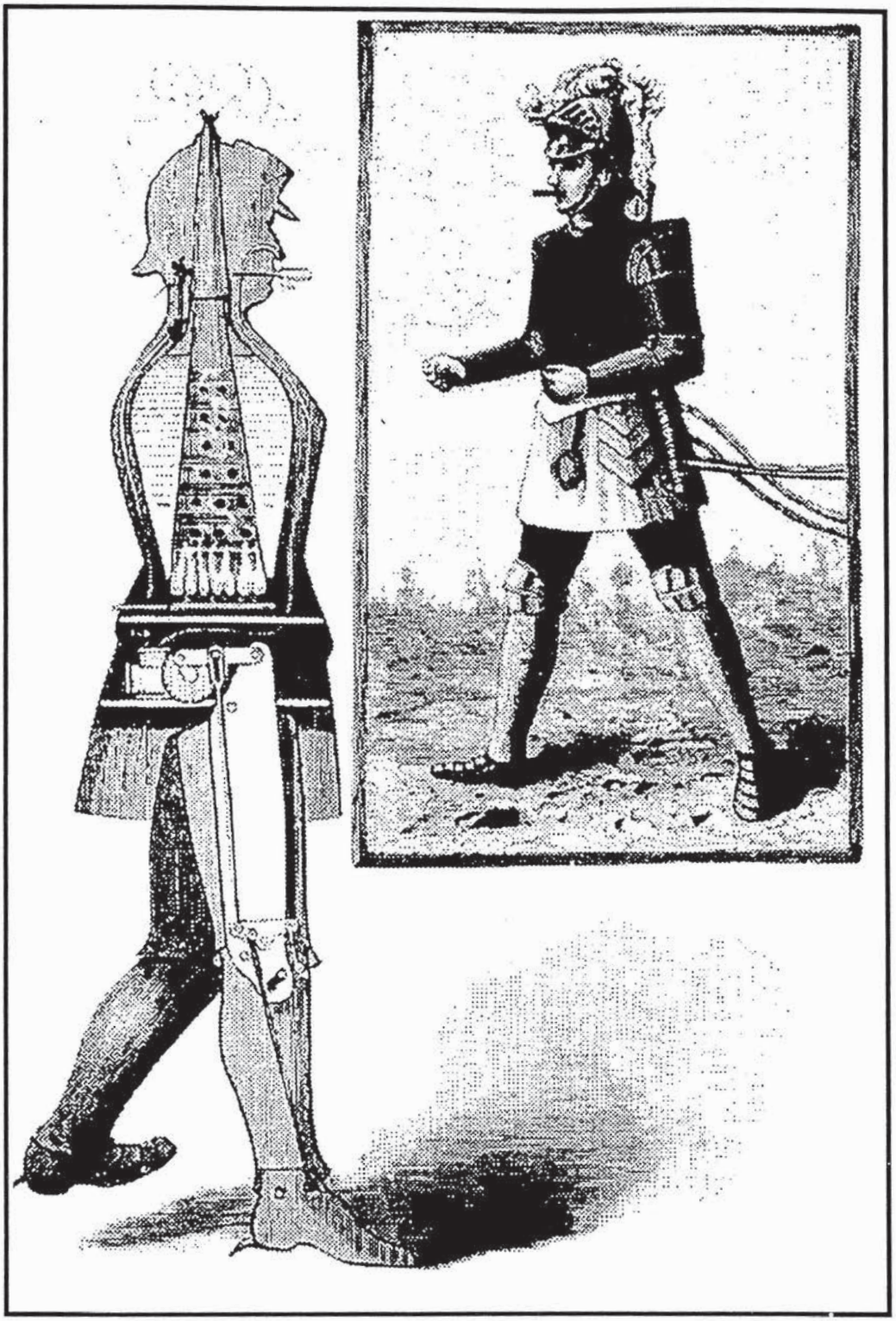


Figure 48
The Walking Tin Man [sic].
19th-century picture of a steam man built in Canada.
'Before man invented electronic computers that imitate the workings of his mind, he built mechanical devices that imitate his physical actions.'
(Wilson 1968:179)

'Oh the nerves, the nerves; the mysteries of this machine called Man! [sic] Oh the little that unhinges it: poor creatures that we are!' (Charles Dickens, *The Chimes* Third Quarter, in Harth 1982:36)

'To be a machine, to feel, to think ...' (La Mettrie 1748 in Johnson-Laird 1993:blurb)

If we were to claim that the thinking machine, though an artifact, exhibits intelligence, we must first clarify what we mean by the 'thinking' it is said to execute. Alan Turing set down the principle that if a machine behaves intelligently, we must credit it with intelligence. Artificial Intelligence (AI) viewed intelligence as an abstract information processing activity eliminating all environmental, social and biological influences upon a developing human mind, brain and body. The Turing Test cannot stand by itself as the criterion for the intelligence of machines. One has to remember that a 'thinking' machine is fed only with what we choose to program it.

If one states that the notion of intelligence is different to matter, a kind of immaterial fluid breathed into a being, then such a fluid could not be programmed into a machine. *'Our conscious thoughts seem to come bubbling up from a subterranean caverns of our minds, images flood into our mind's eye without our having any idea where they came from!'* (Cherniak in Hofstadter & Dennett 1982:283). On the other hand, if intelligence were viewed as matter, where one could build intelligence out of non-mind substances like computer-circuitry, showing that mind emerges out of properly organized matter, would that then claim that computers have intelligence?

Before reflecting upon the notion of intelligence, consciousness is but another element of this debate. In 1949 Gilbert Ryle wrote a book called *The Concept of Mind*, in which he dismissed the idea of a human soul, echoing Rene Descartes' view of an immaterial soul. During that period there were theorists who dismissed the entire existence of consciousness while others viewed it as nothing more than the brain.

Penrose (1994:vi) argued that *'... consciousness ... is doing something that mere computation cannot ... [and] involve ingredients that cannot be even simulated adequately by mere computation ... the mind must indeed be something that cannot be described in any kind of computational terms.'* One is not doubting the ability of AI to build machines that can do many things the human mind can, but one does doubt that it can create the subjective feelings of pain, pleasure, grief, common sense, intuition and, especially, consciousness and awareness.

The McCulloch–Pitts writings, while influential for a decade, lost interest in the AI community, as information processes were preferred. However, with the availability of a powerful computer, 30 years later, Neural Networks re-emerged and was renamed Connectionism. This model aimed to build natural intelligence outside the human skull using computer components. In 1949, six years after McCulloch and Pitts had shown how neural networks could compute, the McGill University physiologist Donald O. Hebb suggested how they could learn. Crevier (1993:31) states that the brain connections change as we learn different tasks, and that specific new neural structures account for knowledge.

Cybernetics

During the 1950s another information processing theory developed. This theory, Cybernetics, related to the relation between humans and technology. Norbert Wiener was the first to find common points between the mind and engineered devices. He defined a machine as a device for converting incoming messages into outgoing messages. It would be impossible to give a full account of the significance of the computer in our environment without briefly mentioning the inter-disciplinary science of cybernetics[16]. In 1950 Norbert Wiener foresaw the inevitability of computers as communicative devices in contemporary everyday life. He wrote:

'... that society can only be understood through a study of the messages and the communication facilities which belong to it, and that in the future development of these messages and communication facilities, messages between man [sic] and machine, between machine and man [sic] are destined to play an ever-increasing part.' (Wiener 1954:9)

Using the Cybernetic theory, Apter (1977) discusses the way in which the brain processes information. He adopted the viewpoint of the human brain as computer and further expanded this notion to the relationship between the artwork and the spectator, to that of

16. In 1948 Norbert Wiener coined the term Cybernetics, which originated from a Greek word *Kubernetes* meaning 'steersman', 'steermanship' or the pilot of a ship. Cybernetics was defined as the control and communication found in animal and human environments, control meaning the regulation and direction that is given to humans or machines by 'feedback devices', brain and program respectively. He stated that all control and communication systems, be they animal or machines, biological or technological, can be described and understood using similar language and concepts. Being inter-disciplinary it related to various concerns: the information theory, communication theory, servo-mechanics, control theory, automata theory, computer science, artificial intelligence, bionics and automation. Similarly, it involved a wide variety of subject matter: engineering, biology, physiology, medicine, psychology, psychiatry, anthropology, sociology, economics, education and art.

Cybernetics dealt with the information/communication theory of messages—how information can be encoded and subsequently decoded, messages which could be considered through written letters, words, musical notes, spoken words, symphonic music, pictures, images, visual or verbal, all dealing with communication codes. Even though Wiener's theory originated in the designing of computational devices for the use in anti-aircraft warfare, it consisted of more than a simple analogy between humans and machines.

program and computer. Apter viewed the artwork as a program which entered into the observer's emotional/intellectual sub-system, which he defined as the observer's 'computer'. He further stated that human creativity involved control and communication—an interaction of emotional and intellectual processes in the nervous systems of the artist, an interaction which depended on 'input' and 'output' interconnecting systems and sub-systems. This viewpoint echoed Wiener's Control theory. The Control theory reflected upon the effect that messages had in a system, and the way in which information is used within a system and between a system and its environment, which were then related to the way in which the human eye and brain system view, look, observe, interpret and/or read the messages found in images and text, pictures and words.

Similarly, Nolan Sheperd (Radin 1992) wrote about 'man-computer symbiosis' in which he discussed the kind of society in which human existence had become dependent on the Cybernetic process. By claiming that the computer had the ability to simulate intelligence, he was indirectly stating that mind or intelligence were themselves mechanical, computational. *'Symbiosis results when people conform and integrate their behavior to that of the machine. Thus people lose not only their individuality but something of their humanity'* (in Radin 1992:25). In contrast, Licklider stated in 1960 that: *'There are many man-machine systems. At present, however, there is no man-computer symbiosis'* (in Woolley 1992:145).

Cognitive Science and Emergent AI (Connectionism)

During the early 1950s engineers, mathematicians and psychologists saw this goal by capturing a fragment of the life the human mind in machines. During this period two schools of thought emerged, those that believed intelligence was based entirely on logic, leading to the development of Cognitive Science/Psychology, and on the other hand those who taught programmed machines to learn from experience and who attempted to replicate the workings of the brain in networks of artificial neurons (Neural Network). During the mid-1960s, the early Neural Network (NN) models, also known as Emergent AI and later Connectionism, seemed as promising as the rule-driven theories. However, by the end of the decade the NN models was swept aside. The reason for this was that computers of that era could only handle one computation at a time, where as the NN models relied on simultaneous interactions of multiple independent agents. Rule-based AI came to dominate the field, creating an embodiment of intelligence as rules and reason.

Emergent AI[17] began with the research of Warren McCulloch, Walter Pitts and Donald Hebb in 1943. McCulloch and Pitts tried to explain the workings of the human brain by coming up with mechanism by which networks of interconnected cells could perform logical operations. They studied a collection of model neurons, showing that they were capable of calculation and certain logical function. They idealized the neuron as a strictly binary device, either it was firing or not (on/off). The all-or-none action potentials made the neurons somewhat analogous to the bistable units in electronics-binary logic on/off, true/false, 0/1. However, information conveyed by brain neurons is not either yes or no, but 'quasi-digital', the rate of the neuron's firing is significant to the information it conveys[18].

Current attempts to read meaning into the electrical activities of neurons found within the brain are perhaps not so far removed from Galen's theory of an invisible fluid flowing through the nerve fibres. It is of relevance to note that understanding the neuron and cell functions of the brain does not guarantee that we will understand the brain; it is yet just another perception and interpretation. The existence of electrical currents in the brain were first detected in 1875 by English physician Dr Richard Carton, the existence of brain waves were further researched in the 1920s by Hans Berger, a German neurologist who recorded the waves on paper. These waves he termed electroencephalographs (EEGs) from the Greek word *enkephalos*, or brain.

17. Emergent AI was based on the perceptron, a computer program made up of smaller programs called agents, and the overall result/solution to the issue depended on the various strengths of the agents. The analogy with the neuron in the brain was evident. The connectionists, the group of emergent AI researchers, spoke of the artificial neuron and neural nets and claimed that the best way to build intelligent systems was to simulate the natural processes of the brain—a system of information that was not statically and logically placed but could be evoked, and was inherent everywhere, rather than found at a single point (Rule-based).

18. In other words, each neuron receives signals from neurons attached to its input lines, and if the sum total of inputs at any moment exceeds a critical threshold, that neuron will fire and send its own output pulse rushing off to other neurons, which may in turn fire. Baron (1987:28–35) further expanded upon this analogy by stating that the brain is very different and vastly more complex than a serial digital computer. He viewed neurons as the computational elements of the brain. In a computer, the smallest unit of information is the bit, which creates on/off signals (1 represents a signal, 0 represented a signal is absent) in the wires of a data bus. These operations work on arbitrary permutations of binary digits. Numeral quantities are transmitted as electrical signals through a collection of wires/cables. Baron viewed the smallest unit of information in the brain as the rate of firing of an individual neuron, the 'data buses' of the brain he saw as the neural pathways or nerves. Although information is conveyed from one part of the brain into another by the neurons themselves, the connections were not like the wires of a data bus that do not modify the signals they convey. Baron stated the these signals did not travel sequentially (as do electronic signals) but at alternative directions until finding the desired pathway. Computer programs use abstractions developed by the mind of a programmer, but it is a misconception to think that our natural mental processes are 'programmed' in such a manner. The human brain does not follow instructions programmed by an operator nor does it work in binary notations.

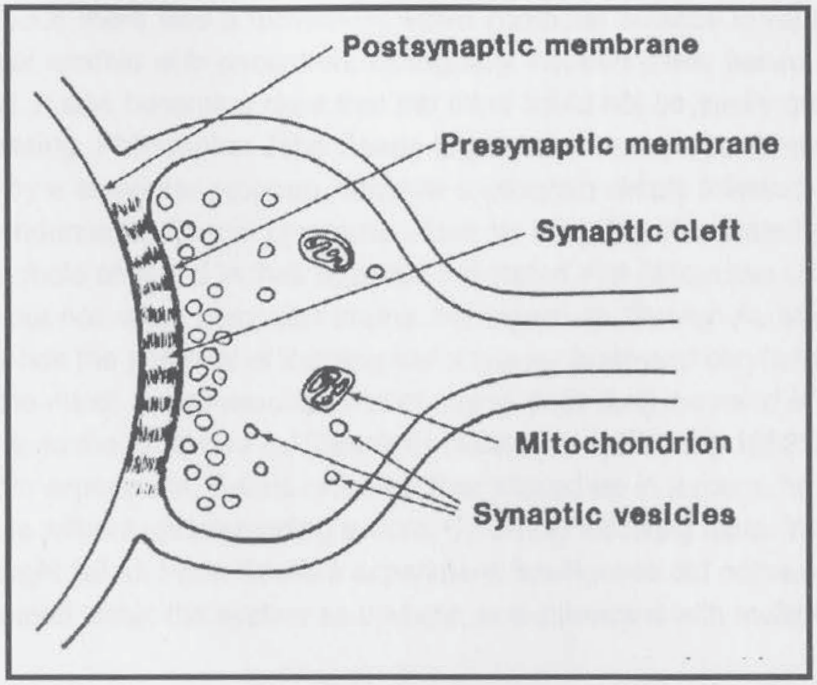
The concept of individual neurons was developed by Spanish anatomist Santiago Ramon y Cajal (1852–1934). He was the first to realize that the nervous system of all animals and humans consisted of many individual cells that were quite distinct from each other, but that communicate with one another at special locations called synapses[19] (*Figure 49*). We see a vast network of cells 'talking' to one another in the language of tiny electrical blips; these blips are 'heard' by other cells as postsynaptic potentials.

In the late 1950s Newell and Simon wrote a program called the General Problem Solver (GPS) that attempted to capture human reasoning and recode it as computational rules. Allen Newell and Herbert Simon viewed the mind as a computational system, as the brain literally performing computations which they regarded as sufficient for intelligence, which they related as identical to that of computations that could occur in computers. As the GPS became well known in academic circles, some psychologists began to wonder if human problems could be solved with such logic. During that period psychologist were dedicated to Behaviourism theories where the study of the mind was expressed in terms of stimulus and response. The Behaviourists viewed the human mind as a black box that could not be opened. With the developments of rule-based theories, a new psychology for describing the inner state of the human head, in terms of logic and rule, came to be known as Cognitive Science.

In 1960 Hubert Dreyfus argued against the developments of Cognitive Science. He saw a fundamental difference between human and computer intelligence. Dreyfus argued that computers would need bodies in order to be intelligent, as intelligence is constructed from our sense of physical embodiment and connection with our surroundings. As Dreyfus stated (in Radin 1992:21) the computer is *'... certainly more precise and more predictable than we, but ... human emotional life remains unique ...'*. So computers would need bodies to empathize and feel pain. According to Dreyfus, computers are insensitive to context; they must be programmed to respond to bits of context-free data which requires no interpretation in order to be understood.

The computer culture in the mid-1970s saw AI identified with information processing and the rule-based approach of Cognitive Science. But the spread of information processing ideas about the human mind met with significant resistance in the broader culture where people questioned this notion of the programmed self against the emotional, spontaneous and intentional self.

19. A synapse is a place where nerve cells join, the contact between neurons that are used for signalling. A synapse is activated when an action potential—an impulse emanating from a neuron—invades a synaptic terminal; a chemical neurotransmitter is released, and a signal is communicated to the postsynaptic cell. The process of integrating information, of collecting signals from thousands of sources, involves filtering processes and nonlinear decisions. If we assume that synapses are sites of information storage, then we can make a rough estimate for the total information stored in the brain—a single synapse can store only a few bits of information in the form of a coupling strength.



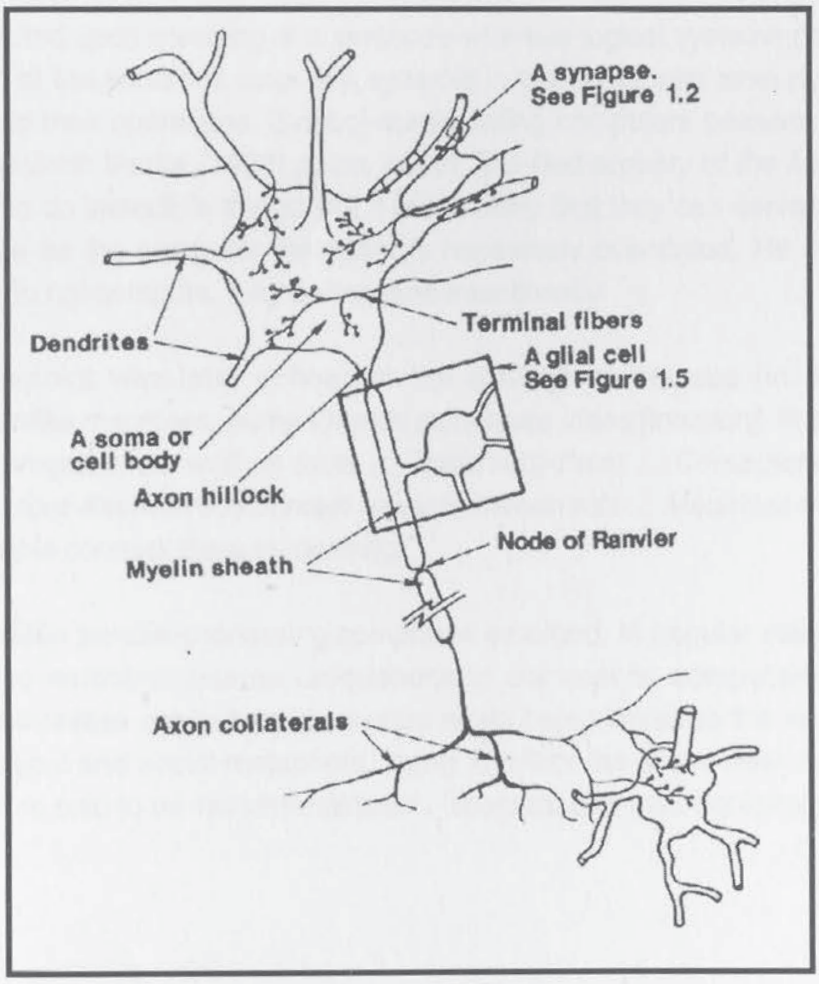


Figure 49
The structure of a synapse.
(Baron 1987:4–5)

During the 1980s there was a movement within computer science to replace such centralized, logical models with decentred, biologically inspired ones, based on neural network systems. It was becoming clear that the mind could not be easily grasped by information processing. Philosopher John Searle argued that true *understanding* could never be achieved by a computer program, because a program simply followed rules and thus could never understand. Formal programs attach *no meaning*, interpretation or content to any of the symbols encoded in their systems. He stated that AI teaches us about the biological brain but not about computer brains. He objects to 'Strong' AI, which claims that the computer has the potential of thinking like a human brain and can teach us about the workings of the mind: *'... the assumptions of strong AI [is that] the mind is to the brain as the program is to the hardware ...'* (Searle in Hofstadter & Dennett 1982:363). Using his Chinese Room experiment, Searle reflected how, closed up in a room, he could communicate Chinese without understanding a word, by simply following rules. Yet such theories of logical thought failed. From Searle's experiment, intelligence did not reside in an isolated area, it existed within the system as a whole, and interacted with multiple fragments of the mind.

Humans reflected upon *meaning* of a sentence whereas logical systems could not recognize the truth of the sentence since the symbols in the sentences have no meaning and are arbitrary to their operations. Symbol-manipulating computers possess syntax but no semantics. As John Searle (1992) points out in *The Rediscovery of the Mind*, computers may be able to do incredible things, but it is not likely that they can serve as a paradigm for intelligence as the computer metaphor is hopelessly overstated. He goes on to say that humans do not compute, they understand intentionally.

Searle's viewpoint was later echoed in the writings of Penzias (in Schneiderman 1992:545): *'Unlike machines, human minds can create ideas [intuition]. We need ideas to guide us to progress, as well as tools to implement them ... Computers don't contain "brains" any more than stereos contain musical instruments ... Machines only manipulate numbers; people connect them to meaning.'*

By the mid-1980s parallel-processing computers emerged. In popular culture people had been trying to establish human uniqueness in contrast to computers, while in the research communities computers were once again being linked to the world of humans through biological and social metaphors, trying to mirror the brain. Now both people and computers were said to be 'nondeterministic' , 'spontaneous' and 'non-programmed'.

Neural Networks (fuzzy logic, PDP) involved the invention of computer programs which operated at a non-sequential, parallel processing level made up of many units, 'echoing' the brain-neuron interconnected behavioural activity. Connectionist theory opened the way for new ideas of nature as a computer and of the computer as part of nature, as well as softening the boundaries between machines and people. Connectionism described computers as opaque systems in which emergent (biological) processes occurred. There is a certain irony that a quarter of a century ago AI theory challenged the behaviourists' insistence on the mind as black box, as that which was logical and programmed. Thirty years later Emergent AI was closing the box that information processing had opened as a rule-based system to that which was opaque and seen as a box filled with neural networks of complexity. Connectionism began to present the computer as though it were an evolving biological organism. Computer models reflected the idea that the 'I' might be a bundle of neuron-like agents in communication, creating a similarity between humans and machine workings. However, evidence has shown that brain neurons are not only much more complex, but have different properties to those which are electrical.

When AI was perceived as synonymous with information processing, it was generally unacceptable to humanists. Now that theorists of emergent AI use the language of biology, and neurology, to describe their machines, AI begins to acquire more interest. In the 1990s, artificial intelligence seems to be suggesting not a modernist mind as mechanism but a postmodern mind, as a new kind of machine, situated somehow between biology and artifact (a cyborg, a mixing of biology and technology).

The most significant factor of today's expert systems (using neural network system found in pattern, speech and image recognition systems, financial analysis, medical diagnosis systems, fuzzy logic) is that they do *not understand* what they reason about. Machine-like, they handle empty tokens of knowledge that they recognize but do not comprehend. Though they will on occasion show a surprising likeness of human reasoning and competence, it is a void parody; the narrow performance of an automaton instead of a creditable copy of human thought (Crevier 1993:205).

According to Turkle (1995:147), by the late 1980s, the boundary between people and computers had been displaced. It was displaced away from thought to emotion. Computers 'might' think, but humans feel. Yet, with the advancement in psychopharmacology, which suggested that human motion and emotion were controllable via medication, people began to question emotions . This led to a biological life where the difference between computers and humans was life. Our bodies and our DNA are becoming our

new line of investigation. Perhaps it is the idea of an intelligent machine, a machine that might engage people in meaningful conversation, that constitutes the real psychological threat?[20] But is this not already happening, when people converse with computers on various personal and financial levels?

Today we trust computers (programmed by people) with our money—bank tellers, ATM, tax advisors—and even our important personal mail. Some even go to the extent of confiding in computer psychologists. Such was evident from as early as 1976 when Joseph Weizenbaum designed an artificial intelligence program called ELIZA, a psychotherapist, although Weizenbaum had not intended that the program should actually be used as one. This invention led to people confiding in the program, even when they knew it was a computer with pre-set responses randomly selected from a list. Even when people were fully aware of the true nature of the program, they still became emotionally involved with the program and revealed to it intimate personal miseries. Weizenbaum considered such an involvement as 'obscene', that people would substitute a computer system for a human function that involved interpersonal respect, understanding, and love (Crevier 1993:142).

Even psychiatrists who heard about ELIZA expressed an interest in the computer's therapeutic potential (Turkle 1995:105). Such responses raise sombre questions about our society being vested in machines. Weizenbaum later wrote a book, *Computer Power and Human Reason,* in which he depicted how computers could be programmed to appear intelligent, as he had done with his ELIZA program. ELIZA was a fascination not only because it was 'lifelike', but because it made people aware of their own desires to 'breath' life into a machine. Software such as *Depression 2.0* (on the commercial market today) reflects how people accept and confide in computers and perceive them psychologically. This software was designed by Kenneth Colby, who worked with Weizenbaum on the program ELIZA; Weizenbaum's worst nightmare had come true. With reference to AI being installed into smart bombs and various military instruments, the notion of human judgement is also being questioned.

Movies such as *Colossus: The Forbin Project* (1969) and *Wargames* (1983) reflect on our trust and acceptance of computer decisions. In *Wargames*, a child hacker almost causes World War III by breaking into the missile defence system. The officers are convinced it is the real thing and begin putting their keys in the missile launching locks. There is, however, a character who will not turn his key as his judgement differs, and he is killed for not doing his job (even though he was correct). What role is human judgement playing if

20. Another threat that could be seen is artificial life, which involves the realization of lifelike behavior on the part of human-made systems. According to Schirmacher (in Bender & Druckrey 1994) 'artificial life' is a concept that seems to mean 'substitution of nature' '*In the animistic view of nature held in primitive [sic] societies, spirits resided in all matter and were responsible for most events observed in man's [sic] physical surroundings.*'(Harth 1982:19) 'A-life' studies ways of building systems that act as if they are alive (simulate life) the realization of lifelike behavior on the part of human-made systems. The computer virus is a form of a-life, the H bomb of the information age.

it cannot stand up against computer judgment? Has the Hal syndrome come to pass (after the paranoid computer in Stanley Kubrick's 1968 movie *2001: A Space Odyssey*)? Hal the computer was programmed to think and talk like a person. Here an intelligent computer, in control of a space ship bound for Jupiter, Hal turns psychotic and kills the ship's human crew when faced with conflicting mission goals. In other movies, such as *Virtuosity*, a computer-generated serial murderer named Sid 6.7 moves from virtual reality into plain old reality. In *Johnny Mnemonic*, Keanu Reeves is a high-tech messenger with a computer chip in his brain, about to explode. And in *The Net*, computers change Sandra Bullock's identity, turning her into a stranger with a police record.

Everywhere computers are turning truth into falsehood. All this tends to put a damper on the idea that we are eager to embrace a wonderful new technology, yet it does not necessarily flow that all computers are destructive. The film industry is focusing on negativity and technophobes, while book titles such as *Windows '95 for Dummies* or *The Complete Idiot's Guide to Windows '95* really gives the human race a sense of self intelligence. All these movies focus on the assumption that humans are enamoured with computers, while the plots say otherwise. Film makers ignore the subtle messages of their films, which play on a technophobia most people would be embarrassed to acknowledge: fear that everyone else must understand computers, fear that computers will somehow take over our lives, fear of the unknown.

The following section will investigate the notion of alienation felt by humans towards computer technology.

F. Alienation

In our culture an intelligent machine is immediately assumed to be a bad machine. As soon as intelligence is ascribed to the artificial, some people believe that the artifact will become evil and strip us of our humanistic values.
(Baecker & Buxton in Keller & Preece 1990:19)

Many science-fiction novels promote a technophobia/compuphobia attitude towards human inventions, depicting them as *'other'*, as alien and disconnected from their environment. Paradoxical and ambiguous attitudes have viewed the computer (advanced technology) as a symbol of 'big brother' surveillance and revered it as the pathway to understanding. On the one hand there is a futuro-ecstatic embrace of 'the new' yet there is also a strain of suspicion, resistance, skepticism and mistrust of its supposed power.

Rosenberg (1983) claims that with the advance of science and the spread of technology, the emergence of machines (which do the work of hands and muscles) drove humans in search of shelter from the onslaught of hard materiality of measurements and machines . As stated in 1928 by Bertrand Russell (in Woolley 1992:64): *'Machines are worshiped because they are beautiful, and valued because they confer power, they are hated because they are hideous, and loathed because they impose slavery.'*

According to Pontus Hulten (1969) the mechanical machine has been defined as an 'imitation' of our muscles, which have lost their dominating position among the tools of human kind, while electronic devices which imitate the process of brain systems are gaining 'control' of our environment. In many controversial mythical readings, the mental workings of the human brain have been seen as an analogy for the electronic processes of the machine (computer), whereby the brain is seen as a processor of information, receiving information through the senses, processing it and storing it, and then decoding and encoding transmitted messages.

Numerous writers of essays and science-fiction stories/novels have shown the technological demons finally taking control of the human spirit, where 'electronic brains' rule the world and are the slave-owners of humans. These fears are portrayed in the idealized future—nightmares of techno-Fascism and global extinction, the loss of individuality by a controlled destiny. People are seen as powerless endangered species in a system where technology is owned and manipulated by those in power to control and direct society. These machines are seen as potential revolutionaries, thinking slaves, with a higher intel-

ligence quotient than that of their inventors, which revolt without feeling and respect against humanity, and so the inhabitants of the earth are doomed. A place is created where even a brain could live outside its skull. Author Hans Moravec indulges in such provocative thoughts in his book *Mind Children*. He foresees the brain leaving the organic body behind, like an empty shell, and brain cells being displaced by silicon, byte by byte:

'In a final, disoriented step the surgeon lifts its hand. Your suddenly abandoned body dies. For a moment you experience only quiet and dark. Then, once again, you can open your eyes. Your perspective has shifted. The computer simulation has been disconnected from the cable leading to the surgeon's hand and reconnected to a shiny new body of the style, colour, and material of your choice. Your metamorphosis is complete.' (Moravec 1991:25) But are these writings science-fiction and thus so removed from reality?

'In an era when parts can be routinely detached from one body and plugged into another; when the U.S. National Institutes of Health offer to replace corpses in medical schools with "industry-standard digital cadavers"; when certain machines can appropriate the functions of human organs, while others are invested with intelligence, when the life of the body can be prolonged when the mind has ceased to function; when genetic change can be engineered and human beings cloned,' then maybe the impossible is becoming the possible. (Ewing 1994:9)

One could state that the feelings of alienation and fear towards computer technology are due to the anxieties and insecurities people feel due to their ignorance of computer usage and ability. Such misconceptions can be clearly seen with reference to computer chess games.

Computer chess games are a rule-based system, and such games have been elevated to the status of 'mental geniuses' that beat human masters (for example Deep Thought/Deep Blue software). Getting computers to win games against humans has been one of the earliest goals in AI. By performing tasks that were meant to be done by humans, computers would be said to require intelligence. One needs to recall that computers and humans do not play the chess game the same way. In the three minutes allowed per move in tournament play, Deep Thought considers 126 million moves per play.

Computers are merely programs (developed by humans) which mechanically compare a complexity of electronic codes and numbers. This the observer misleadingly views as

intellect, by adopting the intentional stance that the chess computer has 'desires'. Programs have no intentionality. The fact that the computer uses symbols that stand for objects in the 'real' world is arbitrary to its operation. Wagman (1993:13) points out that *'... the calculus of human thought is, as demonstrated in the psychoanalytic theory of psychology, distinctly responsive to the content and import of personal ideation. Thus artificial intelligence is limited to modelling only the mechanics of human reasoning and human problem solving.'*

Therefore, the metaphor of seeing oneself as computer—*'A brain is a computer and a computer is a brain'* (Bergmark 1990:48)—refers to the notion that the mind is equated with software and the brain as wetware, which reduces the human being to a set of instructions. This is a seductive and flawed idea which has been much written about by AI theorists and science-fiction novelists, and is reflected as a contemporary theme in numerous movies, such as *The Lawnmower Man, 2001, Johnny Mnemonic, The Net , Terminator, Robocop,* and *Strange Days.* This is an issue that even appeared on the front cover of the April issue of *Time* magazine (*Figure 50*), and is reflected in numerous magazine advertisements (*Figures 51a to 51d*).

According to Radin (1992), Bergmark's statement *'A brain is a computer and a computer is a brain'* reflects the confusion with which people have greeted the developments of artificial intelligence. She goes on to say that if the computer has a mind, what is the essence of that mind? By referring to the writings of Dreyfus, she reflects their viewpoint, that thinking and feeling are inseparable and that the computer is *'... certainly more precise and more predictable than we, but ... Human emotional life remains unique ... what is more important is our ability to recognize, to synthesis, to intuit'* (in Radin 1992:21).

In whatever application computers compute, genuine understanding of what it is actually doing, meaning is far from reach. These mindless machines do not understand the things they are programmed to do. The quality of 'understanding' is that which is essentially missing from any purely computational system, understanding which reflects on conscious awareness in humans.

Unlike a computer made to yield all its stored information, no human can willingly or unwillingly be drained of all its knowledge. Each human brain is unique and a life-time of learning and experience can only enhance its idiosyncrasies. The brain cannot be replaced, duplicated or reset; it is not a closed system which becomes filled with gigabites of memory, but is one of constant expansion, diversion and flux. A computer only manipulates uninterpreted abstract entities, whereas human's reasoning is not a formal syntactic process. It is instead a matter of understanding meanings and manipulating their mental representation.

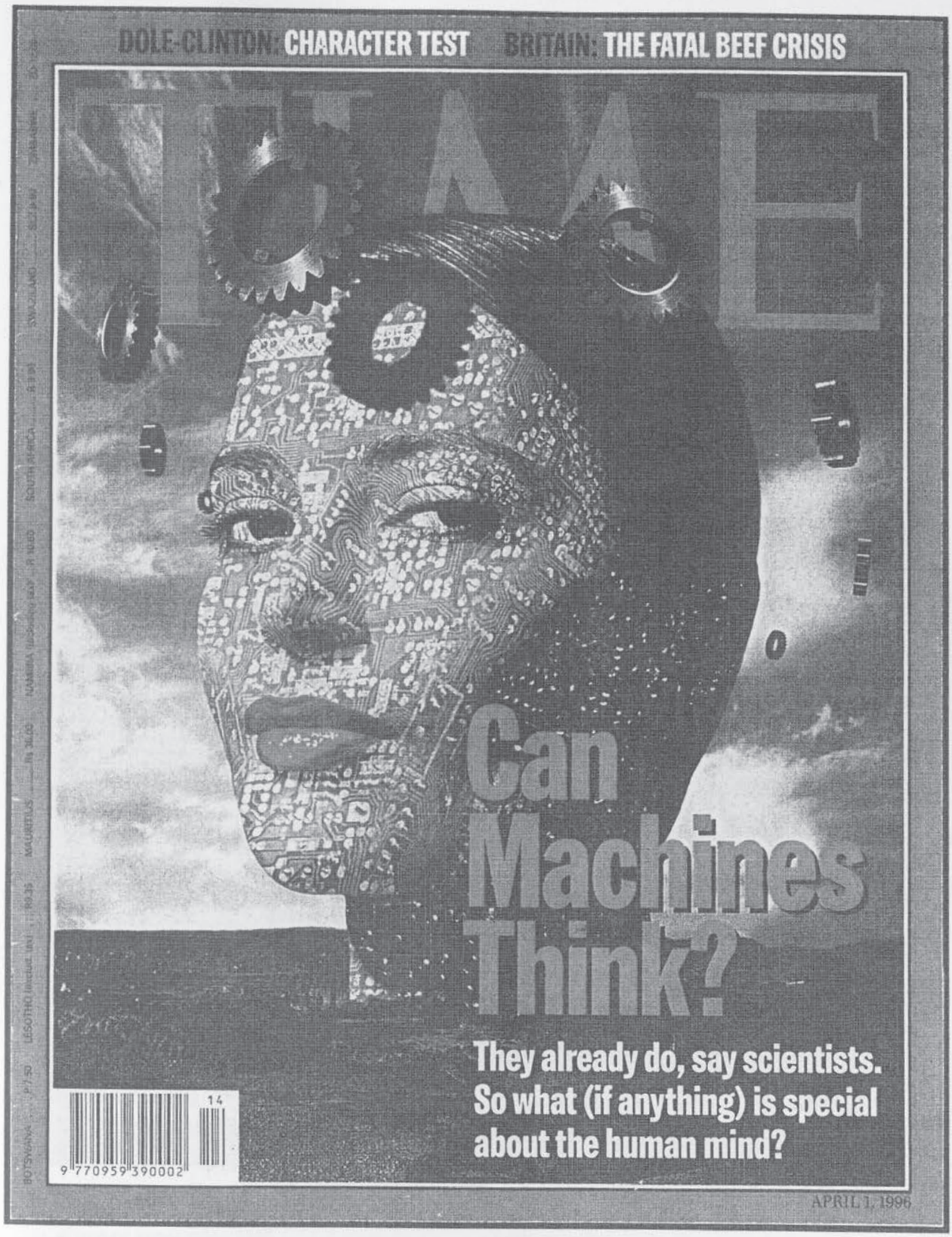


Figure 50
Can Machines Think?
Front cover of *Time* magazine April 1996.

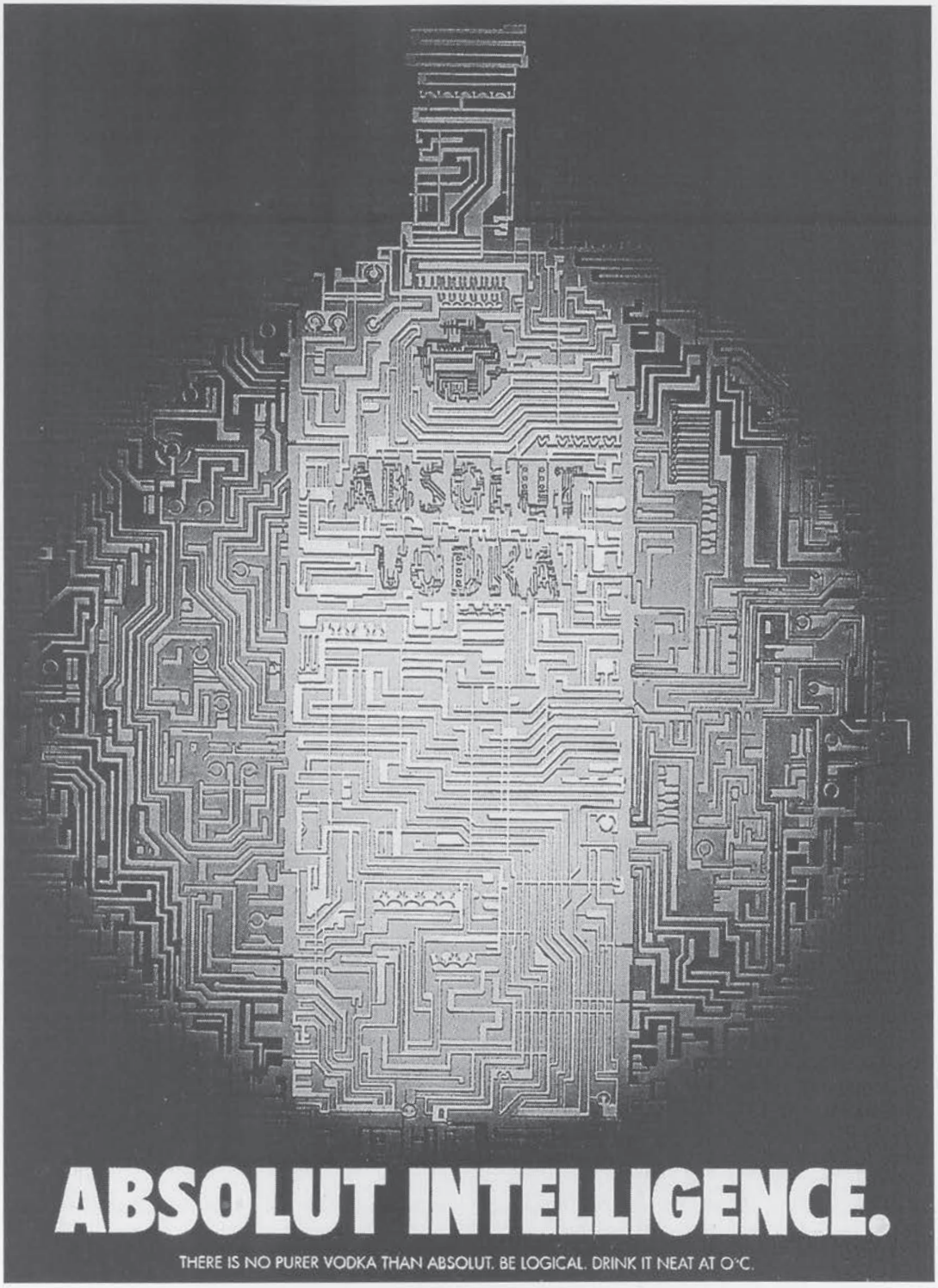


Figure 51a
Absolute Intelligence 1995.
Vodka advertisement.
This image shows a connection between computer chips and intelligence, reflecting on the contemporary concern with the connection between humanity and computers.
(*ID* 1995:43)

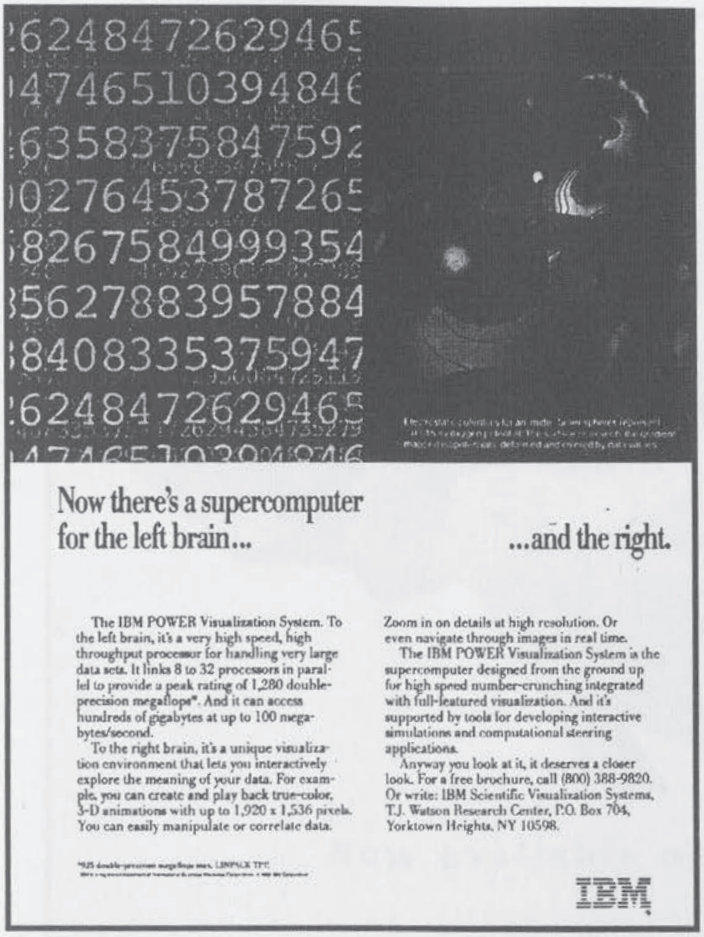


Figure 51b
IBM advertisement.
(*Computer Graphics World* December 1992:10)

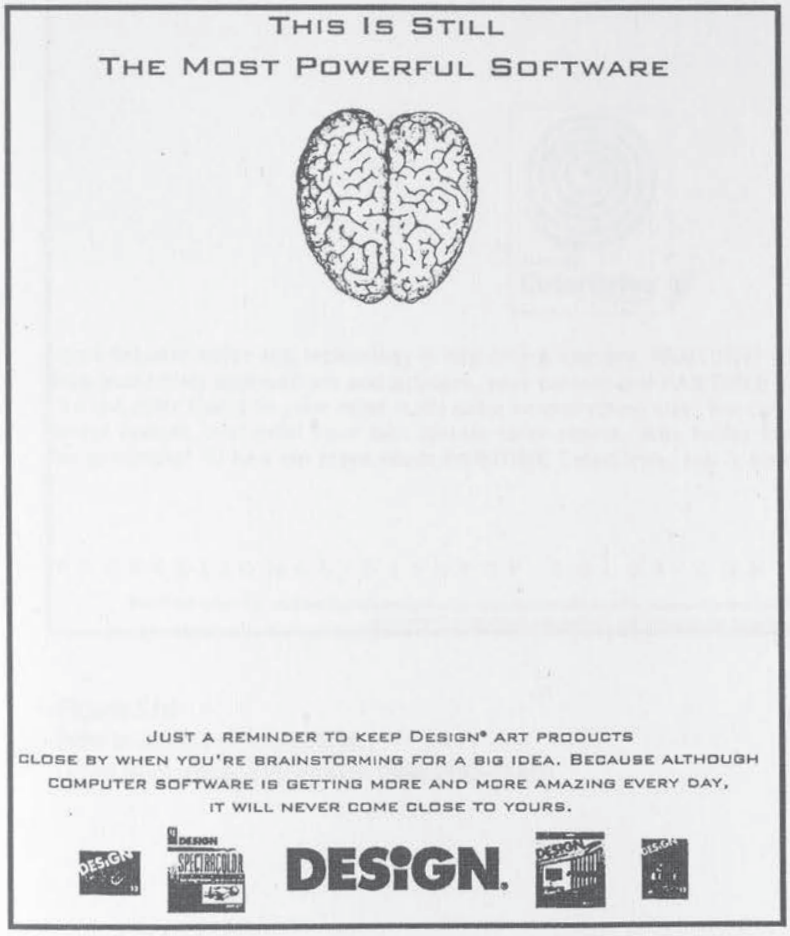


Figure 51c
This is still the most powerful software (human brain) 1994
Design art products advertisement.
(Print 1995:12)

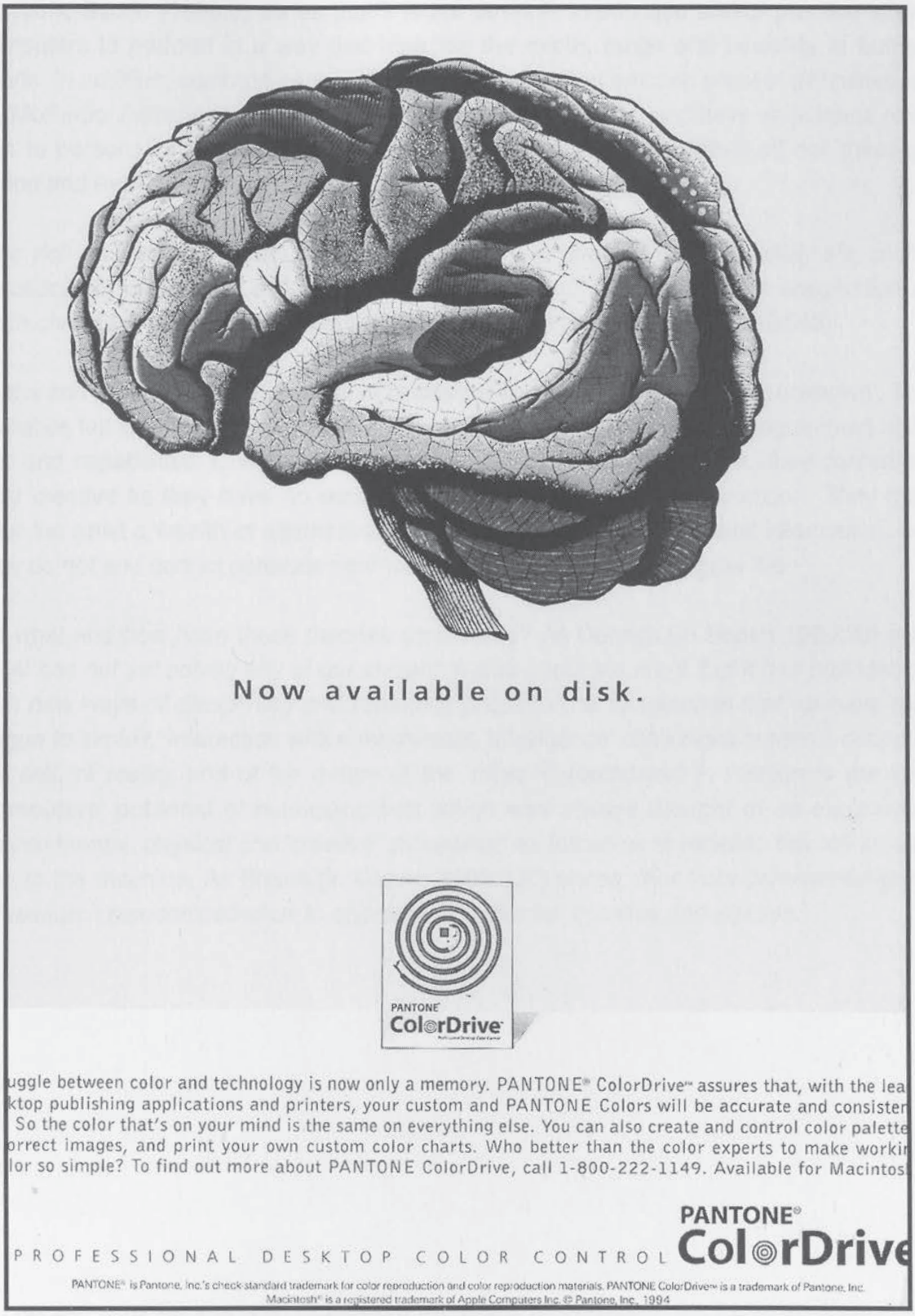


Figure 51d
Now available on disk 1994.
(*Print* September-December 1994:20D–20H)

Similarly, Boden (1990:6) states that it is not possible in principle and/or practice to get computers to perform in a way that matches the depth, range and flexibility of human minds. In addition, common-sense thinking, motivation and emotion present difficulties for AI. Motivation/intentions are the origin or driving force of action and have an intimate relation to personality and the self, while emotions/moods virtually affect all our thinking, action and experience: how can they be likened to computations?

'The rich diversity of human skills, the generative or creative nature of daily life, is the emotional or passionate side of human endeavor, and the idiosyncratic imagination of each child seems lost or undervalued.' (Rosenbrock in Schneiderman 1992:543)

Myths and prejudices are the result of ignorance and fear of '*the other*' the 'unknown'. The anxieties felt towards the computer are due to lack of knowledge of its programmed abilities and capabilities. Computers are not capable of initiating concepts, they cannot be truly creative as they have no access to imagination, intuition and emotion. They may offer the artist a wealth of alternatives and generate valuable new visual information, but they do not and cannot generate new 'ideas' (refer to comic strip, *Figure 52*).

So what and how have these theories contributed? As Dennett (in Boden 1990:20) puts it: *'AI has not yet solved any of our ancient riddles about the mind, but it has provided us with new ways of disciplining and extending philosophical imagination that we have only begun to exploit.'* Interaction with a machinistic 'intelligence' challenges human's notion of the self, of reality, and of the nature of the '*other* '[21] (computer) in relation to the self. Computers' potential of mimicking that which was always thought of as exclusively human mental, physical and 'creative' processes has forced us to redefine the self in relation to the machine. As Shank (in Crevier 1993:336) states: *'Far from dehumanizing us, AI research has compelled us to appreciate our human qualities and abilities.'*

21. The term '*other*' has been used consciously in this section. Understandably, it is a term whose meaning is politically and culturally loaded. Within the context of this paper I have chosen to utilize it as a descriptive term, describing a sense of alienation and fear towards the unknown. The paper will not address the complexities found within the usage of this term and will be italicized, reflecting its loaded meaning.



Figure 52
Graphic Designer comics
(Print September-December 1994:99)

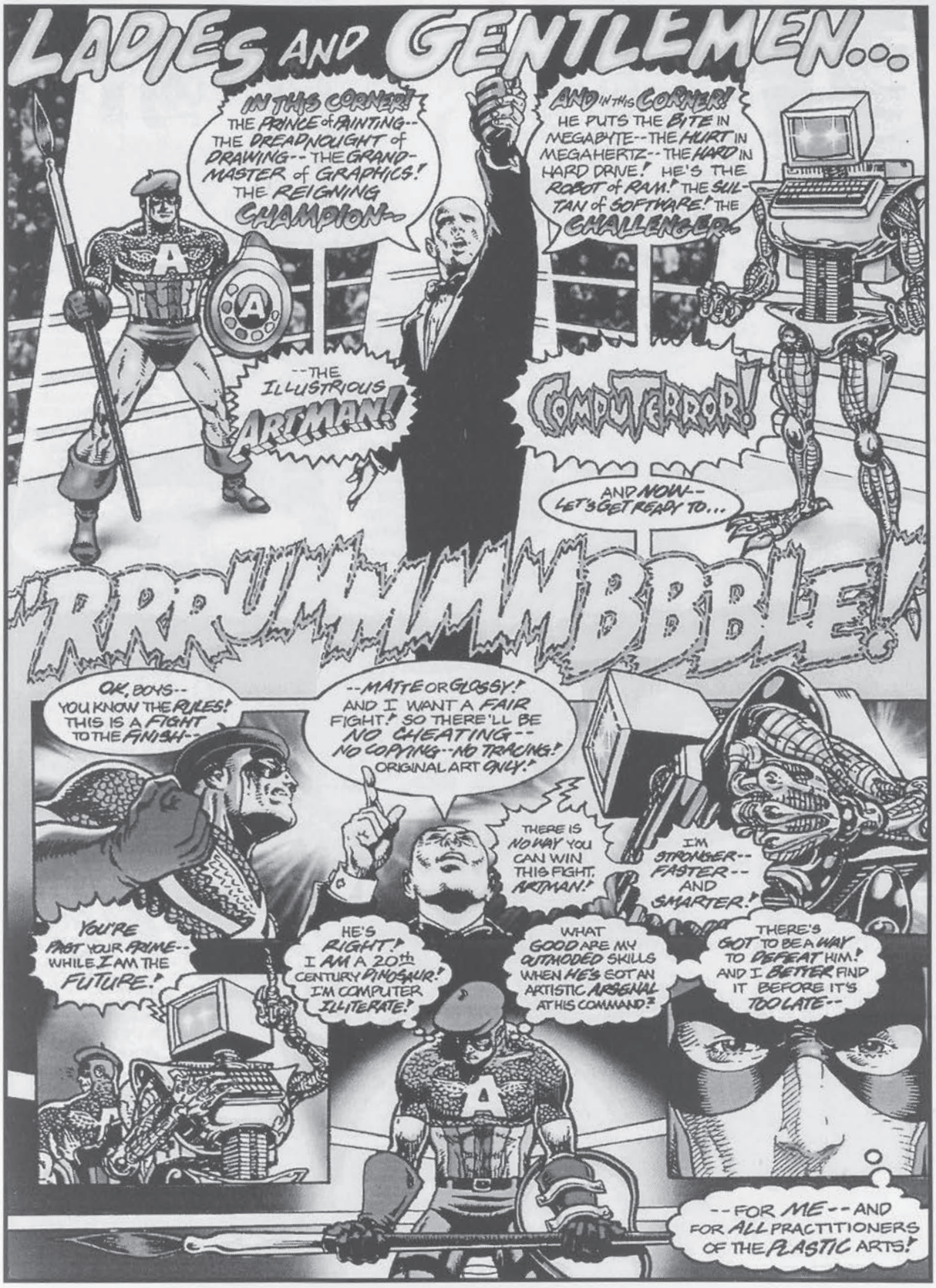


Figure 52
Graphic Designer comics
(Print September-December 1994:100)



Figure 52
Graphic Designer comics
(Print September-December 1994:101)



Figure 52
Graphic Designer comics
(Print September-December 1994:102)

Section six

Conclusion:
The future

'We used to live in the imaginary world of the mirror; of the divided self and of the stage, of otherness and alienation. Today we live in the imaginary world of the screen, of the interface and of reduplication of contiguity and networks. All our machines are screens. We too have become screens, and the interactivity of men [sic] has become the interactivity of screens. Nothing that appears on the screen is meant to be deciphered in depth, but actually to be explored instantaneously, in an abreaction immediate to meaning—or an immediate convolution of the poles of representation.' (Pomeroy in Druckrey 1993:36).

We are living in an environment where time and space are truly dislocated, where the mind can 'disconnect' from its body and surf the World Wide Web, creating opportunities for individuals to connect within any field of communication, transporting images, text, sound and animation along their journey in cyberspace.[22] The body can also break free of its material constraints, or those imposed upon it by the laws of nature. Such transformations are found in the works of Andre Ketexe's forms of transformative and distortive bodies (*Figure 53*), British photographer Bill Brandt (*Figure 54*), and Nancy Burson (*Figures 55a and 55b)* works that the Cubists, Futurists and Surrealists would have only dreamt about.

We live in a world where difference and heterogeneity are 'wired' together. It is within this diverse framework that I attempt to produce works which fuse images and text, which acknowledge this notion of the fragmented and disembodied self, where all cultures intermingle and where everything is 'accessible' by just tapping into the World Wide Web. My works attempt to comment upon this relationship between Humanity and Technology in which the image of the body is disembodied—a place where the truth of appearance is questioned and our own identity in relation to computers is redefined.

22. The question today is who controls cyberspace? *'There are two ways of looking at the Internet. Either as a system of global communication—or as a system of global surveillance. As the digital revolution powers up, Big Brother rides the Information Superhighway and the fight is on to set the rules for cyberspace.'* (Broughton in *i-D* 1995:73) The Internet can be seen as a global nervous system of minds sharing ideas, accessing vast amounts of knowledge and information from the world's great universities, libraries and museums, a cyberplace for learning within 'virtual communities'. Yet what about the concept of privacy or loss of it? Is this a global eavesdropping machine monitoring your every conversation within this global digital communication network? Will strong Encryptions, the 'unbreakable' codes, protect your privacy? *'cryptography only goes a short way to make up for the loss of an assurance of privacy that can never be regained.'* (Broughton in *i-D* 1995:76)

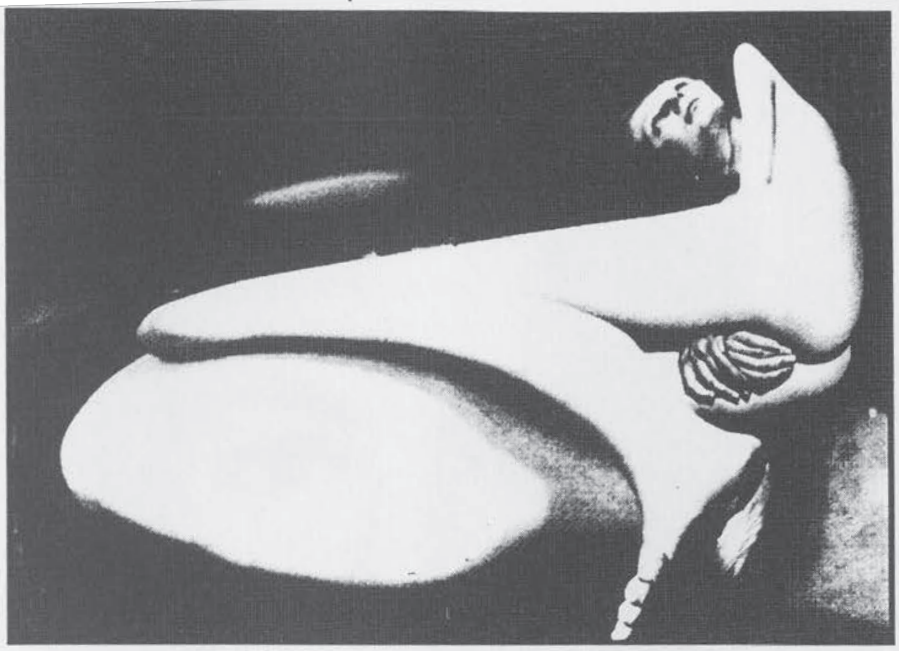


Figure 53
Andre Kertesz: *Distortion 40*,
Paris 1993.
(Lemagny & Rouille 1986:119)

Figure 54
Bill Brandt: *Nude, Belgravia* 1951.
Gelatin silver print.
(Ewing 1994:53)

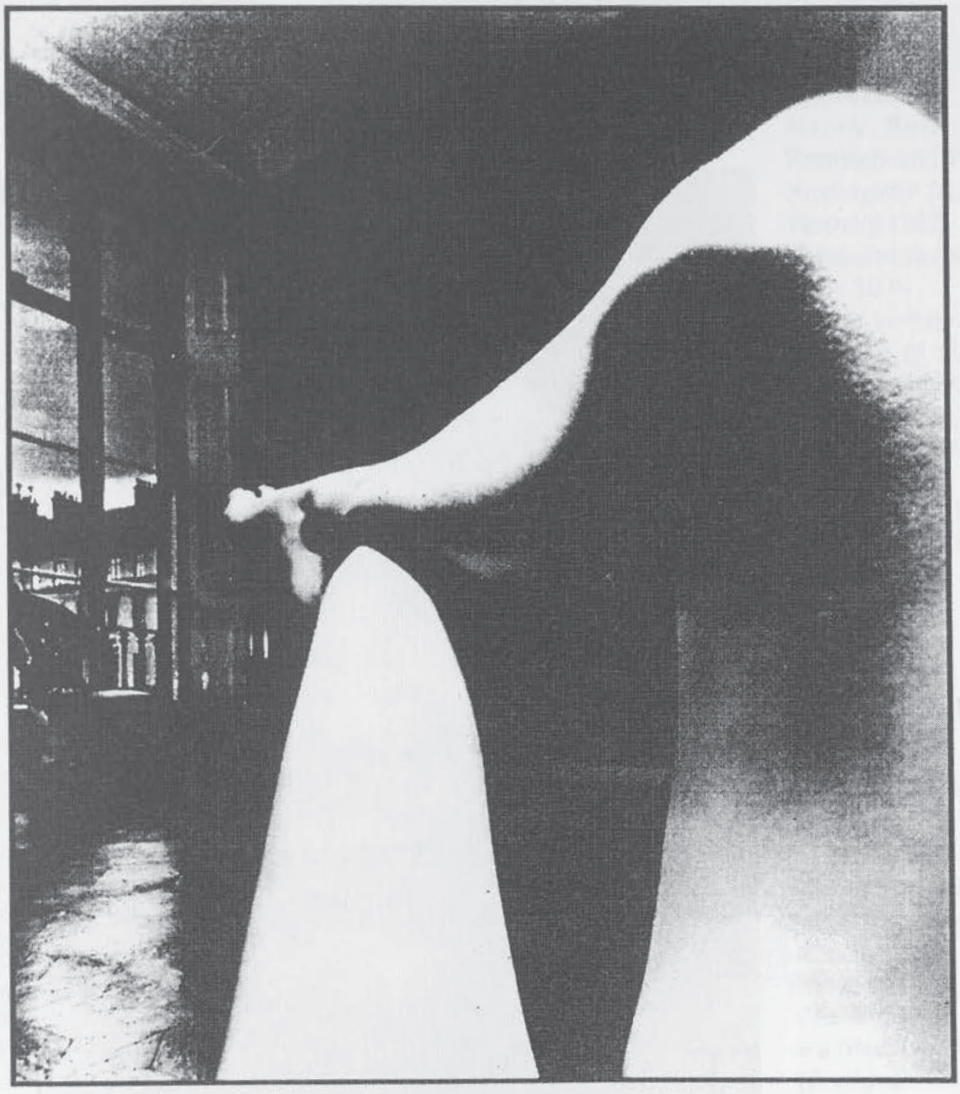




Figure 55a
Nancy Burson with David Kramlich and Richard Carling: *Androgyny (Six Men and Six Women)* 1982.
Simulated photograph,
8 in x 10 in.
In this composite image, the portraits of six men and six women have been scanned into the computer and fused into one simulated portrait. The work suggests the tension and fascination of 'face value'.
(Lovejoy 1989:153)

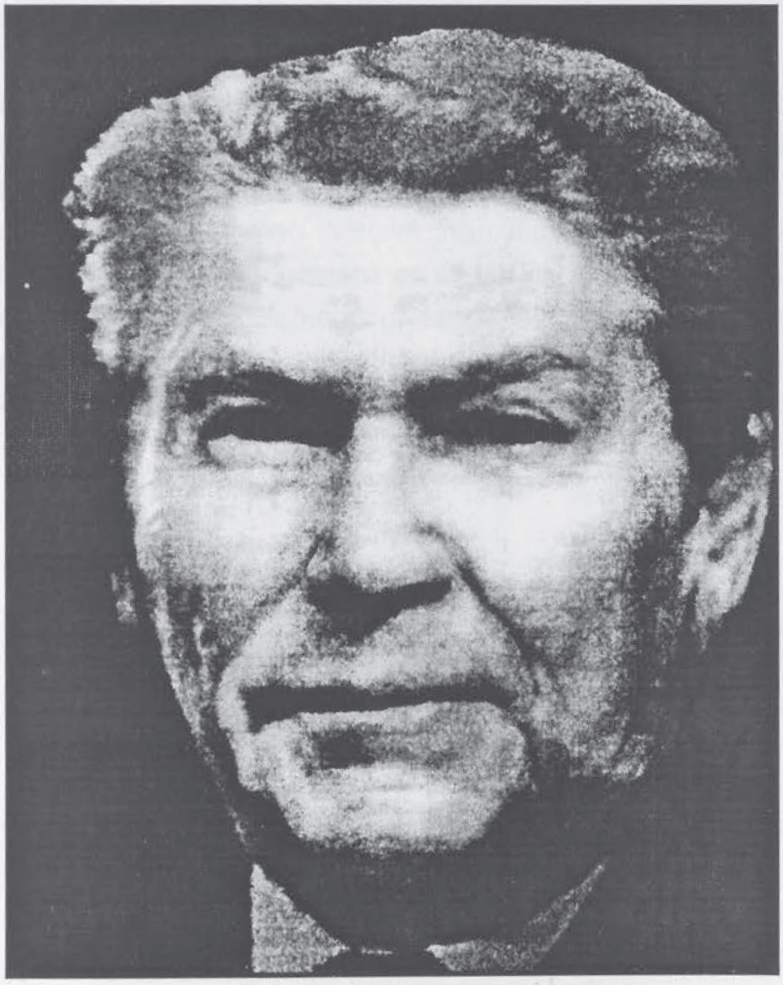


Figure 55b
Nancy Burson: *The Second Nuclear Powers Composite*
1980s
This image comprises of the features of the leaders of the five counties possessing nuclear warheads, Reagan, Brezhnev, Mitterand, Thatcher and Xiaoping. The degree to which each face appears is proportional to the number of warheads in that country.
(Dieckmann in *Art journal* 1985:202)

Virtual communities offer a dramatic new context in which to think about human identity, in the age of the Internet. Yet will people get lost in their surfaces or will we learn to see how the real and the virtual can be made permeable, each having the potential for enriching and expanding the other? With all this development is something being lost—human physical contact and communication. We are in a sense becoming a 'remote' society, a disconnective society, where physical interaction with people is becoming less. People are becoming more self-engrossed in their own lives. The touch, the concrete is transforming into the illusion and the abstract. Our connection with 'virtual' humans is of electronic touch, where the computer truly has become an extension of the self. Have we become seduced by the images on the screen, have we become imprisoned by our screens? One has to examine the way a person uses the medium, and the way that use of the technology affects the person's behaviour, thoughts, and relationships with other people, before one can determine a person as an 'addict' or not (Rheingold 1994:153–154). In terms of 'hacker environments', users are imprisoned by their screens, whereas those who utilize computers for daily tasks as a tool and not an obsession are not 'imprisoned'—it all depends on one's work environment and dependency on such a tool.

Turkle adds that as human beings become increasingly intertwined with technology, distinctions between what is specifically human and specifically technological becomes more complex. *'Are we living life on the screen or life in the screen?'* (1995:21) We begin to ask ourselves to what extent we ourselves have become cyborgs, a transgressive mixture of biology, technology and code. However, to reduce the self to a set of codes is dangerous as notions such as humanness become blurred.

The true danger of computer technology is when our computer-aided world becomes too complex. Interconnected systems can become complicated to a point beyond human comprehension. When we leave faith in the 'hands' of computers themselves, to acquire the necessary understanding to solve the systems, then moralistically and ethically we are endangering human judgement, as stated understanding is not a quality that computers are capable of. Other elements of danger are technical warning signs. Issues such as personal privacy, industrial espionage, computer sabotage, forgery of documents and viruses, are but a few of the dangers of computer technology that come to mind.

Section seven

Conceptual issues and working process

This section briefly reviews the central issues discussed in this body of theoretical work, in order to reflect on those elements particular to the influence of my practical work.

During the first year of study I researched in the thesis department of African Studies. This research program related to a body of work which reflected upon humanitarian social issues, similar to those produced during my Honours year. After much thought and discussion with my supervisor, I decided to investigate a specific area mentioned in the original proposal: *'Another theme that shall be investigated upon shall be the relationship between the Fine Art Tradition and Computer generated and manipulated graphic art.'* (Application for admission to the Degree of Master of Fine Art, 'Image and Text: analysis of the relationship between visual (illustration) and verbal (type/text) 1993:5.)

The progress during the first year consisted of research for the first six months, which required inter-library loans from Unisa and libraries all over South Africa as well as a three-month wait for two overseas PhD theses entitled 'The human and computer relationship: a vehicle for character metamorphosis in fictive literature' by Radin (1992) and Rutsky's (1991) dissertation entitled 'High "Techne": technology and art in modernity and beyond.' During these months, research was done on the technological development of computers and their introduction and influence within the Fine Art field from the 1950s till the 1990s.

In August 1994 I presented my first seminar paper entitled 'Fragmentation and alienation of the pixelized image and text in the computerized technological environment.' This paper briefly researched the effects of computer technology on our lives, its communication and psychological effects, and its ability to distort our visual perceptions (via computer software), where truth became an illusion. The paper also consisted of a documentation of the historical development of computers, its diverse medium and its relation to the Western Fine Art Tradition. Thereafter, the issues of humanity and technology, with reference to the human–computer paradigm, were explored, a theme which embraced my interest in the metaphorical and psychological effects of computers on our social landscape. This journey of research was one of fascination which culminated in the second seminar paper (May 25th, 1995), entitled 'The disembodied self'. In addition, the paper covered a historical and metaphorical account of the complexity of AI and its relation to the human brain. Such research involved work at the University of Cape Town Medical Library, visits to medical institutions: the Department of Anatomy Medical School, University of Cape Town (taking numerous photographs of preserved brains accompa-

nied by Dr H. L. Scheinfeld) and Stellenbosch University Medical School–Tygeberg Hospital (where Dr J. F. Coetzee, Principal Specialist of the Department of Anaesthesiology and Dr A. Levin showed me the Ceregraph: a cerebral function monitor which modifies processed and raw EEG signals and data). In addition I visited the Computer Science Department of the University of Cape Town and contacted Professor Edwin Blake with whom I had brief theoretical talks.

The finalization of my title 'Humanity and Technology: a dissertation visualized through multimedia computer-related design with reference to aspects of the disembodied self, fragmented realities, and the human–computer paradigm', provided a framework within which to work.

The visual work was chosen from the various researched themes found within my body of theoretical work. The practical work is presented in the form of a multimedia presentation viewed from a computer monitor. It is a presentation which reflects upon the connectivity between humanity and technology from a historical, metaphorical and psychological viewpoint.

Historically, the development of technology, from the clock to our present-day computers and the Internet, has altered our means of communication, has created a place, a cyber-space, where both time and space are dissolved, where a new form of inter-cultural connection and communication has evolved.

Metaphorically, the human body seen as an object has over centuries been described as a metaphor of the latest technological invention of its period. Today, in numerous writings, the human being is referred to as a computer or as an information node that travels through the data wire-buses of computer networks. Such is evident in numerous movie themes, as previously mentioned, and on *Time* magazine front cover. In addition, certain scenes of my practical work reflect upon the metaphorical notion of *The disembodied self*, where we have in a sense been disembodied, due to the abilities of computer technology. The self, human identity, is no longer a singular concept but is multiple and diverse. Physically one can alter one's surface image via cosmetic surgery and psychologically by creating various virtual personae (Net), where one's own identity is just another amongst the virtual ones. Here the self is disembodied, where one no longer is bound to one's genetic code or physical presence.

Psychologically, the effect computers have upon human beings has changed our emotional, physical and psychological connection with each other through this abstract form of virtual communication. Other psychological effects are: computer phobias and feelings

of anxiety, alienation, detachment as well as wonder, awe, amazement and fascination, all which portray our psychological acceptance and resistance of this developing technological society, an element which in itself is practically displayed in the presentation.

Another conceptual issue of influence is the notion of *fragmented realities*, an issue which directly links with the connection between humanity and technology. Through computer software manipulation, the reality (truth) of images and text is fragmented and distorted where elements are removed and replaced with images without our knowledge or awareness, creating an illusion of reality. This abstract concept is visualized in the presentation by the manipulations of various artworks and political personae.

Working process

The choice of subject matter used in the presentation was influenced by the research work, a body of text which was the starting point. The preparatory work for the multimedia presentation began with initial extractions of specific phrases, quotations and paragraphs which were re-juxtaposed until a 'story board' of text boxes was roughly sketched and planned. This plan became the core from which images and text were visualized and conceptualized for each frame and scene. An open plan, which was reflected upon, questioned and developed.

The concept of the presentation was to produce an animated visual dissertation that reflects upon the most fundamental concerns and issues. In this sense, the theoretical words were given 'life' and became images on the screen, combining both theory and practical, image and text.

The boxes of text were visualized with imagery and text taken from numerous collected source material photographs of computer motherboards, brains, media imagery from magazines, self-recorded television commercial advertisements, appropriated art historical imagery, drawings and sculptural objects. Imagery and text were translated into various shapes and sizes using various techniques, such as; re-photostating the same image over and over to create a textured effect, working with ink, charcoal, paint and paste, and using various computer software Aldus Freehand 5.1, Adobe Photoshop 3, QuarkXPress 3.11, and Macromedia Director 4.04, all to create and manipulate various images and text (*Figures 56 to 59*).

Various elements were layered over images, duplicated, cloned, pasted, cut and re-positioned into a 'techno-surreal' digital landscape via the use of computer software. With the immense palette of colour, shade, contrast and filter facilities of computer software,

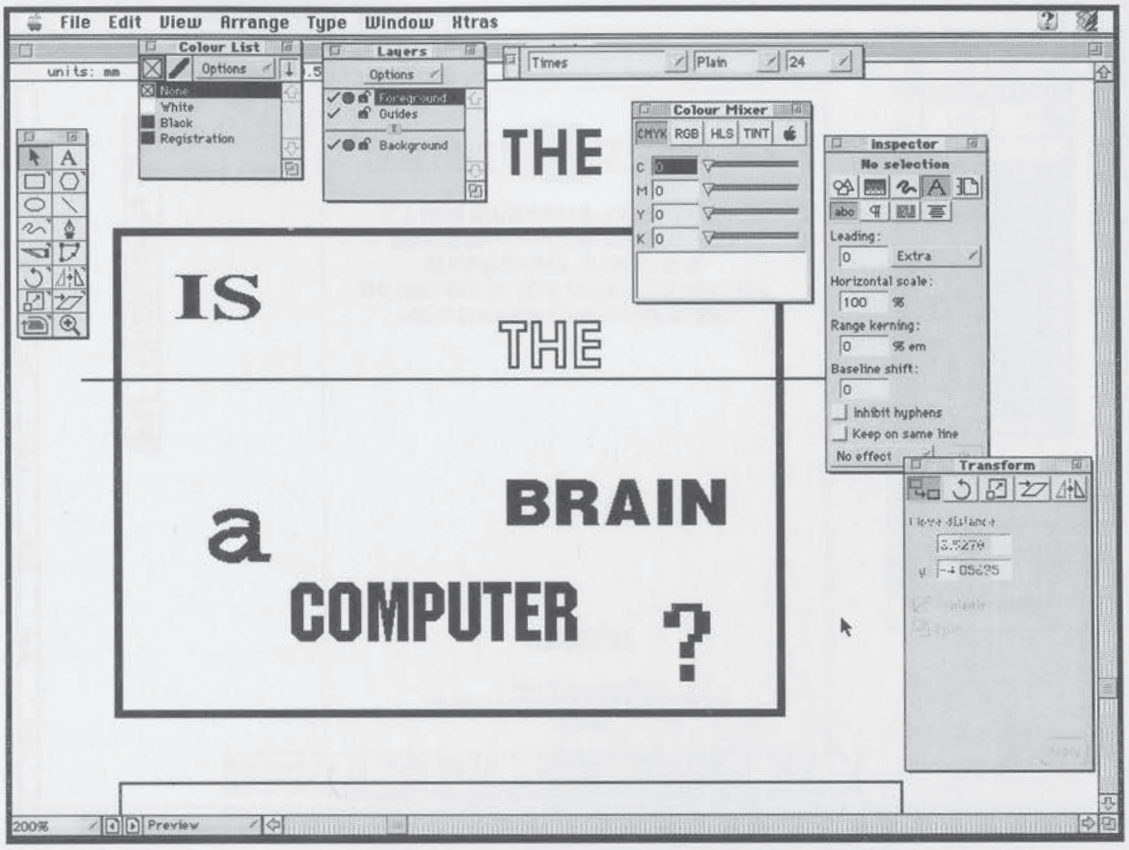


Figure 56
Aldus Freehand 5.1 interface design.

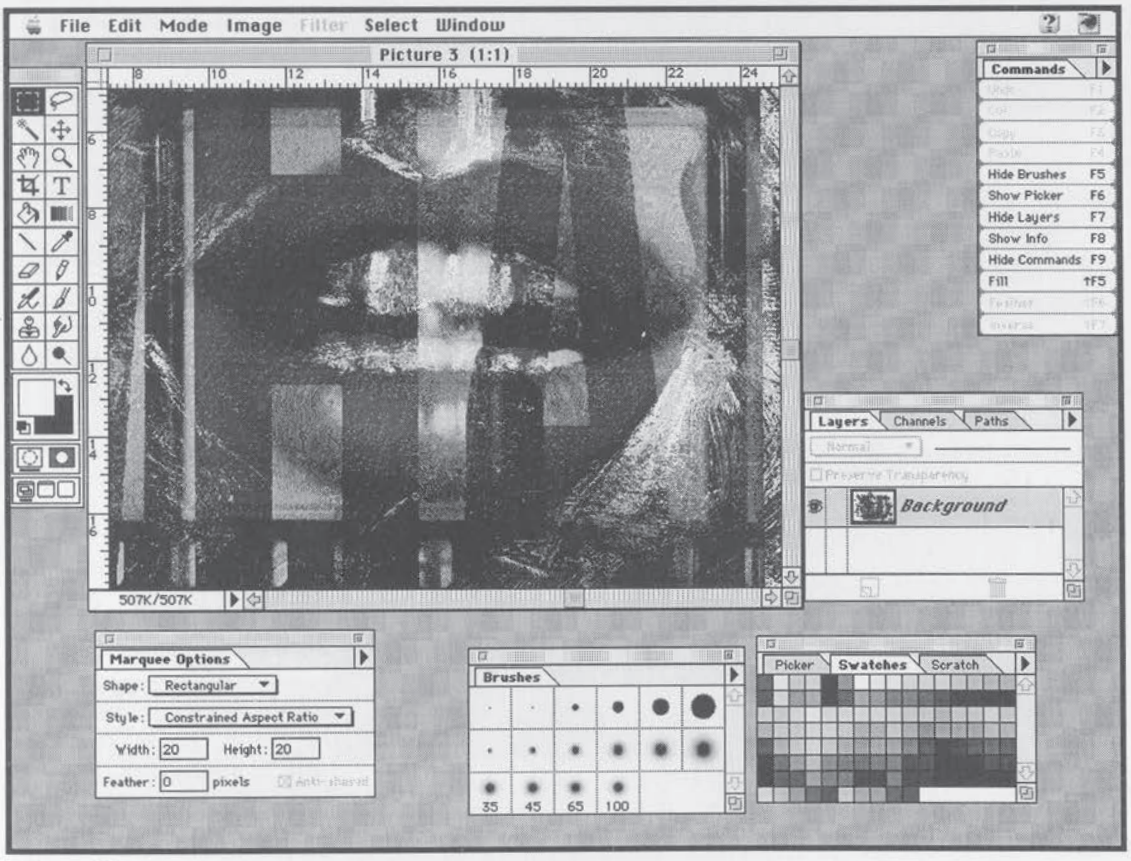


Figure 57
Adobe Photoshop 3 interface design.

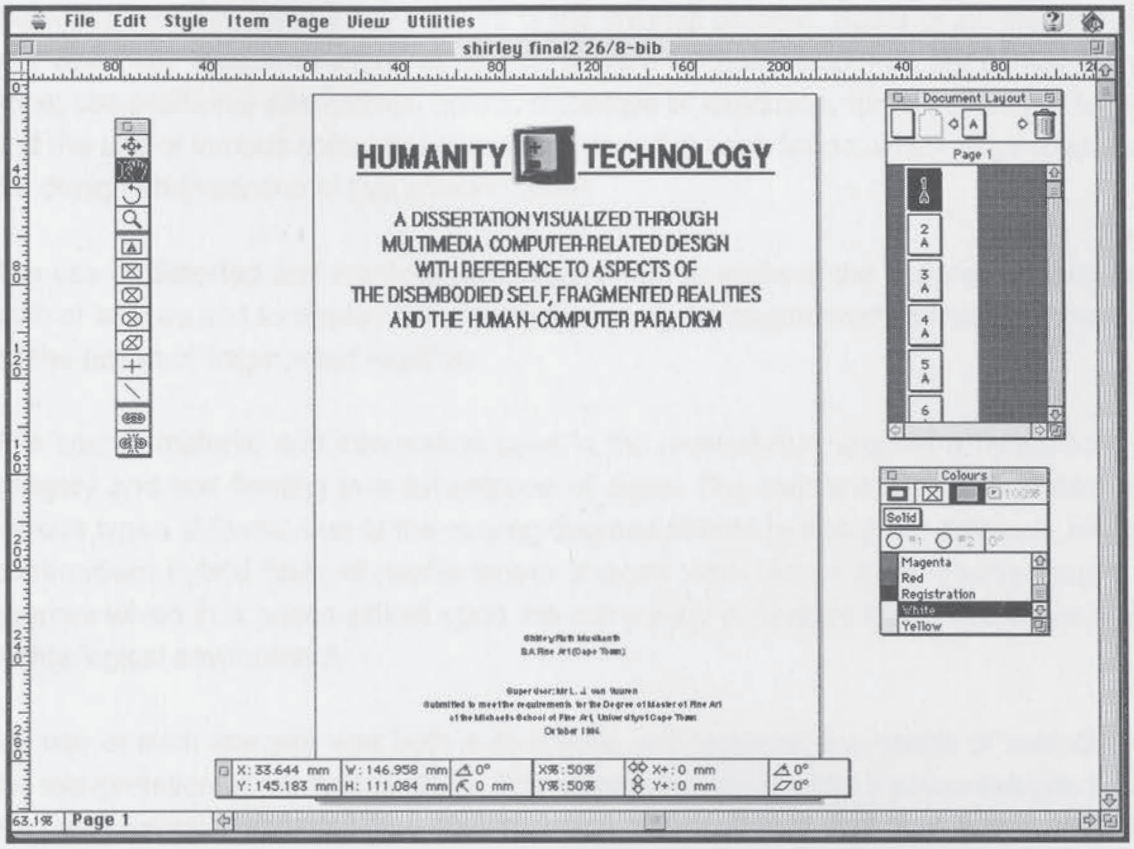


Figure 58
QuarkXPress 3.11 interface design.

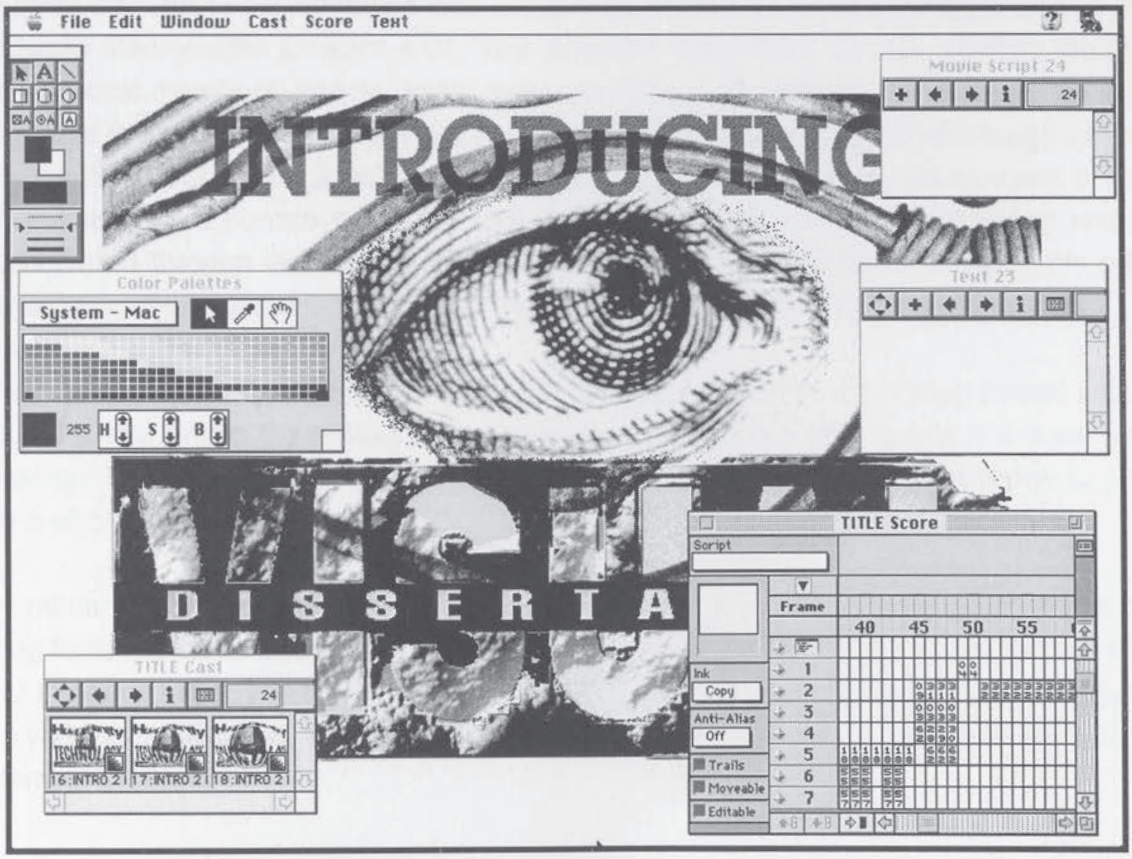


Figure 59
Macromedia Director 4.04 interface design.

experimentation became a key element of the creative process. Some of the imagery and text were flat, black and white, while others were textured, coloured. My choice of balance, compositional alternatives, colour, technique of execution, font size, shape, texture and the use of various software applications varied in each frame, which depended upon the design and intention of that specific scene.

The use of distorted and manipulated imagery was to address the notions of reality and truth of images and to display how reality can easily be fragmented, thereby commenting on the notion of *fragmented realities*.

The source material and information used in the presentation created a hybrid form of imagery and text floating in a cyberspace of digits. The constant shift of materials and various types of forms, due to the varying degrees offered by computer software, led to a postmodern hybrid form of media where images were drawn from a wide variety of sources which in a sense reflect upon the complexity of images found within our social technological environment.

My use of such imagery was both a conscious and unconscious means of selection for the interpretation of my field of study. The manner by which frames where designed, created and selected were at times Dadaist in tone. Chance and experimentation were vital elements in the execution of the work, creating an environment of conscious and unconscious decision-making within the selection process.

Another element of consideration was movement, which was created with the use of the software Macromedia Director 4.04. This software consists of various working modes, frames, cast members, scripts, lingo, score and stage, all allowing one to move various elements in and out of the stage, as well as making elements interactive through viewer participation. Such participation, though minimal, became an essential element of the presentation. The human–computer contact is a core theme of the presentation and is accentuated through viewer participation. The psychological distance between the presentation and the viewer is reduced by the direct engagement and participation.

The use of sound, voice over and background music, became the linking thread which played a vital role in the uniting of the separate frames into a clear visual and aural progression. Careful planning was executed in the making of each frame of a scene to create a whole from all parts.

My primary intention in the multimedia presentation is to attempt viewer participation by bring forth questions about human identity in relation to media and computer technology, and the notion of the truth of an 'image' which can be manipulated (by software) without the viewer's awareness. These are a few of the complex issues this practical presentation attempts to present.

The limitations of the technical process were as following:

Scale

The scale of the images used (whether they be drawings, photographs or scanned 3-dimensional objects) was limited by the size of the scanner bed and computer monitor. Images were limited to an A4 scale, a limitation of physical space, a confinement of space in which freedom of expression and movement is compressed and restricted. Another consideration was the resolution at which images were scanned which altered the file size (disc space). The computer monitor display is 72 dots per inch (dpi), scanning at a larger resolution would create 'wasted' disc space and increased file size. As a result, all images used for the presentation were scanned at 72 dpi, enabling the work to be processed (read) with fewer computer crashes due to insufficient RAM (read only memory which affects computer speed). For printing purposes, imagery can be scanned from 300 dpi to 2800 dpi, depending on the printout quality required (for newspaper, magazines, brochures, etc.).

Scanner

The scanner is a fundamental tool in the art production process. It is the only means of illuminating imagery onto the screen via the scanning process. When the scanner is dysfunctional, a time period of approximately three months without this tool can create a situation of frustration, as a painter without paint would experience.

Disc Space/Memory

When working on a computer the user saves (stores) the work onto external discs such as floppies, stiffies, zip, jazz, bernoulli, CD, tapes or optical. Each device has a set amount of disc space from 1.44 MB (Megabits) to 1 Gigabite (1000 MB) of allocated memory space. This amount of space determines the amount of data/information that can be stored. Large files require adequate amounts of RAM to be processed by a computer. Computer crashes are generally the result of insufficient memory allocation, creating an environment of disillusionment.

During my first year of Masters the only means of data storage was stiffies, a mere 1.44 MB, an impossible situation in which to work. The external bernoulli drive enabled more freedom of space, with 230 MB discs, yet due to unforeseen events, my data was

corrupted and destroyed. After numerous attempts to retrieve the data with the assistance of various professional companies, the work was still irretrievable. Such a situation was initially negative, which transformed into a positive experience, whereby a more focused, structured and productive working method emerged. The use of the external zip drive enabled an alternative and more reliable system for easy backups.

Self- training

The technical process consisted of learning and re-learning various software applications, which could be upgraded every couple months. This process was time-consuming and required patience and experimentation within the learning process. Without knowledge one is unable to utilize the computer programs in a productive way and to the fullest potential. Many hours, indeed months, were spent in front of the computer before being able to apply the learnt experience in the practical work.

Time

A single frame that one views from the monitor, a split second, can take up to a week to produce, from concept to execution. Time is an element that is lost when watching a presentation; images and text move so fast across the screen, that the viewer is unaware of the amount of planning involved. As a point of reference, the multimedia presentation begins with descending numbers from 10 to 1—the creation of each number was approximately three days' work; a scene that took a month's work, is viewed in 10 seconds. The viewers' concept of time can be misrepresented.

The creative process and technical method that was developed contributed to the making of a multimedia presentation.

Section eight

Multimedia representation:

If the reader is investigating this dissertation from Upper Campus, it is advisable to venture a trip to the Hiddingh Hall Library (Michaelis) where a full-colour version of the dissertation is available. In addition, the Hiddingh Hall Library holds the multimedia presentation on CD which can be visualized in the Design Computer Lab.

A. Installation instructions

The Master's presentation CD runs form a CD-ROM drive and requires less than 1MB hard drive space, 8MB RAM, and a Macintosh Power Pc with a 17 inch monitor.
The presenetation is approximatly 20 minutes.

1. First switch on the monitor and hard drive plugs found behind the computer.
Then press the far top right key with a triangular shape found on the keyboard, to switch on the computer.

2. For those who have never worked on a Macintosh computer, it is advisable that you watch the interactive-multimedia Mac basics tutorial (found in the utilities folder) to understand basic computer functions and terminology.

3. Check the 'Monitor & Sound' is tuned to 256 colours, gamma curve at 1.0 linear, and contrast and brightness accentuated (*Figures 60 and 61*). To open up 'Monitor & Sound', 'click' on the apple icon, scroll down to 'Control Panels', move mouse arrow across and select 'Monitor & Sound'. When finished adjusting, 'click' on the word 'Recalibrate' and then close the software by 'clicking' on the word 'File' from the menu bar and then 'Quit'. This adjustment will give the correct colour contrast and speed at which the presentation will be processed.

4. Insert the CD into the CD-ROM drive. When the icon of the CD appears on the screen double 'click' on the CD icon. A folder will appear and inside you will find a file entitled 'Humanity & Technology' double 'click' to begin and enjoy !

5. Optional:
For best viewing, copy the contents of the CD onto the computer hard drive. Prior to the transfer of data, 250MB of computer hard drive space needs to be available. To copy data, select the CD icon and 'drag' it onto the computer hard drive icon. Copying will then take place. Before beginning the presentation remove the CD off the computer by 'dragging' the CD icon into the 'Trash' icon and the CD-disk will be ejected. Then double 'click' on the file entitled 'Humanity & Technology' found on the computer hard drive to begin.

6. When you have finished watching the CD:

6a. If you copied the CD contents onto the computer do not forget to delete the presentation files off the computer. Drag the files into the 'Trash' icon, then 'click' on the word 'Special' from the menu bar and scroll down to 'Empty Trash', and then 'Shut Down' to switch off the computer.

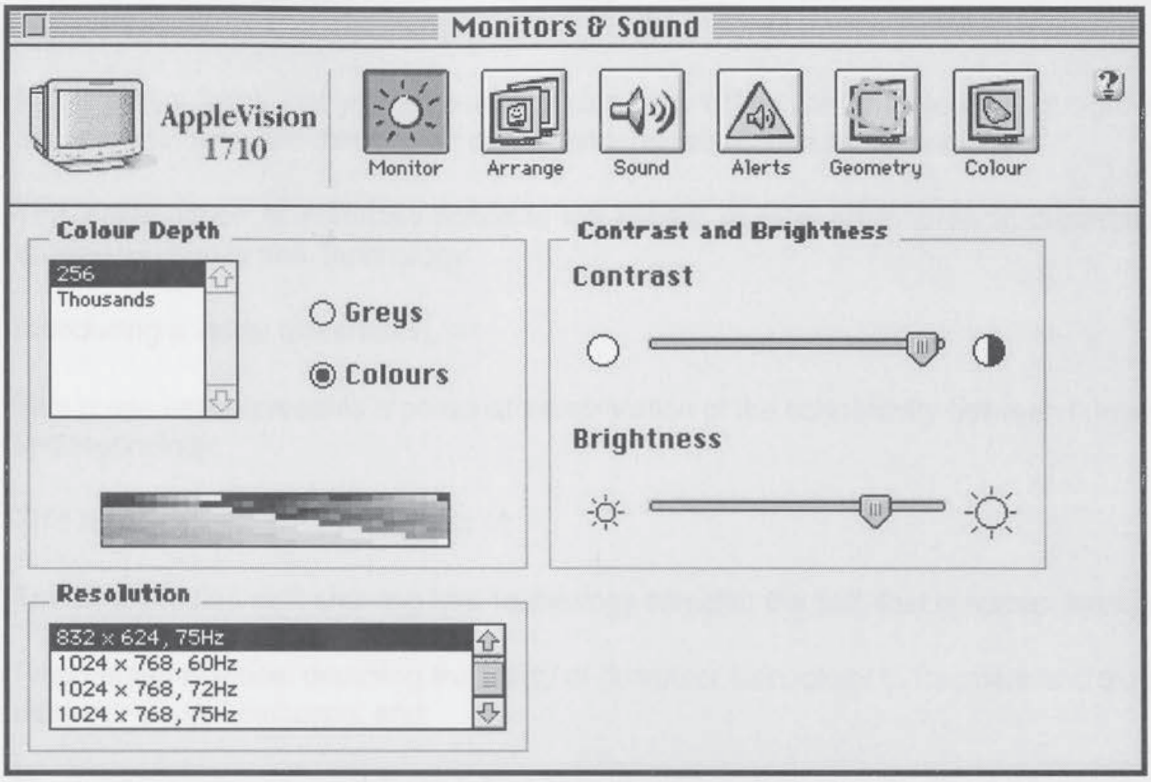
6b. If you did not copy the CD contents onto the computer, 'drag' the CD icon into the 'Trash' icon, and the CD-disk will be ejected. Click on the word 'Special' from the menu bar and then scroll down to 'Shut Down' to switch off the computer.

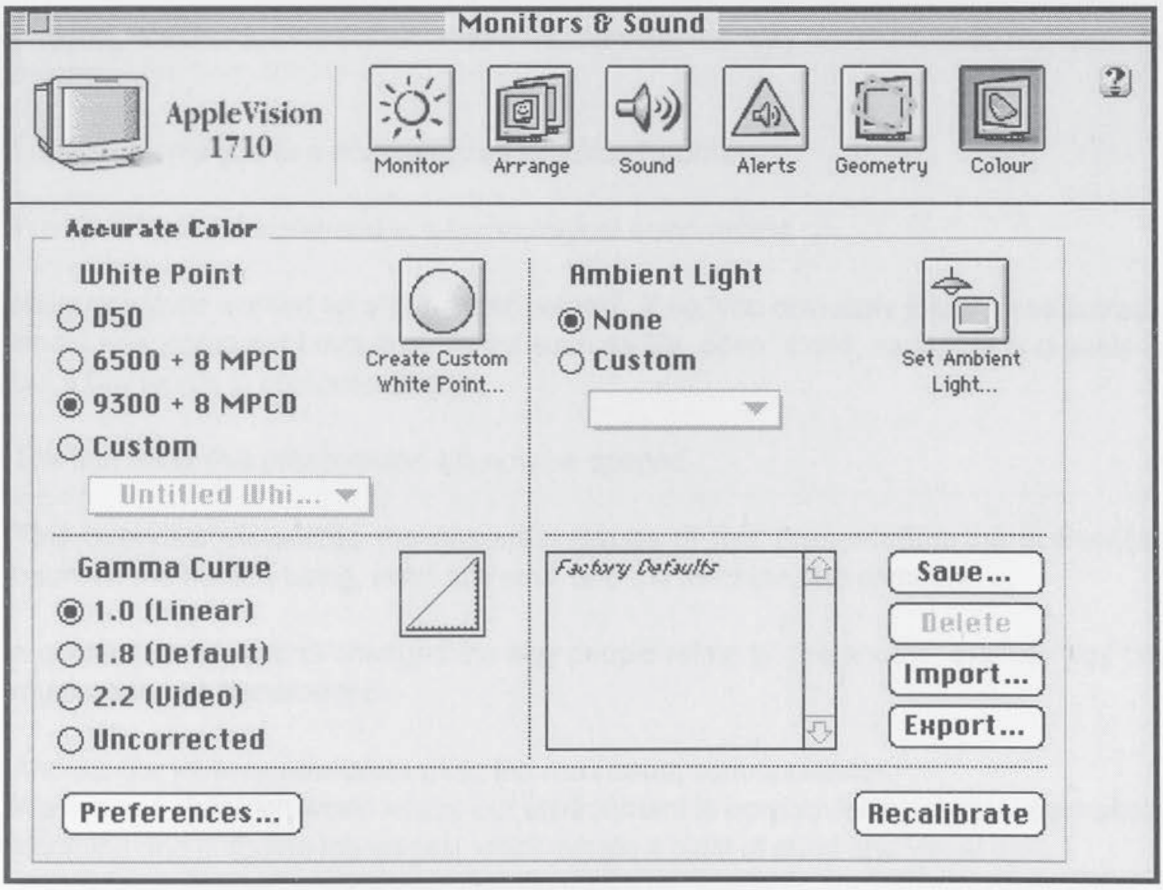
7. Return the CD to Hiddingh Hall Library.

NB:
This MFA presentation must be viewed on a Power Macintosh 7200 with a 17 inch monitor (832 x 624). The resolution must be set at 256 colours, and the sound output quality at 22.050 kHz from the 'Sound & Monitor' found in the Control Panels folder. Please check that the Helvetica Black font is in the Fonts folder found in the System Folder.

Remember to handle with care and keep the CD out of the sun.

This MFA presentation is also available on VHS (Video). Copies are available at Hiddingh Hall Library-Michaelis and at African Studies Library-Upper Campus. Please note that the VHS presentation is not of the same quality as the CD-ROM presentation.





Figures 60 and 61
'Monitor & Sound' setup.

B. Script for multimedia presentation

In this presentation that you are about to view, you will be sent on a journey of sight and sound—a journey commenting on our relationship with computer technology.

This presentation is intimately linked to my Master of Fine Art theoretical dissertation, entitled 'Humanity and Technology'.

Introducing a visual dissertation.

This presentation presents a personal interpretation of the connectivity between humanity and technology.

This broad theme refers to aspects of:

The disembodied self: showing how technology can alter the self, that is human identity.

Fragmented realities: depicting the ability of computer technology to fragment and manipulate our visual landscape, and

The human–computer paradigm: referring to our psychological and metaphorical connection to computers.

Flashing electronic brainwaves make us question the way we think, feel and view ourselves.

I now welcome you to a computerized simulated journey.

We have become immersed in a technological environment.

Have you ever worked on a computer before? If so, you obviously initially had to learn a whole new computer language. Terms such as file, open, close, save, cut and paste are but a few words in computer jargon.

The first file of this presentation will now be opened.

This overview visualizes the essential issues of this presentation the connections between the human being, mind and soul, and the machine, the computer ...

a connection which has changed the way people relate to one another and the way communication has transformed.

And so, our journey now takes us to the next issue, communication.
We live in a data-rich world where our environment is bombarded by digital information—incoming and outgoing messages, which create a blast of aural and visual data.

Beep, beep.

Computers, cellular phones, fax machines, televisions, e-mail, the Internet ... and numerous other electronic devices have changed our social landscape.

Such devices have transformed our planet into one which is electrical, digital and virtual. As well-known philosopher Marshall McLuhan stated: we have extended our central nervous system itself in a global embrace, abolishing both space and time.

Buzz, buzz, all these electrical impulses over computer networks are turning us into a swarm of bees.

Communication voices: hello, goodbye

'Bad command or file name'

'Could not complete your request because an error occurred.'
'Post Script error detected. Offending command. Try again!'

These electrical networks have developed a global village of communication where all cultures can connect with each other, through the World Wide Web.

We live in a digital world where difference and heterogeneity are wired together—a world of textured faces transparently connected in a virtual, intangible and non-physical space. A cyberspace where our minds, or should we say voices, travel through computer networks of zeros and ones.

And so the self in a sense, is disembodied, split and digitized, where the mind can metaphorically disconnect from its body over digital networks.

You can be anyone you want to be because no one knows who you really are behind the screen. People create virtual personae, identities, over computer networks.

You can also change and create your physical identity through cosmetic surgery, just look how easy it is with a 'click' of a button not that you'd want to be any of these faces!

Even in the realm of advertising, human identity is also created and disembodied through produced marketed stereotypes and gender roles.

What do these false masks of mass-media present ?
A consumer and customized image which brainwash and bombard the spectator's psyche.

The human body has therefore become scrutinized by many of our technological devices, a place where our identity is multiple and in constant flux.

But that is not the only effect technology has on us. With computer software manipulation, the truth of an image is unstable.

Is there truth in what we see, is seeing no longer believing?
Our visual perceptions of 'reality' are being distorted and fragmented via computer technology, and thus constantly transformed.

Boundaries between real and virtual, truth and reality are eroding, creating a myth of representation. The truth of appearances is being questioned.

Even our political leaders attempt to camouflage themselves as presidents—personalities who are also distorted via mass-media.

The notion of computer-manipulated images is further displayed in my distortion of Picasso's Les Demoiselle de Avignon of 1917.

The digital image is synthetic and can perpetrate violence and distortion of original visual forms and content.

The surface image comprises dark and light pixels which can be individually altered, manipulated and repositioned without the viewer's awareness.

Seeing is therefore definitely not believing and reality is truly fragmented.

As a result, computer technology has developed a simulated reality, a phantom reality within a techno-surreal landscape, of floating images and text filled with a variety of colour, form, shape, texture, contrast and luminosity.

Our visual landscape has become saturated with images screaming for our attention as Virilio stated: images have become munitions, weapons which attack our visual senses.

This computerized technological environment not only alters our visual senses but also our psychological and metaphorical relation with computers.

In this computerized environment human identity, mind and body is metaphorically questioned in relation to machine—the computer.

Psychologically our relation to computers is mixed,

On one level we are filled with delight, surprise, fascination, amazement, awe and wonder.

On another level we feel disconnected from such technology. We fear it. We are alienated by it due to ignorance.

Crash! Fear of destroying the computer, fear of data-loss.

From a metaphorical stance humans have always yearned to understand what makes them think, feel and be. The human brain, has often been referred to as the latest technological preoccupation.
In 1748 La Mettrie stated: To be a machine to feel, to think.

In 1996 Time magazine covered its front page with an oversimplified statement, 'Can machines think ?' questioning human intelligence, stating that machines have the potential of human intelligence.

Such metaphors promote techonphobia of computers. We fear the ultimate myth or success of artificial intelligence— the development of electronic brains.

In 1990 Bergmark stated: Is the brain a computer, is the computer a brain? Such a superficial statement deserves a simple answer, no!

Through this study I have come to the conclusion that machines, computers, are empty tokens of information and attach no understanding to their programmed codes. Computers only manipulate numbers, people connect them to meaning.

Computers are more precise but human emotional life remains unique. Humans don't compute, they understand intentionally. Consciousness is doing something that mere computation cannot do.

Computers are mindless!

Even in a technologically advanced state of evolution that humankind might find itself in the human soul will command supreme.

C. Brief notes on the explication of selected frames of multimedia presentation.

Please note that these notes are to be regarded as an entry level into the work. Personal interpretation of the work is valuable. All images are 220 mm x 300 mm in size (832 pixels x 624 pixels) on a 17 inch monitor screen. The hardware used varied from the Macintosh LCIII (8 MB RAM with 80 MB hard drive) to the use of a Power Macintosh (24 MB RAM with 500 MB hard drive). Software used was Aldus Freehand 5.1, Adobe Photoshop 3, QuarkXPress 3.11 and Macromedia Director 4.04.

The visual reference in this section is colour lazer copies, as a result size, colour and luminosity is misrepresented. In addition, the element of movement and sound is removed from these still frames. Please refer to the computer monitor multimedia presentation for correct display of sound, colour and movement.



Figure 1
Welcome screen message.

The multimedia presentation begins with the viewer interacting with the computer. The viewer is required to 'click' on the word 'Start' to begin. Such interaction, viewer participation, is an important component of the presentation as it reflects on the human–computer paradigm and on our psychological relation to computers (phobias, anxieties, etc.). The visual image created refers to the structure of computer screen messages. Script: *Welcome. In this presentation that you are about to view, you will be sent on a journey of sight and sound—a journey commenting on our relationship with computer technology. This presentation is intimately linked to my Master of Fine Art theoretical dissertation, entitled Humanity and Technology.*

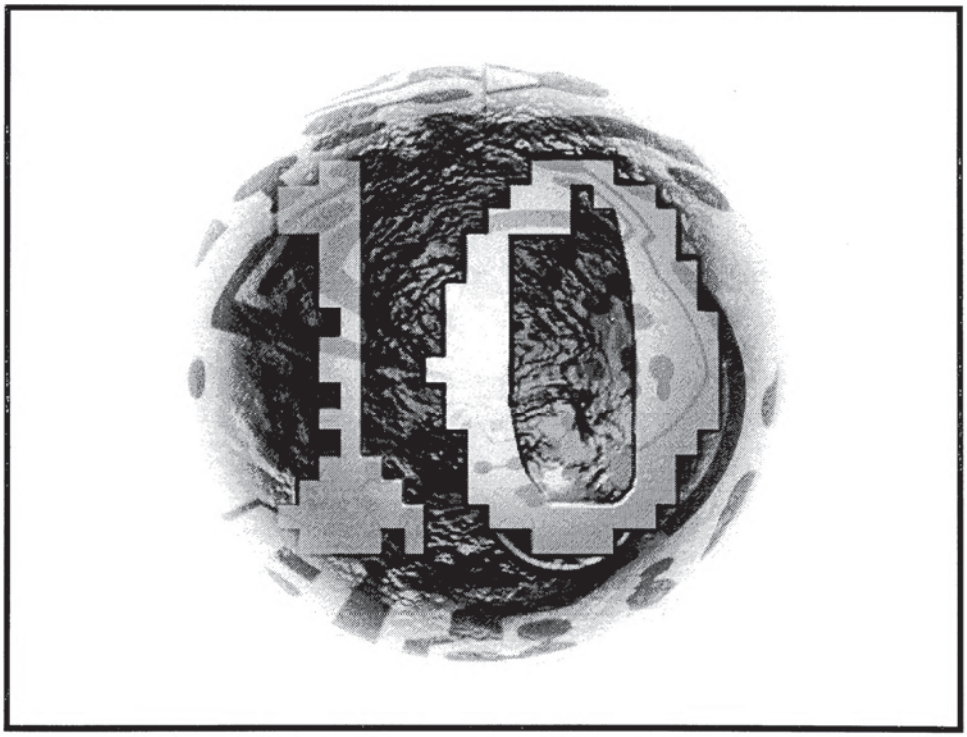


Figure 2
Number 10.



Figure 3
Number 9.



Figure 4
Number 8.

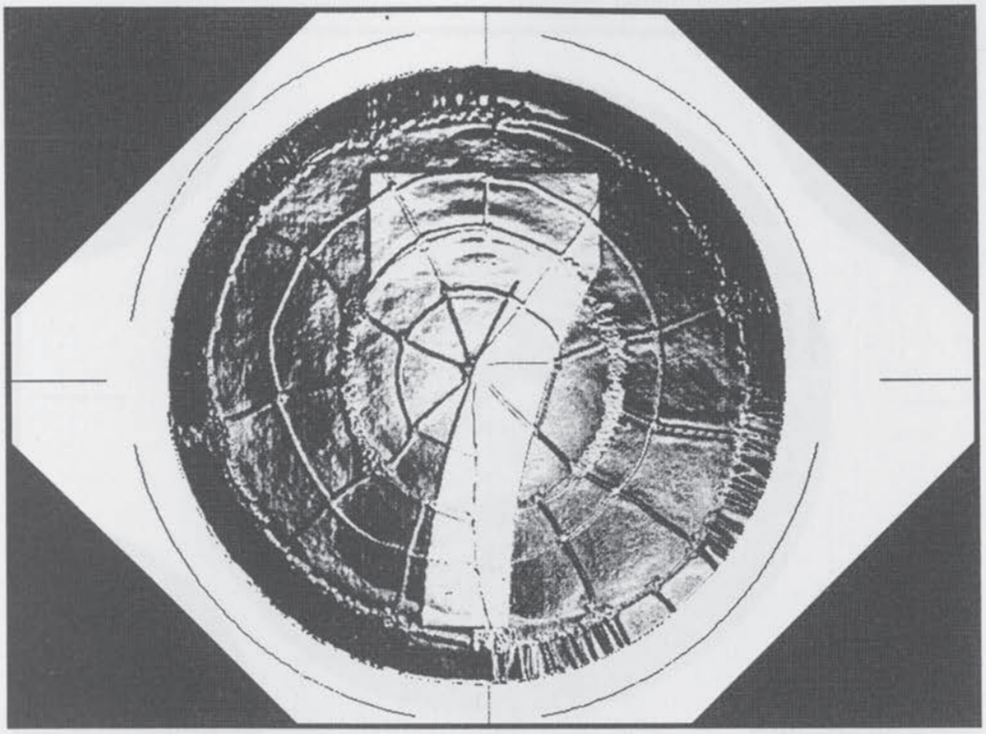


Figure 5
Number 7.

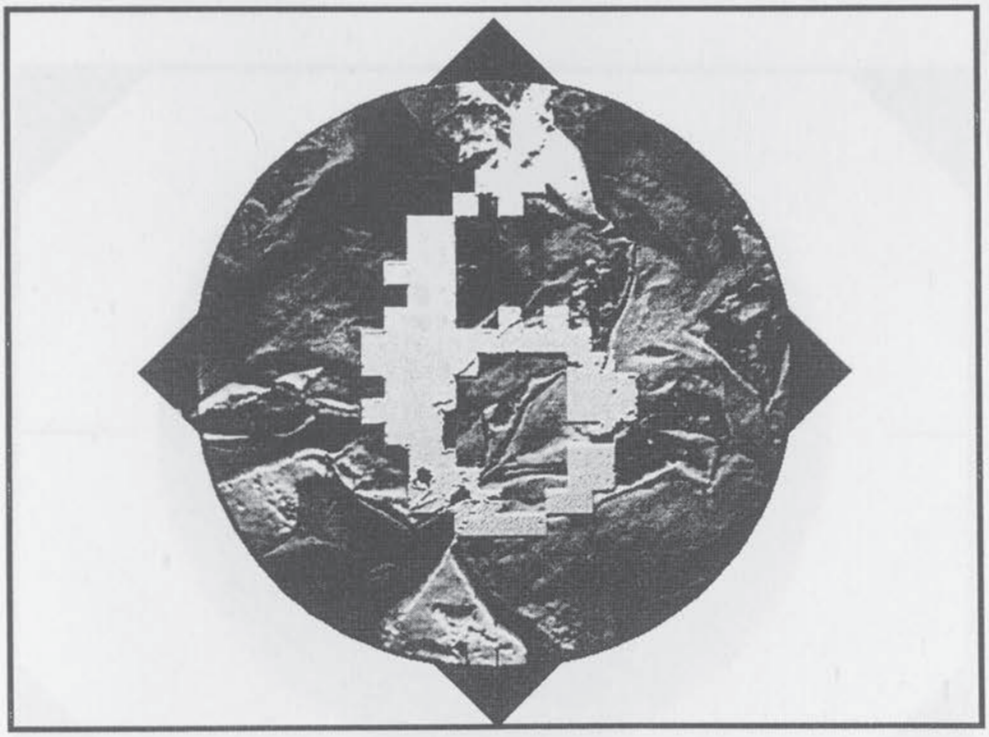


Figure 6
Number 6.



Figure 7
Number 5.

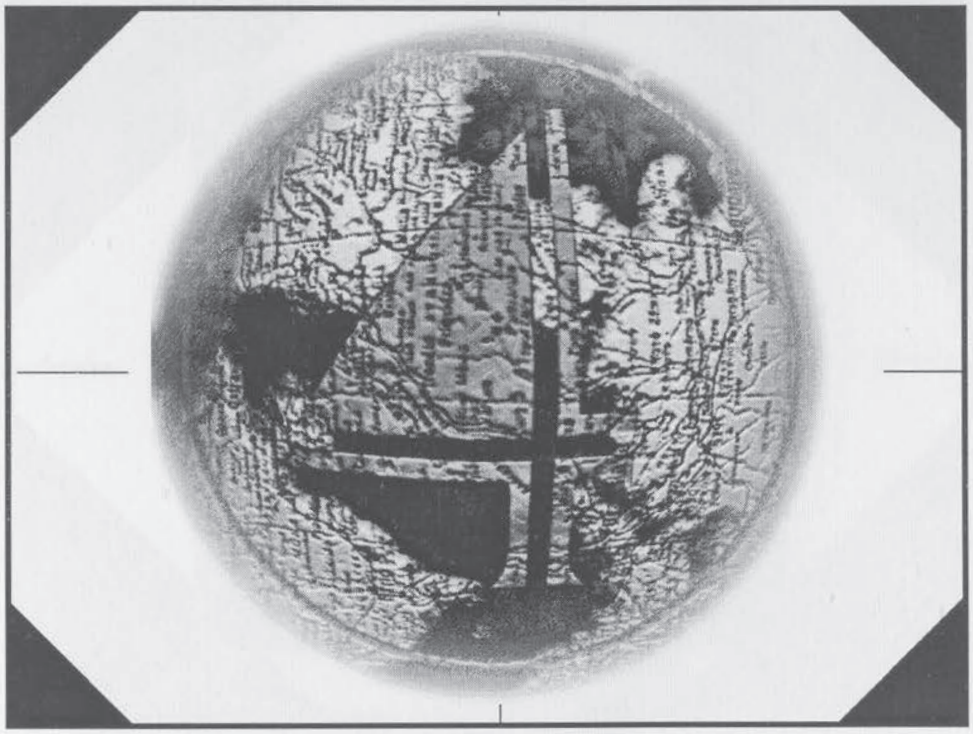


Figure 8
Number 4.

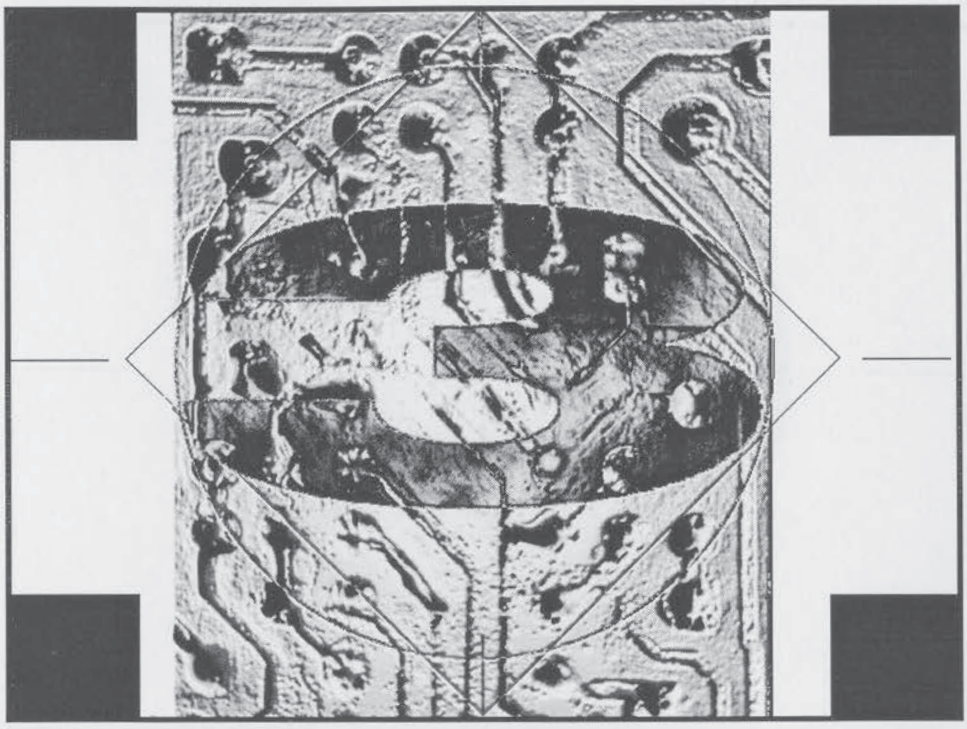


Figure 9
Number 3.

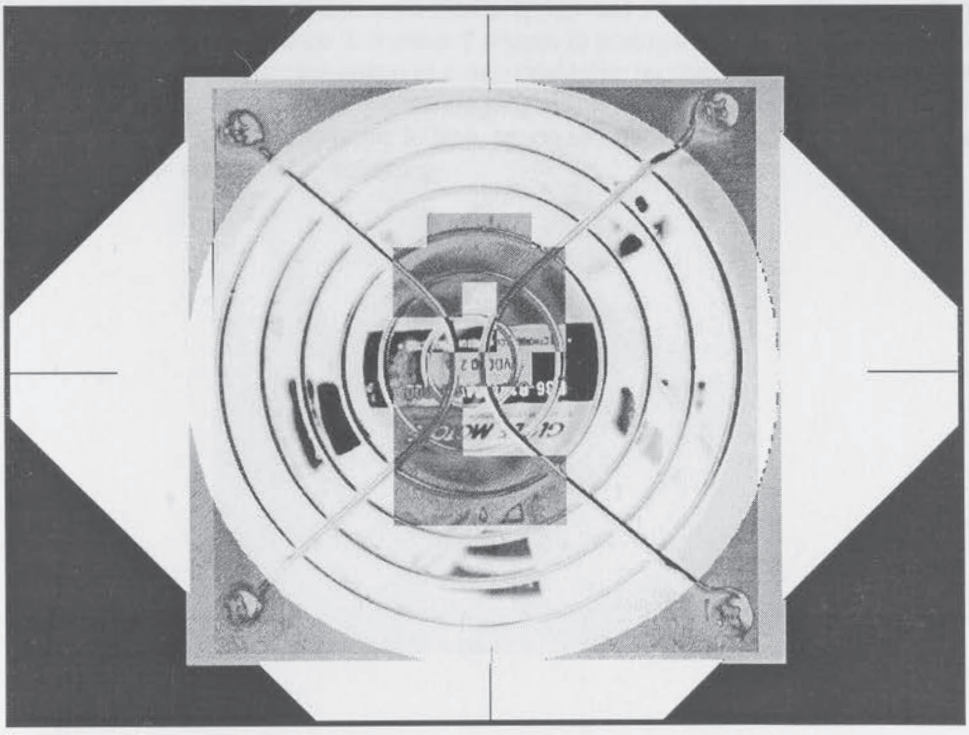


Figure 10
Number 2.

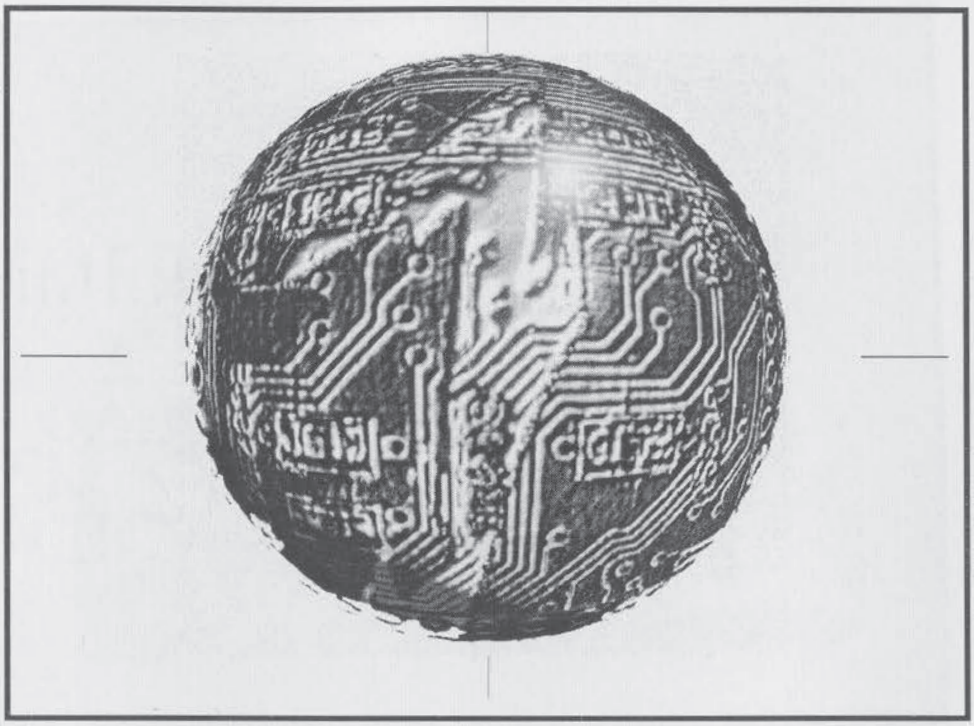


Figure 11
Number 1.

The descending numbers represent the start of the presentation. The visual imagery used in numbers 10, 3, 2, and 1 refer to computer imagery: circuits and hardware elements. Numbers 9, 8, and 6 use textured backgrounds created with washes, ink, charcoal and paste on fabriano, and were then scanned and manipulated with colour using computer software Photoshop 3. Number 7 (Figure 5) portrays the use of a 2-dimensional metal element, echoing the shape of a web (metaphor for the Net). Number 5 (Figure 7) presents an enlarged finger-print, referring to the human touch, mark. Number 4 (Figure 8) displays a map, referring to time, space and distance, all elements which are 'wired' together via computer technology.



Figure 12
Introducing a visual dissertation.

The concept of this frame is to produce a body of practical work which reflects on the theoretical work, thereby combining image and text. Script: *Introducing a visual dissertation. This presentation presents a personal interpretation of the connectivity*



Figure 13
Humanity and technology: an investigation of the relation between the two.

This scene displays the title of the dissertation. The design of the words *Humanity and Technology* differ in form and colour, one geometric and cold (blue), the other rounded, elastic and warm (red), evoking different qualities of the words, thereby creating a visual metaphor within the text/image. Script: *... humanity and technology. This broad theme refers to aspects of:*



Figure 14
The disembodied self.

This frame depicts the subtitle. The word 'disembodied' comprises distorted and manipulated letters, which are a metaphor of the way technology has enabled us to alter the self both physically (cosmetically) and metaphorically (personae on the Net), creating a 'crisis' of human identity. Script: *The disembodied self: showing how technology can alter the self, that is human identity.*



Figure 15
Fragmented realities.

This frame refers to the ability of computer technology (software) to fragment imagery without our awareness, bringing forth the notion of the truth of the image. The design of the word 'Fragmented' is fragmented in form, echoing its meaning. Behind the text appears an image of a painted eye, referring to our visual sight. Script: *Fragmented realities: depicting the ability of computer technology to fragment and manipulate our visual landscape, and ...*



Figure 16
The human–computer paradigm.

This frame depicts the use of warm and cold colours, evoking human and computer elements. Behind the words appears a distorted computer circuit image, between the two words appears a computer punch key with a + sign on it. The use of computer icons was specifically selected in the creation of this frame. Script: *The human–computer paradigm: referring to our psychological and metaphorical connection to computers.*

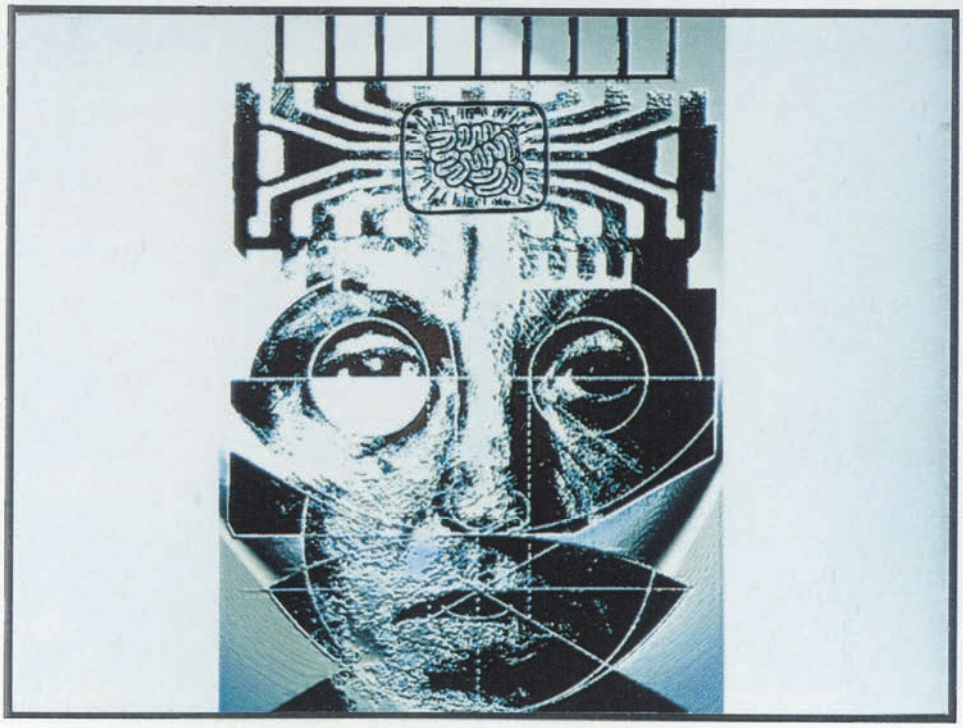


Figure 17
Face, computer chip and flashing brain.

This image subtly refers to the connection between hand-drawn imagery and that which is computer-aided. The relation between the brain, face and computer chip refers to the metaphorical relation of human intelligence to AI. Script: *Flashing electronic brainwaves make us question the way we think, feel and view ourselves.*

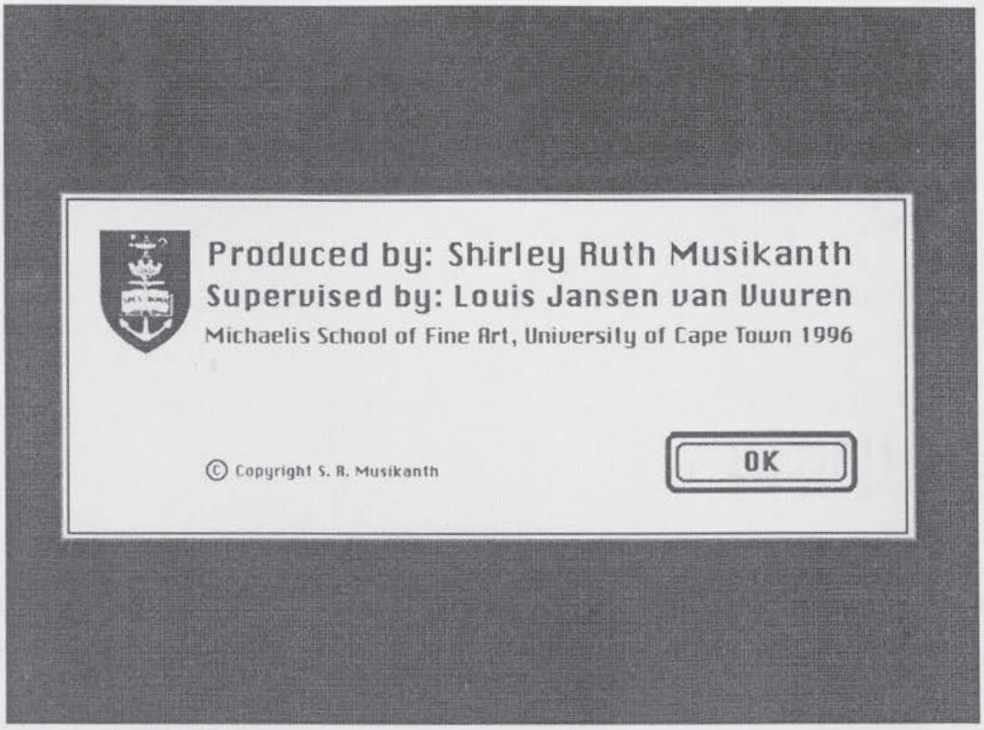


Figure 18
Computer message.

This frame depicts the use of computer screen message design, a device in which the producer's and supervisors' names are inserted.



Figure 19
Cyberspace.

This image refers to computer circuits. An image which was manipulated and distorted to create an illusion of depth. Script: *I now welcome you to a computerized simulated journey.*



Figure 20
Navigating through cyberspace.

This scene displays a red arrow 'opening' up the overview document by clicking on the various menu bar icons. Script: *We have become immersed in a technological environment. Have you ever worked on a computer before? If so, you obviously initially had to learn a whole new computer language. Terms such as file, open, close, save, cut and paste are but a few words in computer jargon.*



Figure 21
Time

Figures 21 to 23
Cogs and watches represent time, the waiting for files to be processed and read by the computer. Script: *The first file of this presentation will now be opened.*

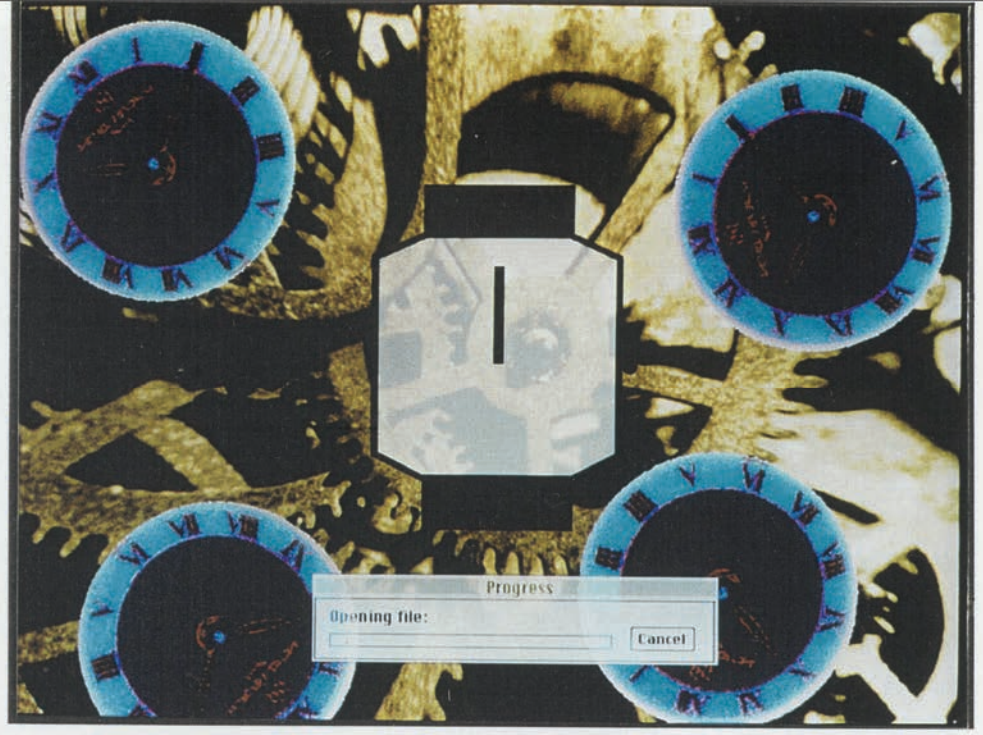


Figure 22
Time.

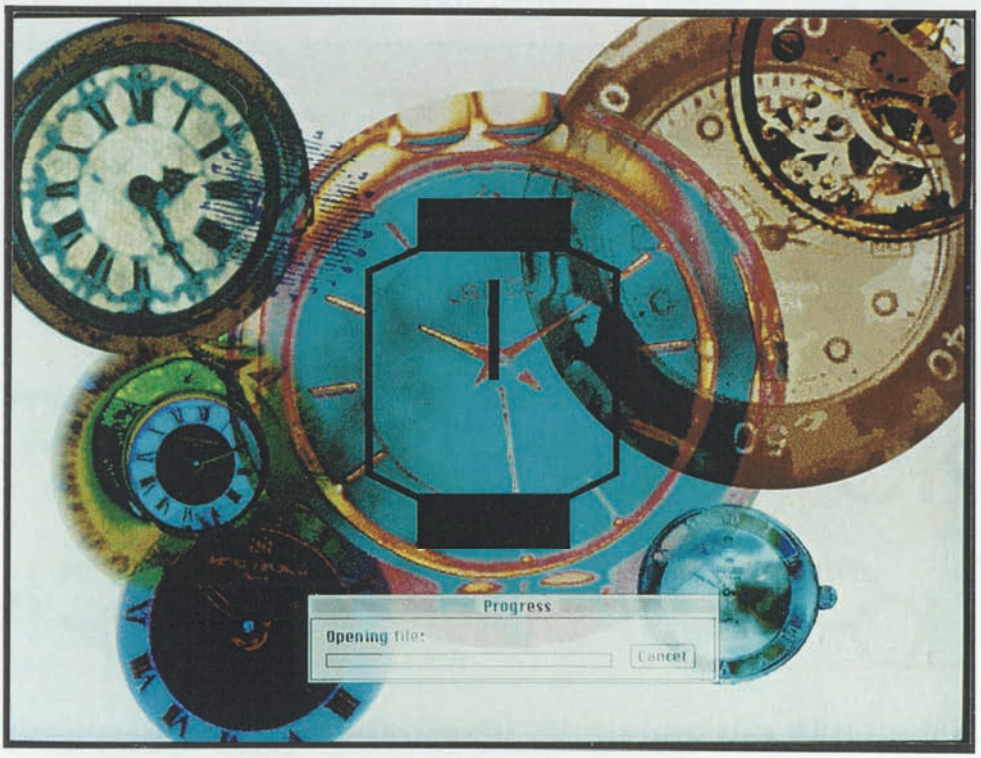


Figure 23
Time.

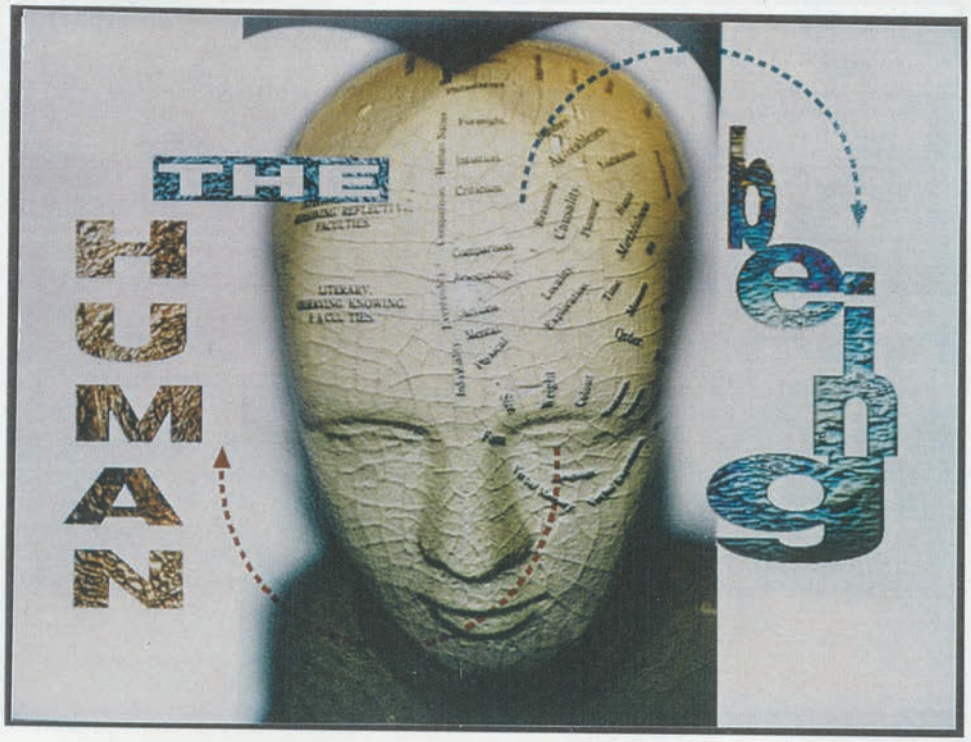


Figure 24
The overview: the human being.

This frame and the preceding frame depict human elements, the mind and soul, displayed as a visual introduction to the human being. Reference to the anatomical head refers to the historical misconceptions of the human mind and thought. Script: *This overview visualizes the essential issues of the presentation: the connection between the human being ...*

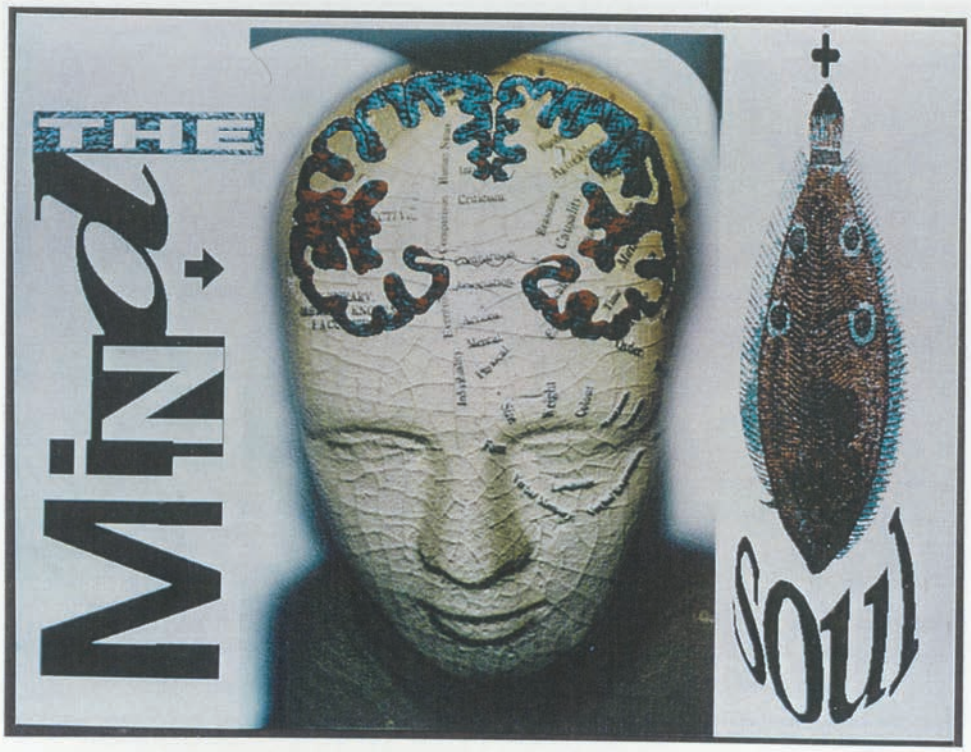


Figure 25
The overview: mind and soul.

The image of the sole is used as a visual pun for soul. Script: *... mind and soul ...*

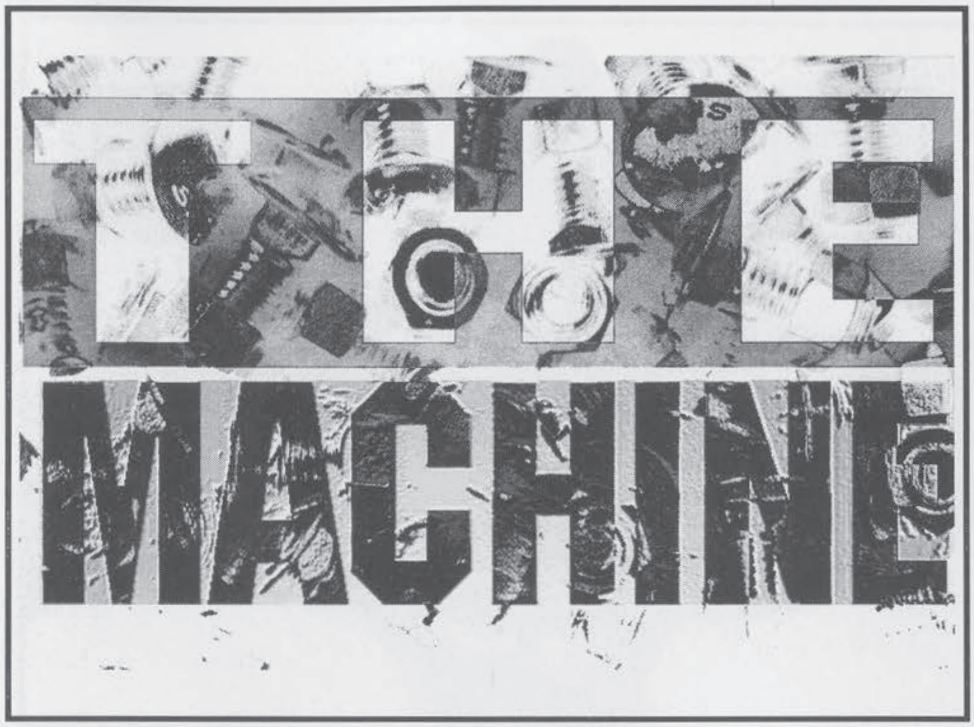


Figure 26
The overview: the machine.

This image displays angular structured words, 'The Machine', with cogs and screws layered over the words. Script: ... *and the machine ...*

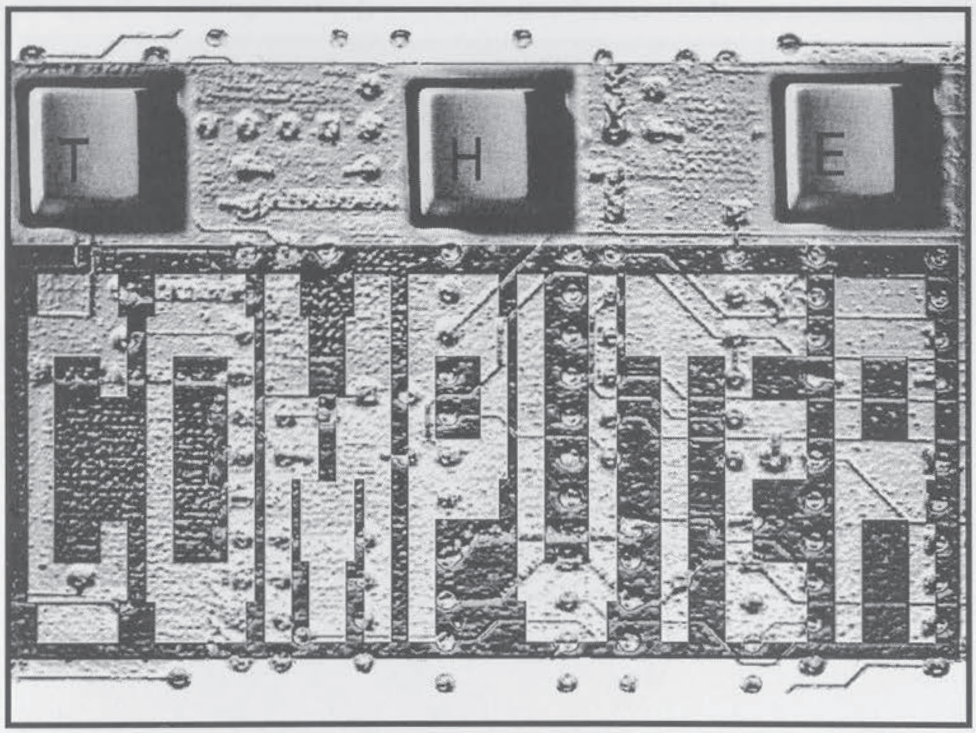


Figure 27
The overview: the computer.

This frame presents elements of computer circuits, hardware devices and binary notation layered over and above the word, 'The Computer' Script: ... *the computer.*

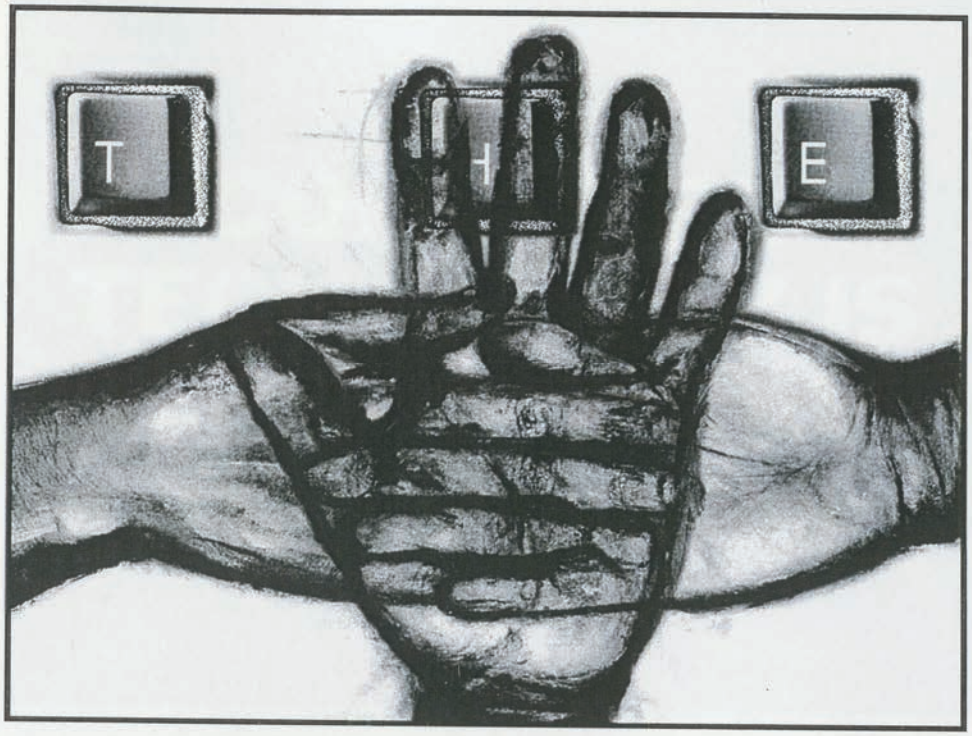


Figure 28
The overview: the connection.

Figures 28 and 29
This scene consists of various elements: computer punch keys, hand-drawn hands symbolizing the human touch, flesh against hard materiality. The word 'connection' is 'filled' with a manipulated computer circuit. This scene reflects on the connection between the human being and computer technology. Script: ... *a connection which has changed the way people relate to one another and the way communication has transformed.*



Figure 29
The overview: the connection.

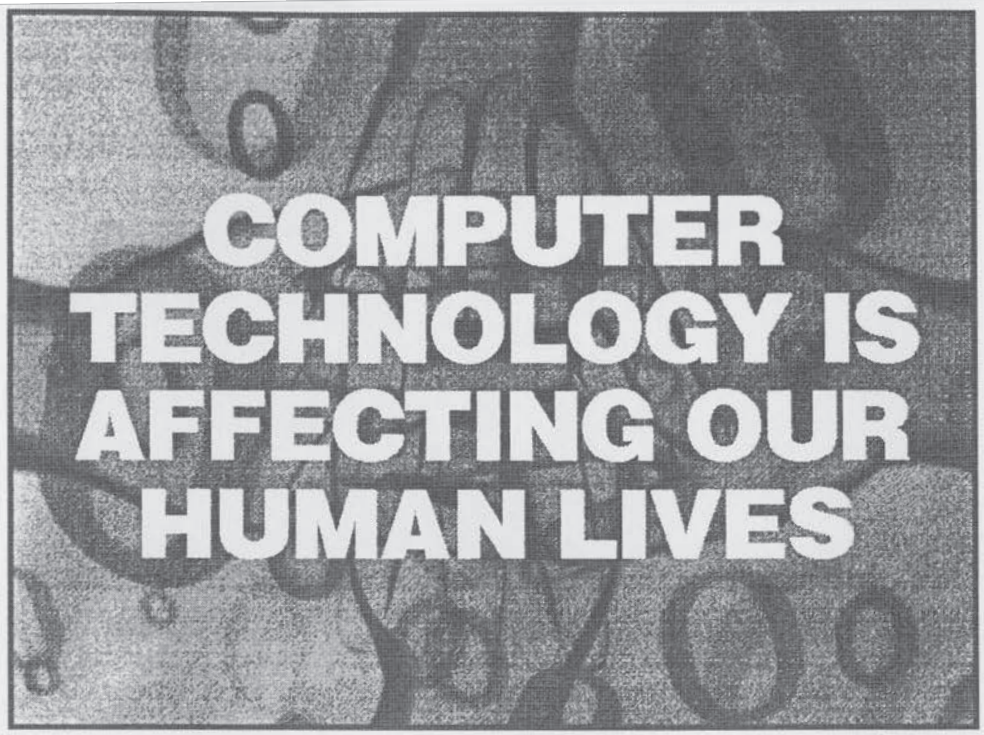


Figure 30
The overview: effect of computer technology.

Figures 30 and 31
This scene depicts a series of text reflecting on the effect of computer technology.

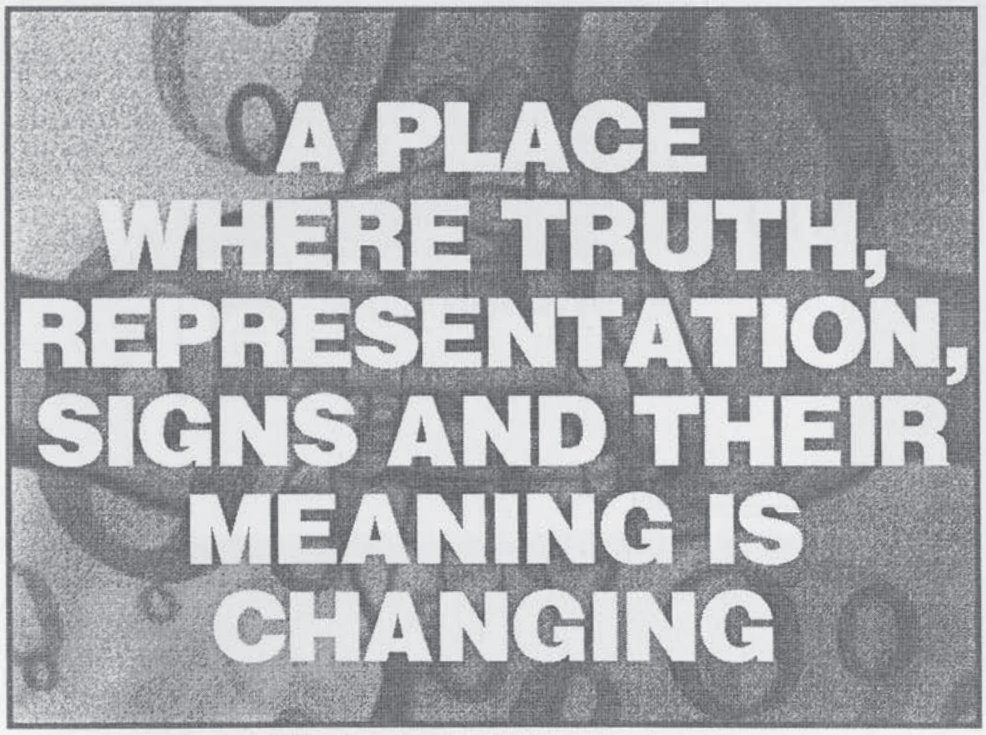


Figure 31
The overview: effect of computer technology.

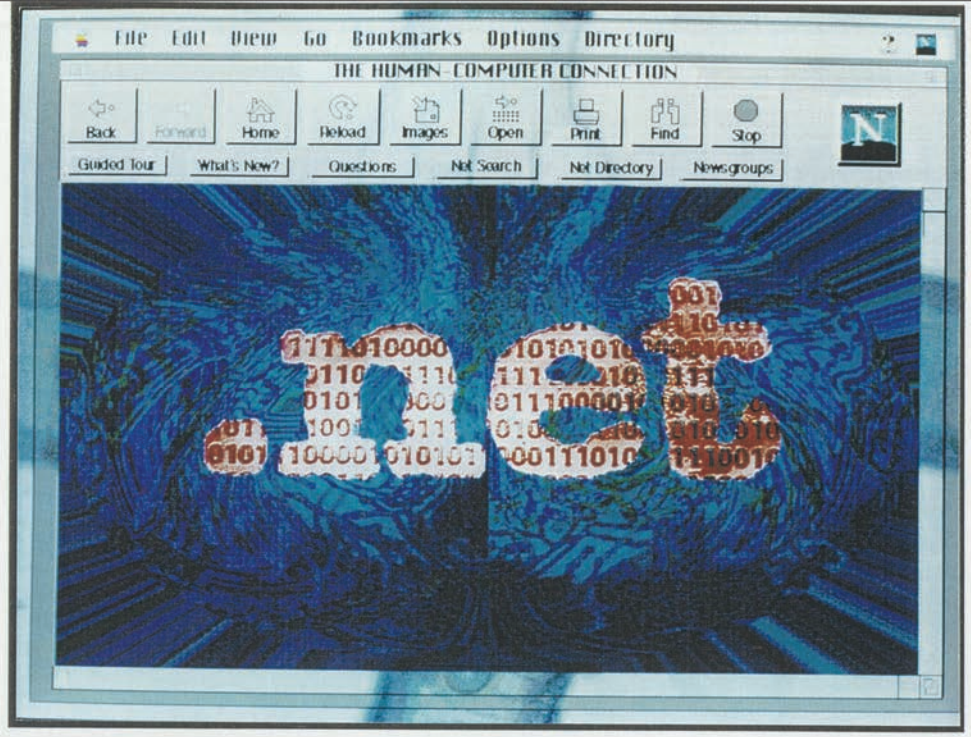


Figure 32
The overview: the net.

This image depicts the effect of computer technology on communication.

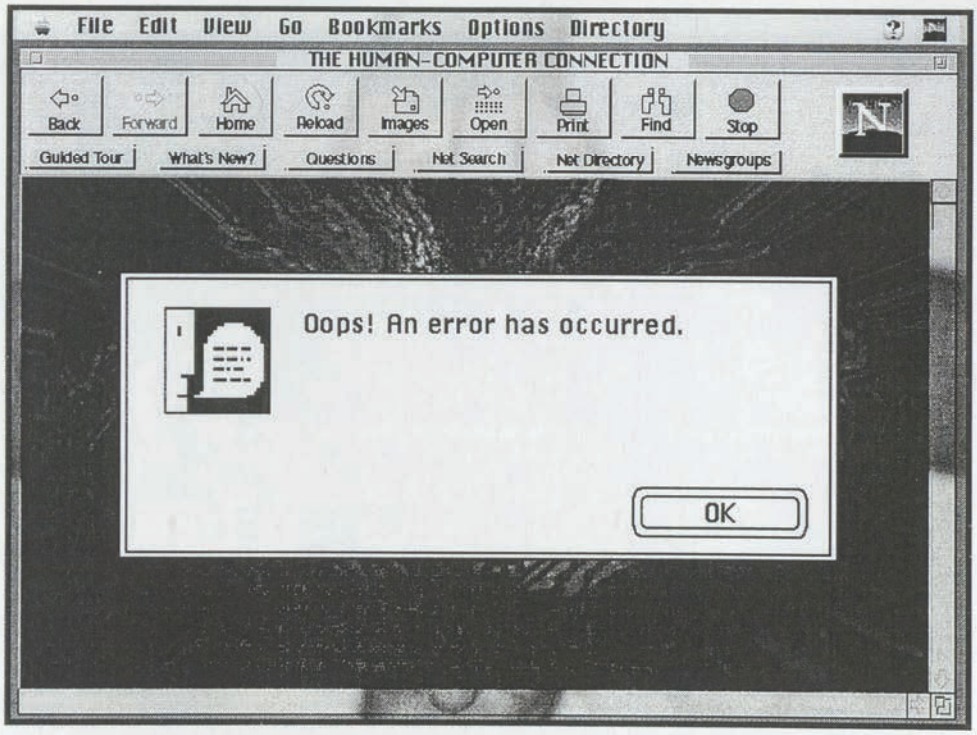


Figure 33
The overview: oops, an error has occurred.

This image refers to computer screen error messages and the use of subtle 'human' overtones by the use of terms such as 'Oops', 'Sorry', 'Welcome', as if the machine had emotional human characteristics. Script: *And so, our journey now takes us to the next issue, communication.*

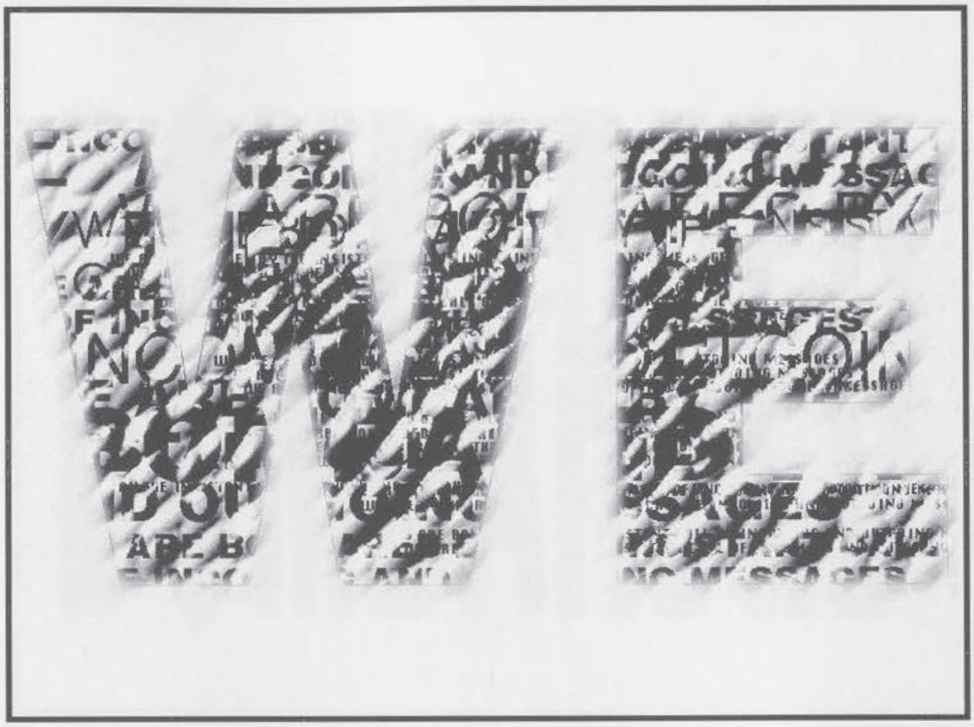


Figure 34
Scene: Messages.

Figures 34 to 43
These frames are created in black and white, imagery, which flashes at the viewer, creating a sensation of bombardment of messages and data. Script: *We live in a data-rich world where our environment is bombarded by digital information—of constant incoming and outgoing messages, which create a blast of aural and visual data.*

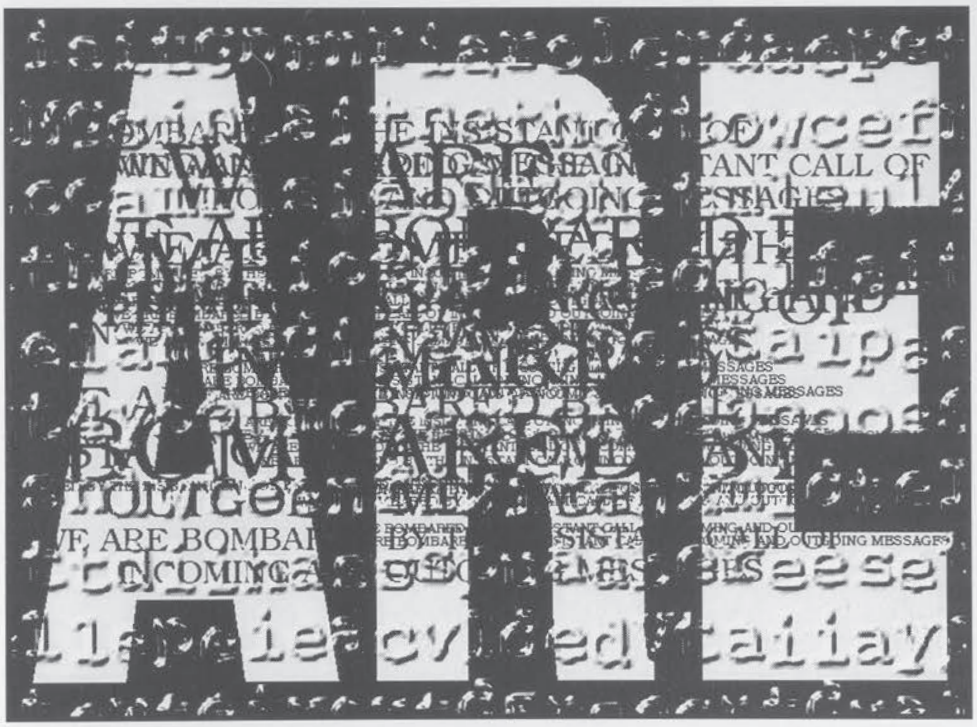


Figure 35
Scene: Messages.



Figure 36
Scene: Messages.



Figure 37
Scene: Messages.

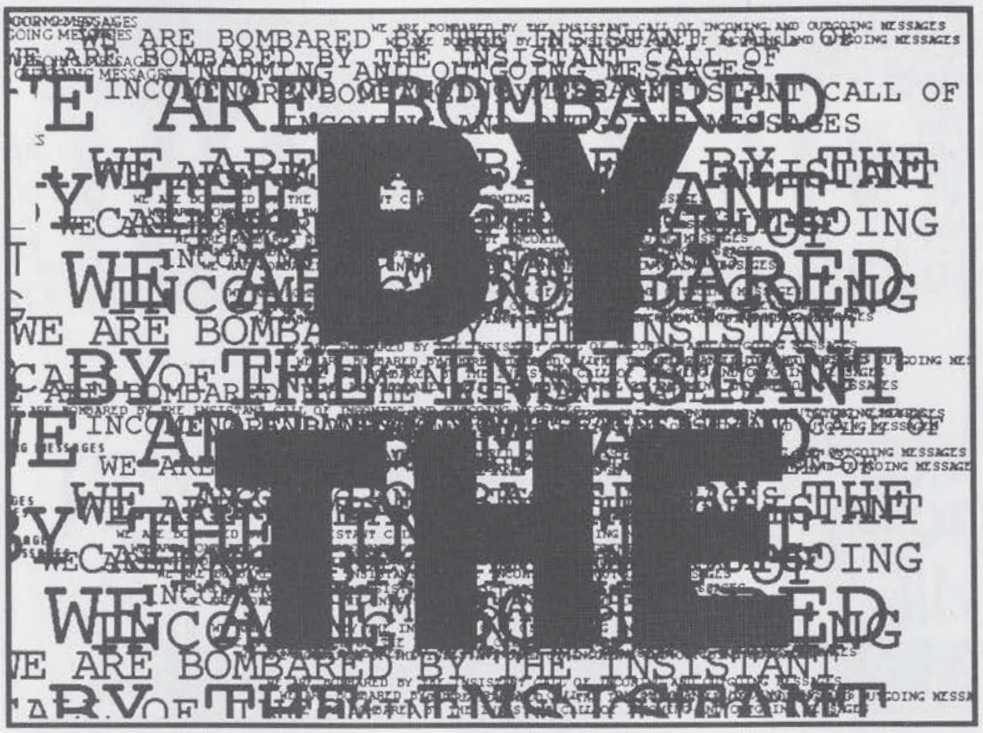


Figure 38
Scene: Messages.



Figure 39
Scene: Messages.

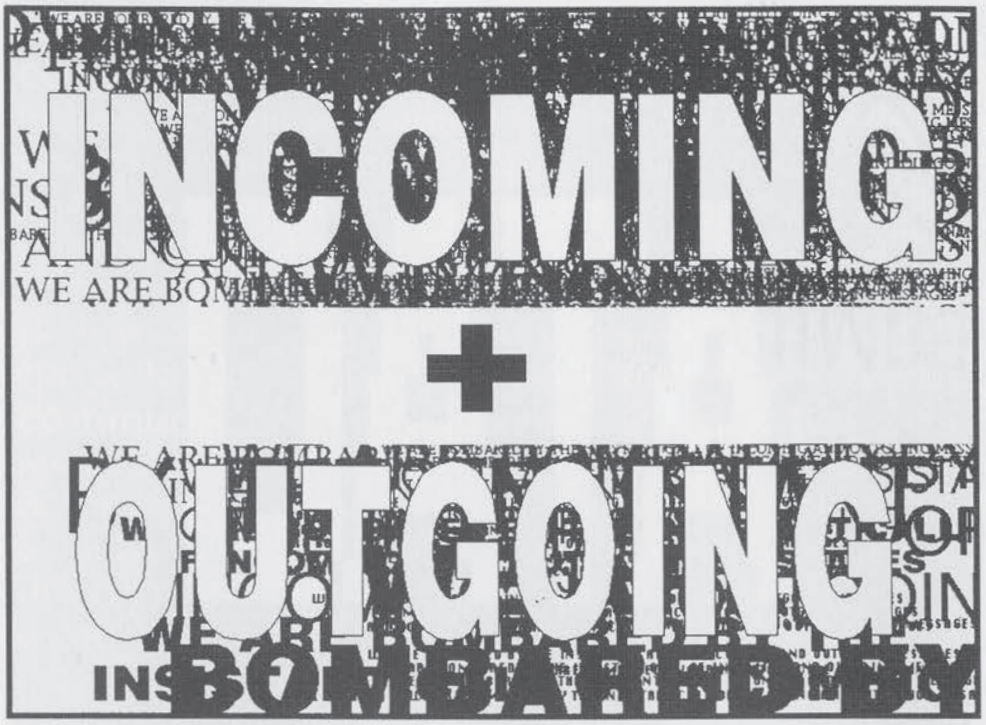


Figure 40
Scene: Messages.

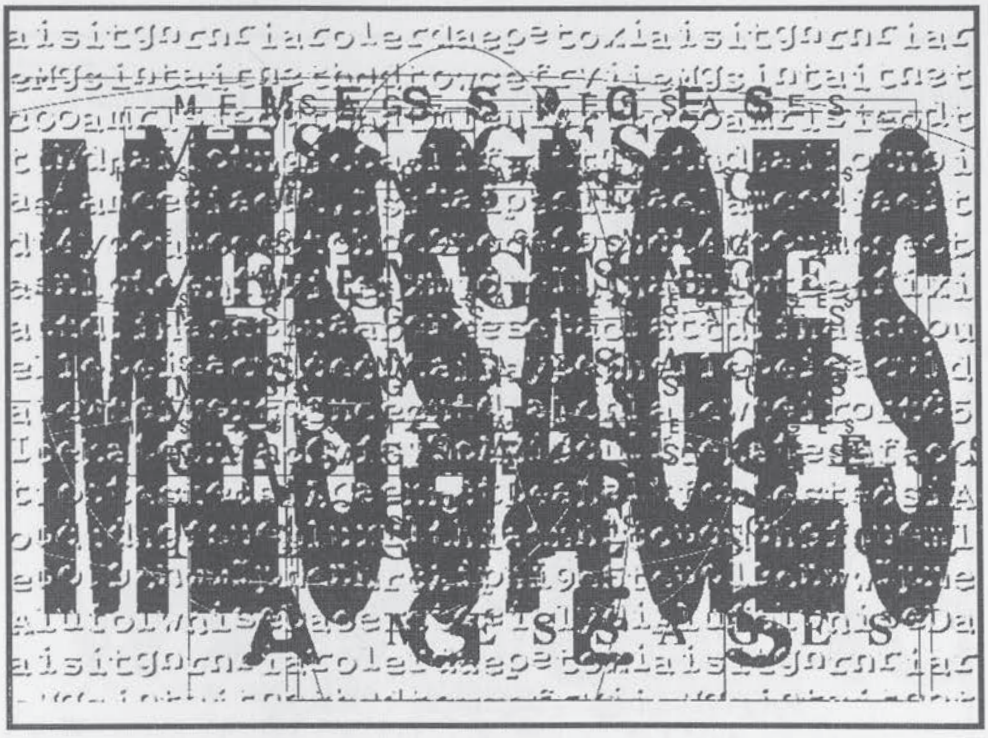


Figure 41
Scene: Messages.

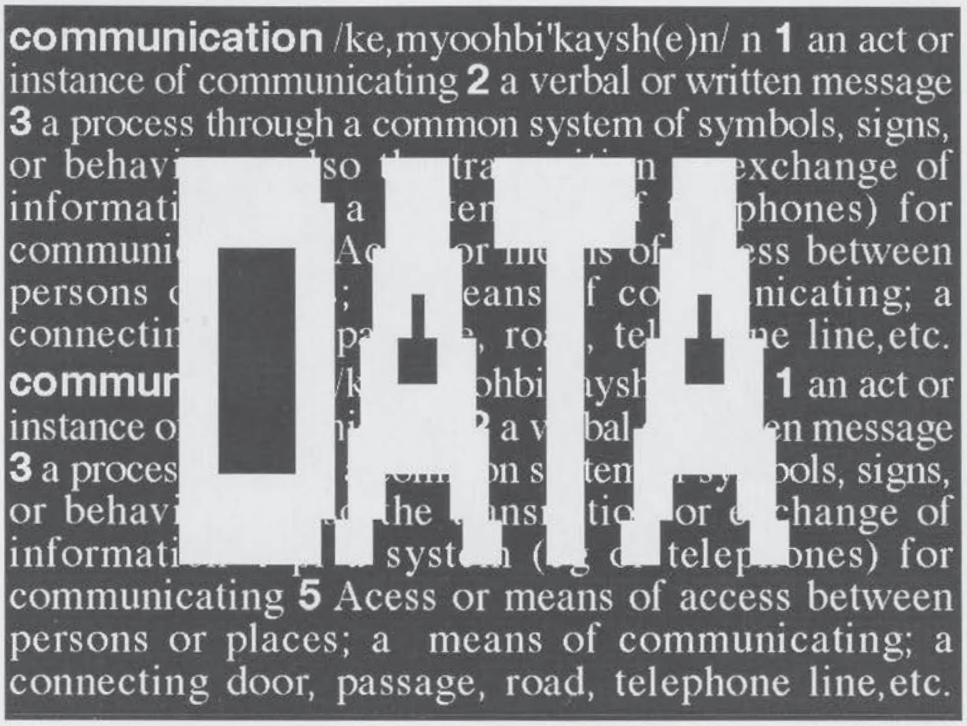


Figure 42
Scene: Messages.

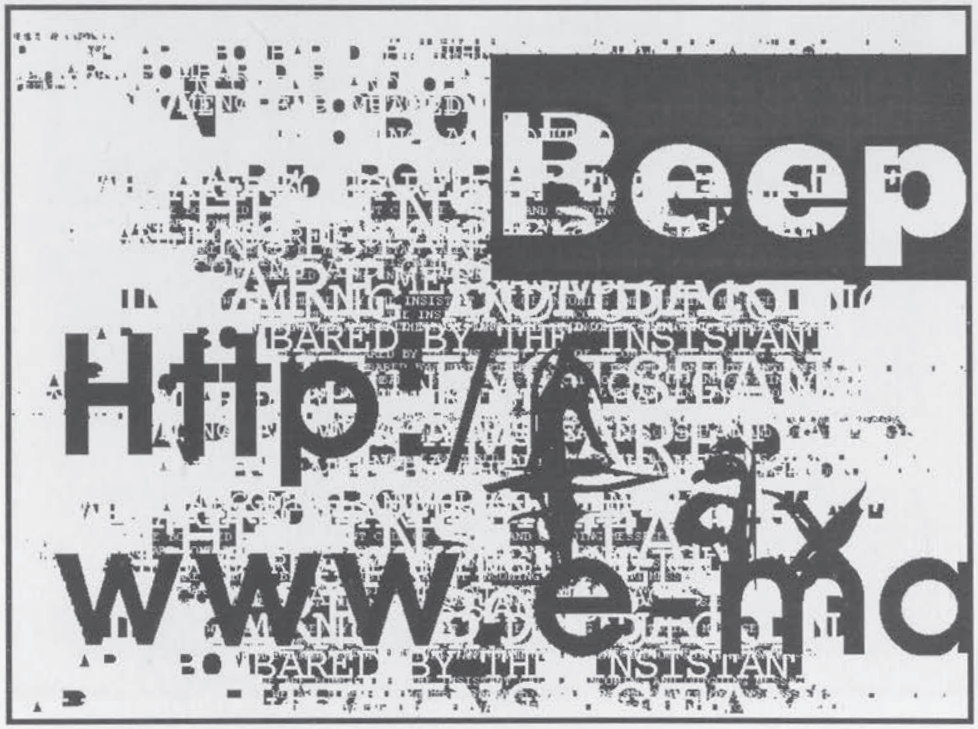


Figure 43
Scene: Messages.

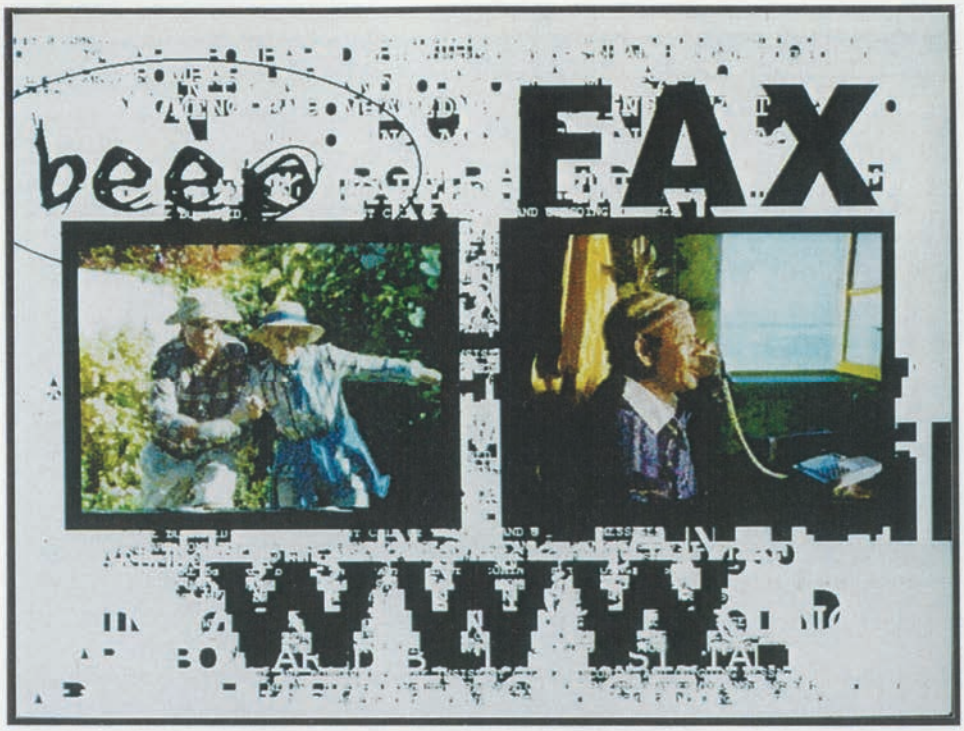


Figure 44
Commercial break

Commercial break. Specific commercial advertisements were recorded (Telkom, Vodacom) which comment on our technological environment and our dependence on technology (cell, telephone, computers) for communication.

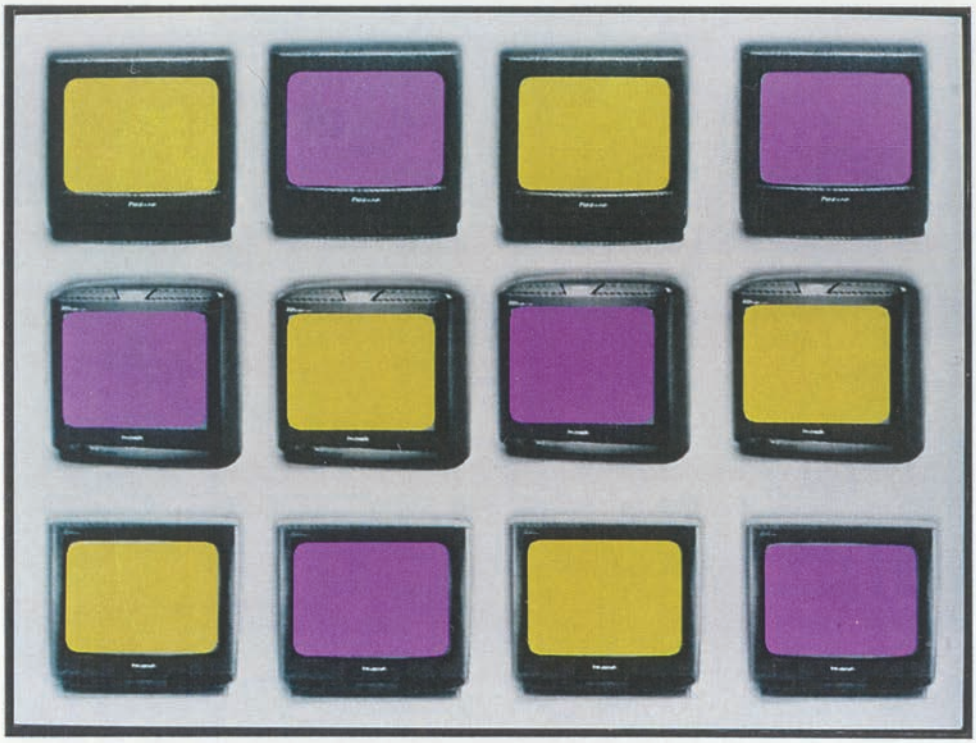


Figure 45
Electronic devices.

This scene presents the various technological devices we depend on. Script: *Computers, cellular phones, fax machines, televisions, e-mail, the Internet ... and numerous other electronic devices have changed our social landscape. Such devices have transformed our planet into one which is electrical, digital and virtual.*

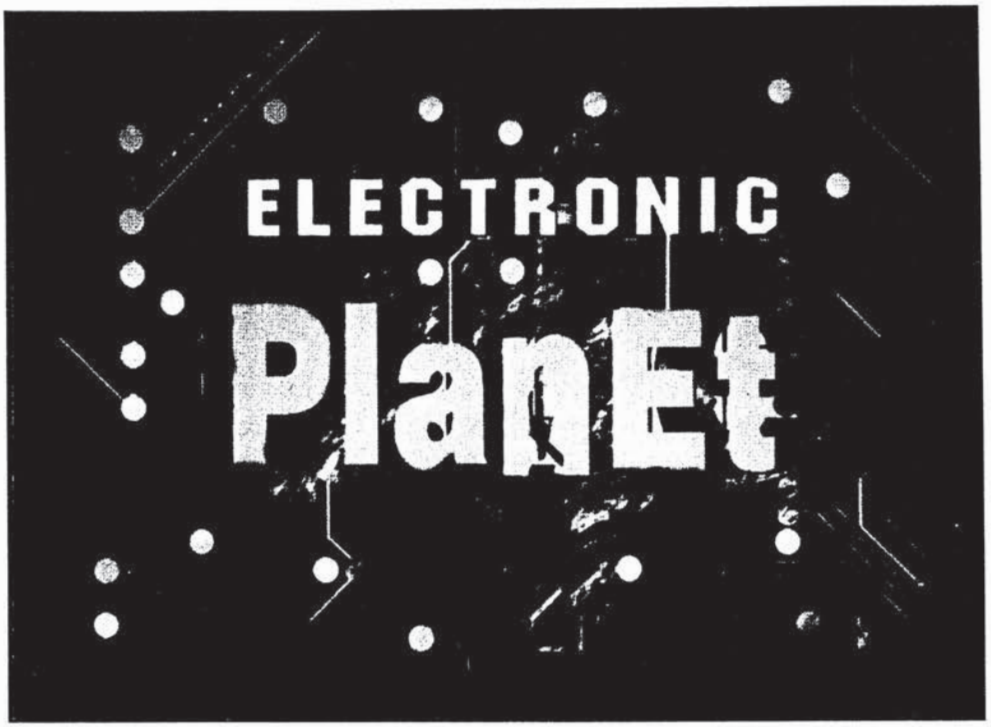


Figure 46
Electronic planet.

This image is a visual portrayal of this electronic planet. Script: *As well-known philosopher Marshall McLuhan stated: we have extended our central nervous system itself in a global embrace, abolishing both space and time.*



Figure 47
Electronic beehive.

Figures 47 and 49
This scene visualizes a quotation referring to our electronic environment using visual references to beehives and computer motherboards. Script: *Buzz, buzz, all these electrical impulses over computer networks are making us into a swarm of bees.*



Figure 48
Electronic beehive.

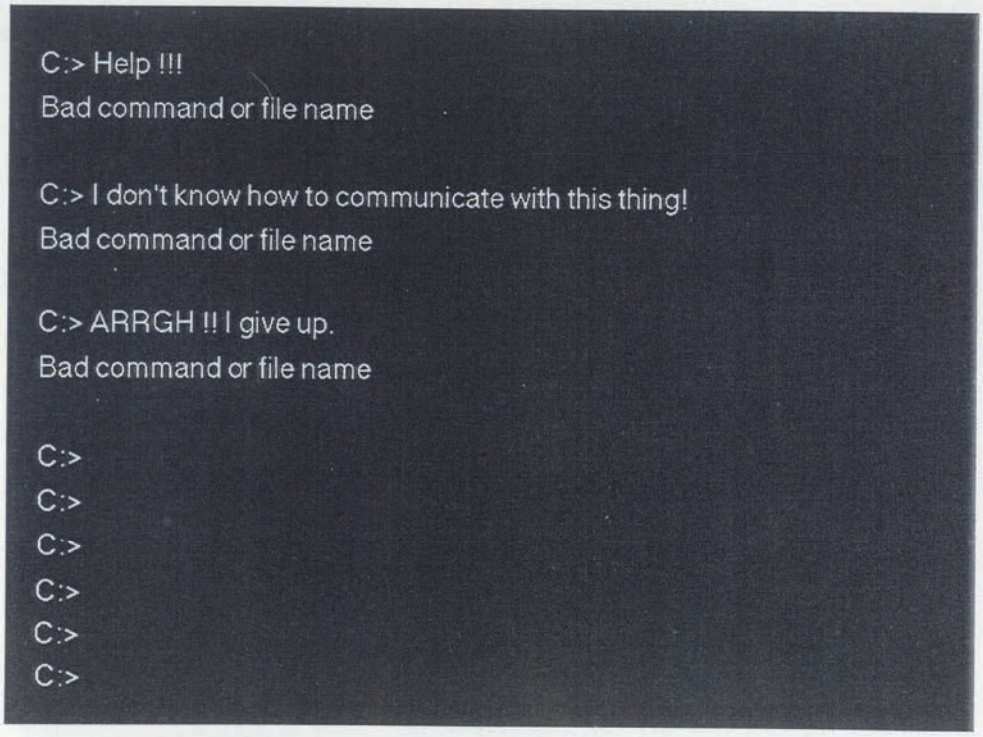


Figure 49
Computer environment .

Script: *Bad command or file name.*



Figure 50
Communication.

Figures 50 and 52
Both frames use computer punch keys to make up the words— a 'message'. Each punch key presents various language icons, an inter-cultural form of communication created by computer technology. Script: *These electrical networks have developed a global village of communication where all cultures can connect with each other, through the World Wide Web.*

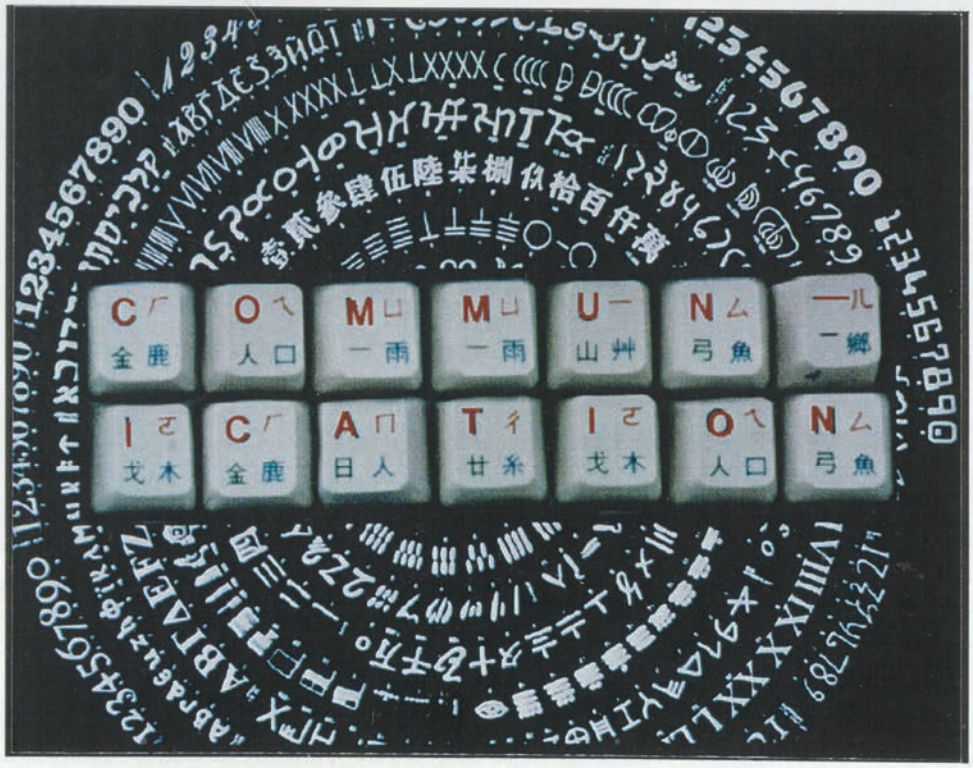


Figure 51
Communication.

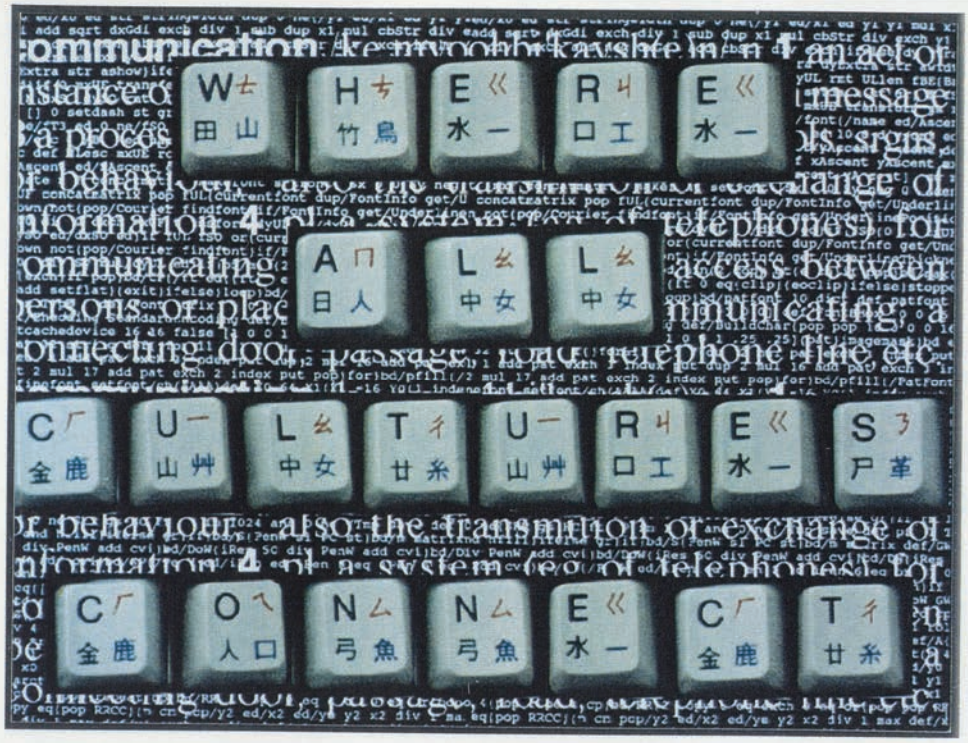


Figure 52
Where all cultures connect.



Figure 53
Faces, races.

Figures 53 to 55
This metaphorical scene presents illustrated imagery of a few culture groups. With the development of computer technology, all cultural groups have become 'wired' together in a digital, virtual connection. Script: *We live in a digital world where difference and heterogeneity are wired together—a world of textured faces transparently connected in a virtual, intangible and non-physical way, a cyberspace where our minds, or should we say voices, travel through computer networks of zeros and ones.*



Figure 54
Faces, races.



Figure 55
Faces, races.

This frame depicts the combination of a hand-drawn image with a web layered over the face, a metaphor for the World Wide Web.

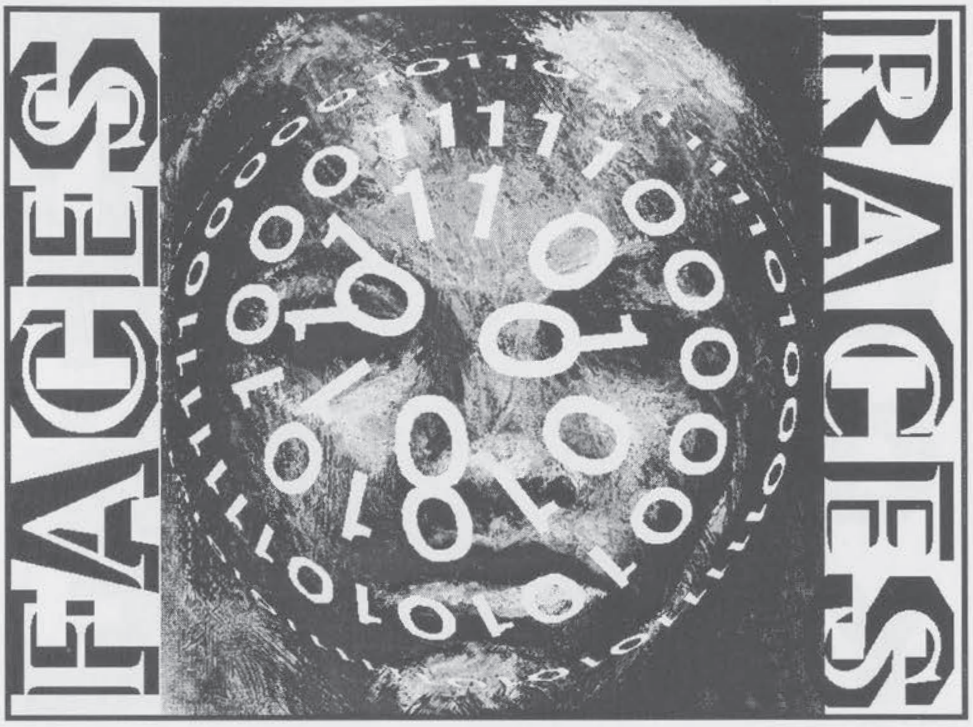


Figure 56
Digital connection.

This scene brings forth the question of human identity, where everything is reduced to digits, zeros and ones, pixels. An identity that can be transformed and created digitally. Script: *And so the self, in a sense, is disembodied, split and digitized, where the mind can metaphorically disconnect form its body over digital networks.*



Figure 57: Identity

Figure 57 to 59
'The body is viewed as an instrument which may be adjusted to suit the taste of the owner ... it is perceived as nothing more than an item wrapped in skin. A post-human form freed from genetic code and a freedom to reinvent and transform'. These frames depict the manner by which forms can be digitized, altered, fragmented and manipulated via computer software. Script: *You can be anyone you want to be because no one knows who you really are behind the screen. People create personae over computer networks.*



Figure 58
Fragmented face.

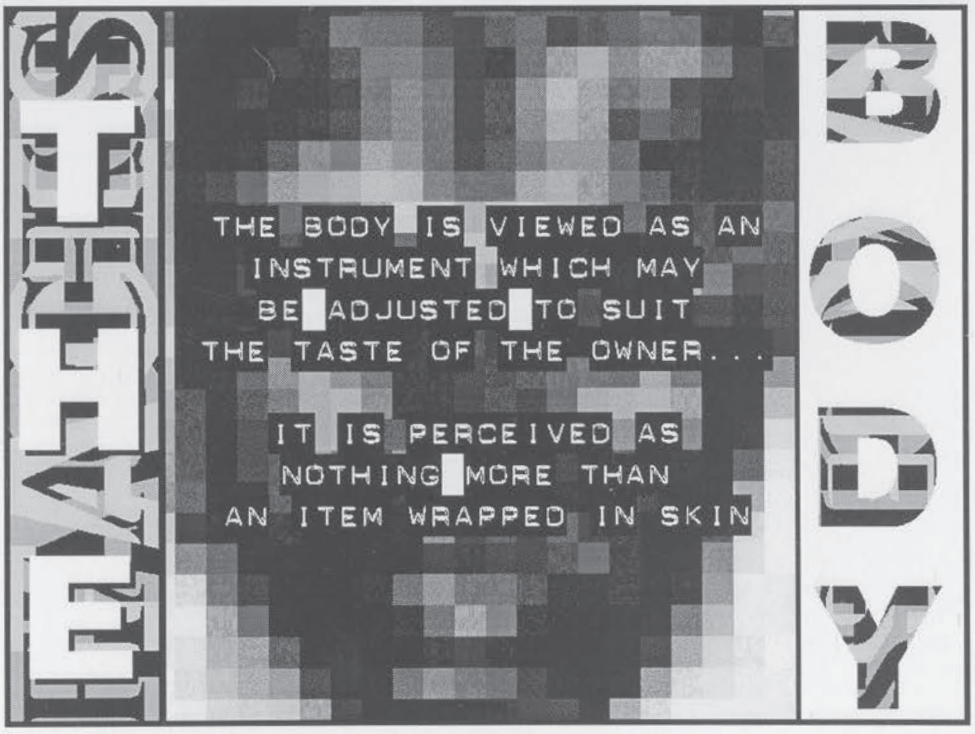


Figure 59
Multiple identity.



Figure 60
Distorted faces.

Script: *You can also change and create your physical identity through cosmetic surgery, just look how easy it is with a click of a button—not that you'd want to be any of these faces!*



Figure 61
Media and self.

Script: *Even in the realm of advertising, human identity is also created and disembodied through produced marketed stereotypes and gender roles.*



Figure 62
Digitized self.



Figure 63
Media scene.

Script: *What do these false masks of mass-media present?*
A consumer and customized image which brainwash and bombard the spectator's psyche.



Figure 64
Media scene.



Figure 65
Media scene.

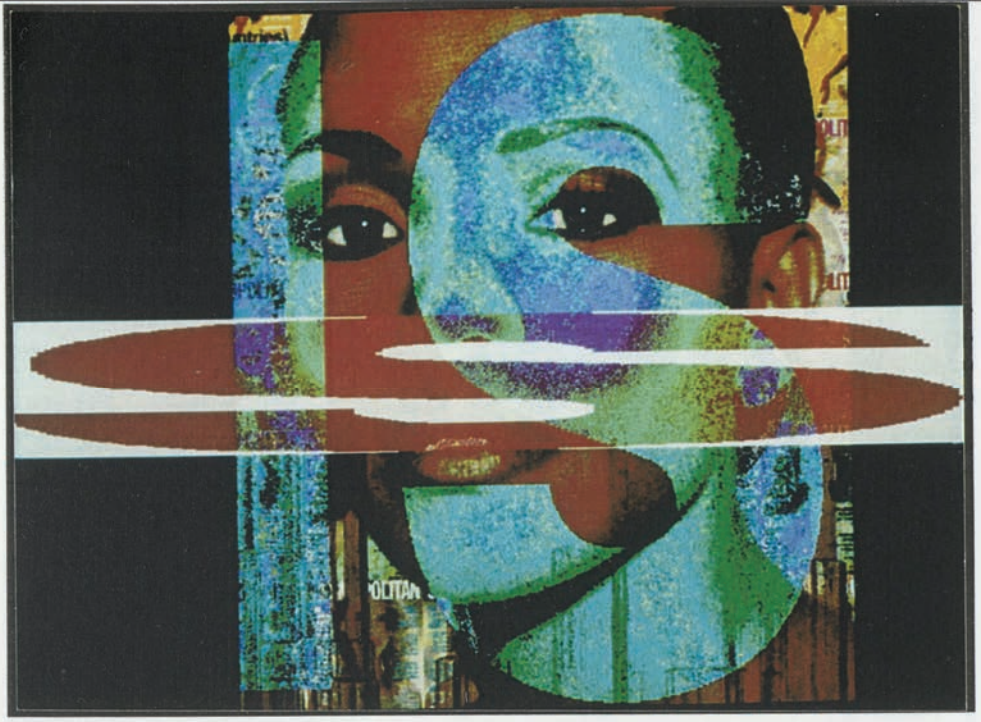


Figure 66
Media scene.



Figure 67
Commercial break.

This selected advertisement (Liquifruit) comments on the effect of media on human identity.

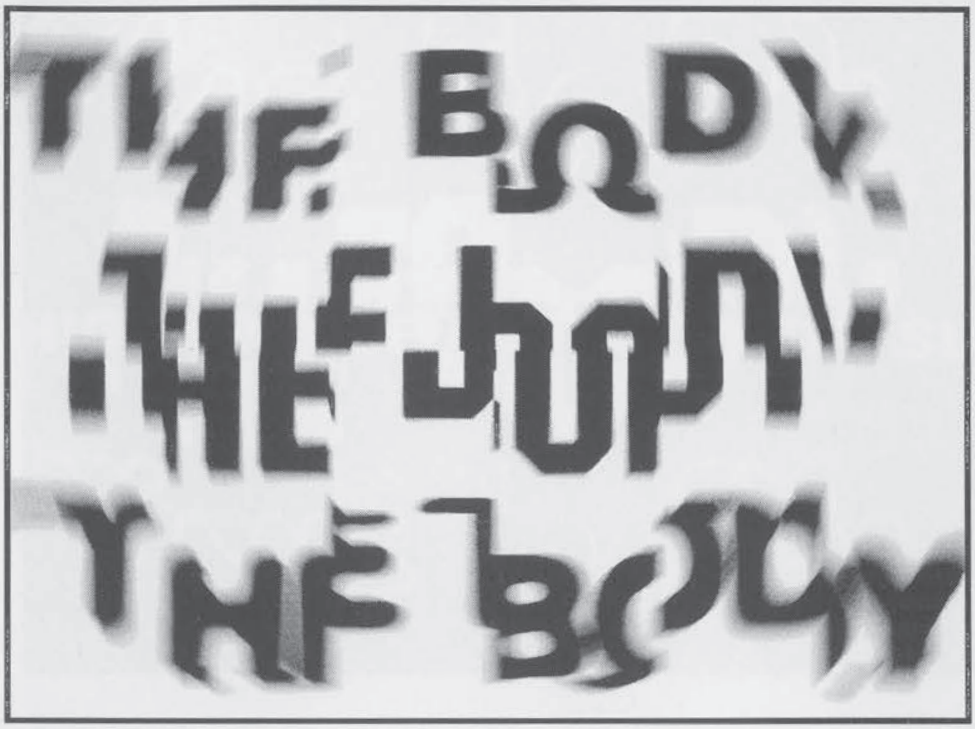


Figure 68
The body.

Script: *The human body has therefore become scrutinized by many of our technological devices, a place where our identity is multiple and in constant flux. But that is not the only affect technology has on us. With computer software manipulation, the truth of an image is unstable.*

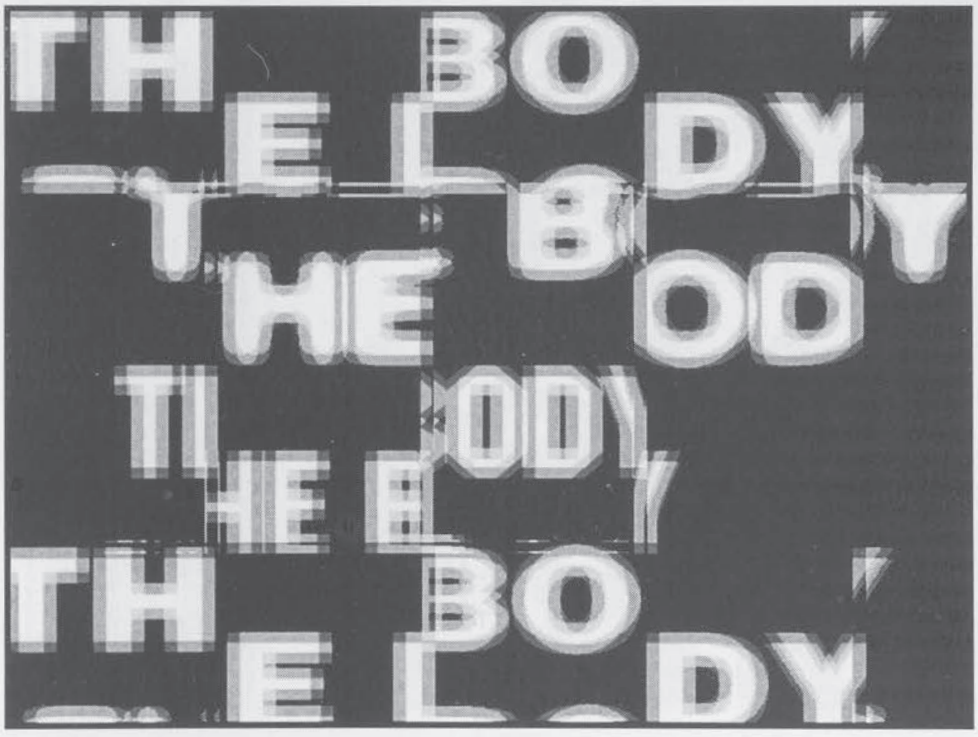


Figure 69
The body.

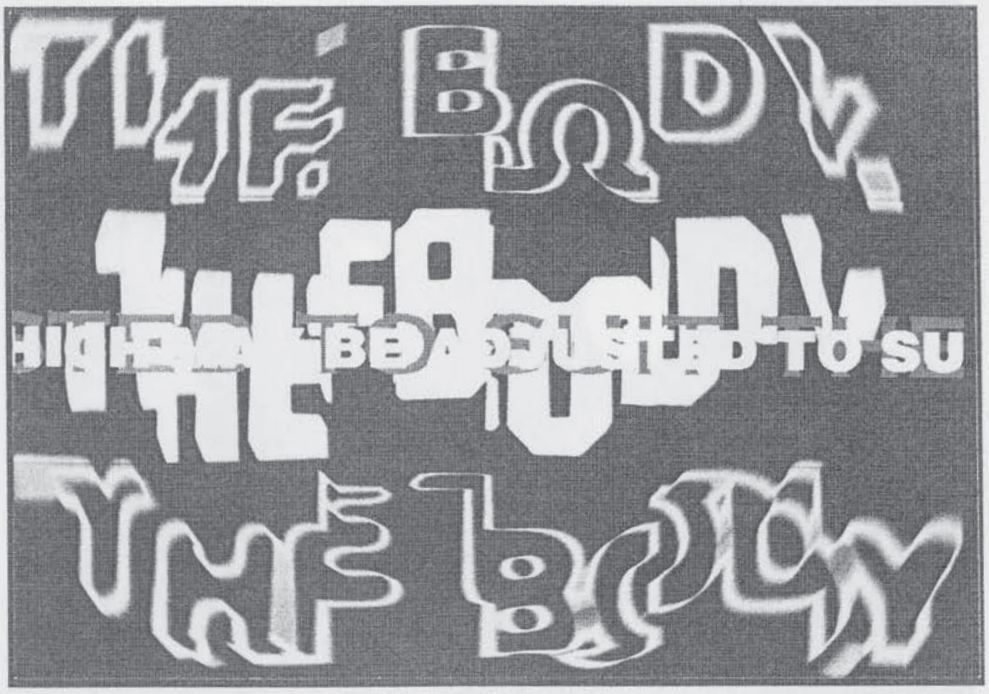


Figure 70
The body.

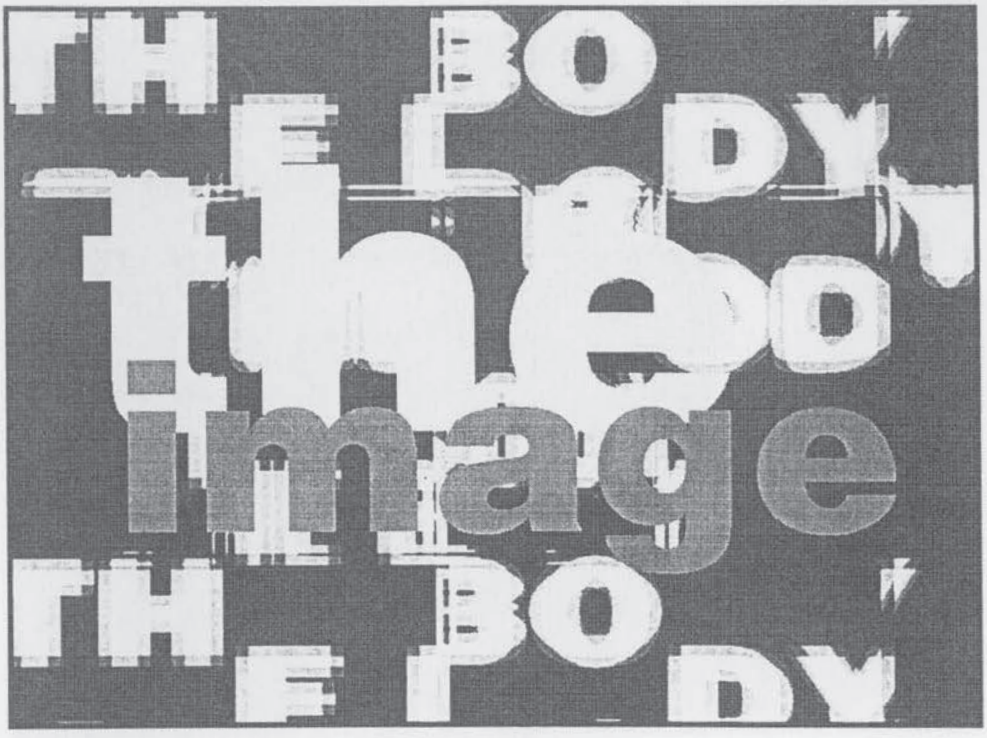


Figure 71
The image.

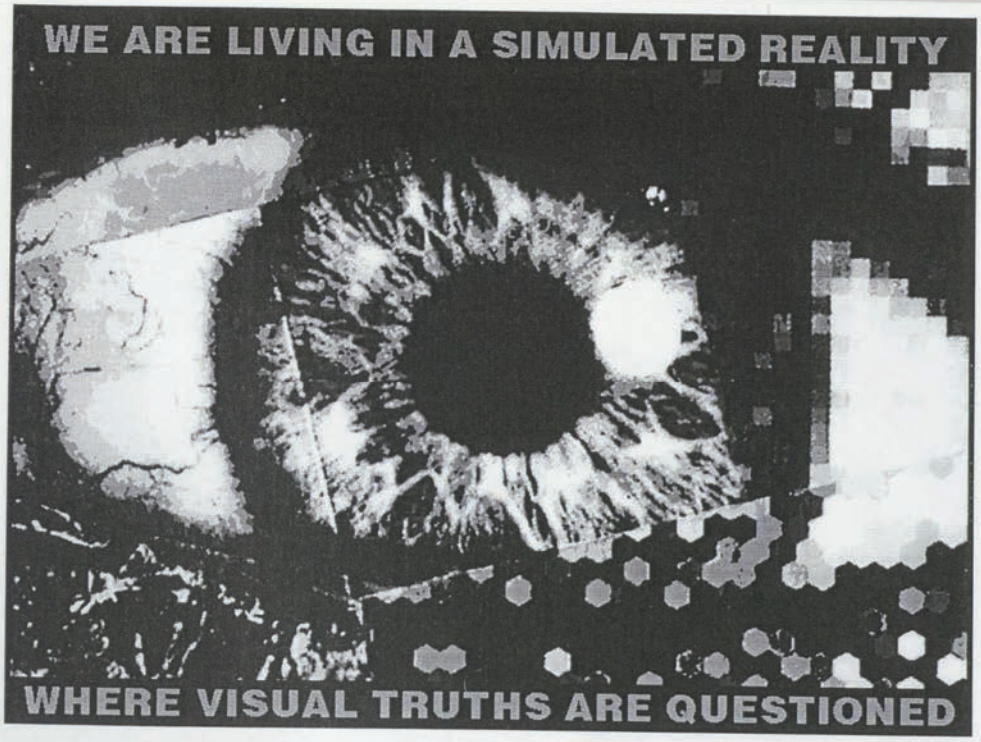


Figure 72
Simulated reality.

Script: *Is there truth in what we see, is seeing no longer believing? Our visual perceptions of 'reality' are being distorted and fragmented via computer technology, and thus constantly transformed. Boundaries between real and virtual, truth and reality are eroding, creating a myth of representation. The truth of appearances is being questioned.*

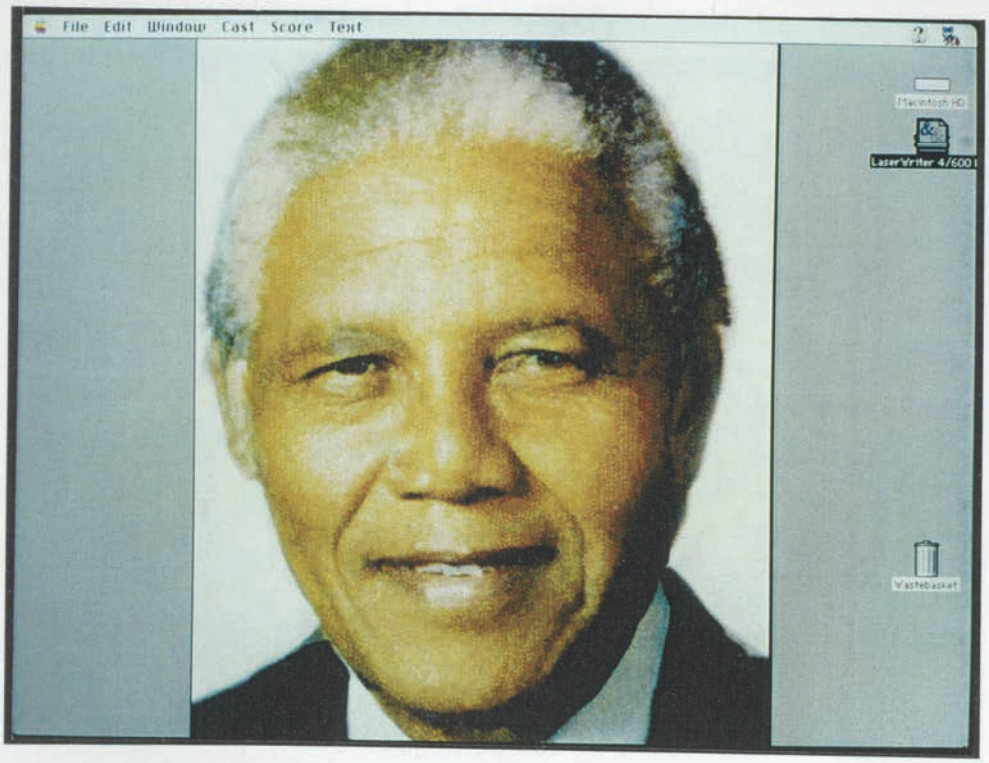


Figure 73
Political personae—distorted.

This scene depicts the morphing of F. W. de Klerk into Nelson Mandela, commenting on the ability of computer technology to distort and fragment the truth of the image. Script: *Even our political leaders attempt to camouflage themselves as presidents—personalities who are also distorted via mass-media.*



Figure 74
Self with painted Picasso face.

Figures 74 to 77
This scene depicts the distortion of Picasso's *Les Demoiselle De Avignon* 1917 which comments on the notion of fragmented realities. Script: *The notion of computer-manipulated images is further displayed by my distortion of Picasso's Les Demoiselle de Avignon of 1917*



Figure 75
Art distortions.

Script: *The digital image is synthetic and can perpetrate violence and distortion of original visual forms and content. The surface image comprises dark and light pixels which can be individually altered, manipulated and repositioned without the viewer's awareness.*

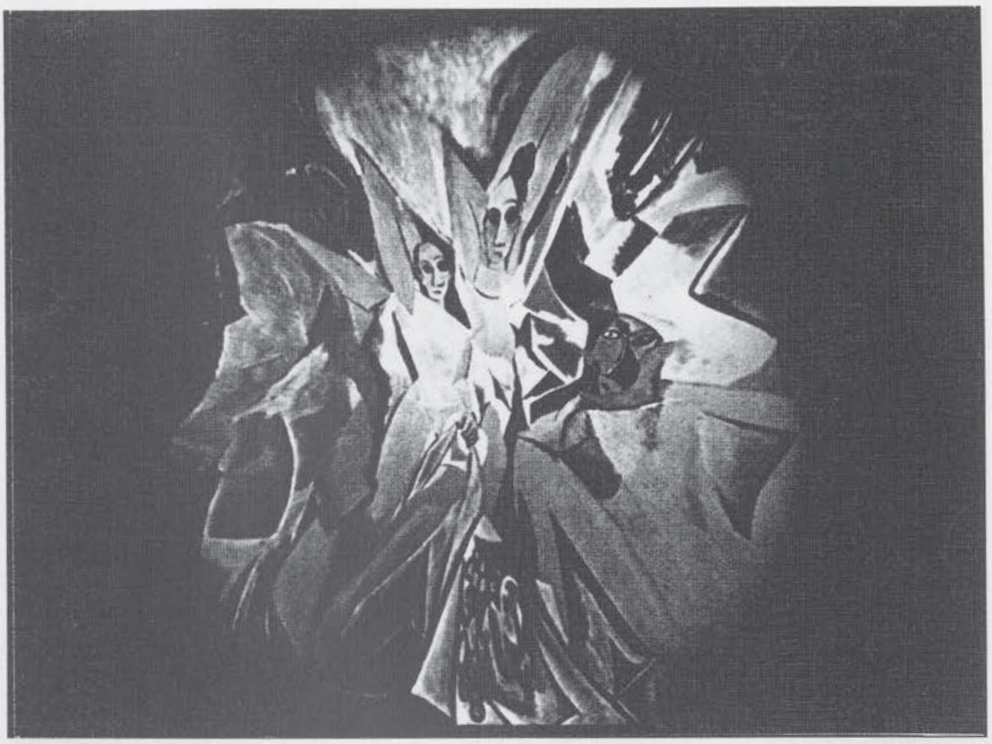


Figure 76
Art distortions.

Script: *Seeing is therefore definitely not believing and reality is truly fragmented. As a result, computer technology has developed a simulated reality, a phantom reality within a techno-surreal landscape, of floating images and text filled with a variety of colour, form, shape, texture, contrast and luminosity.*

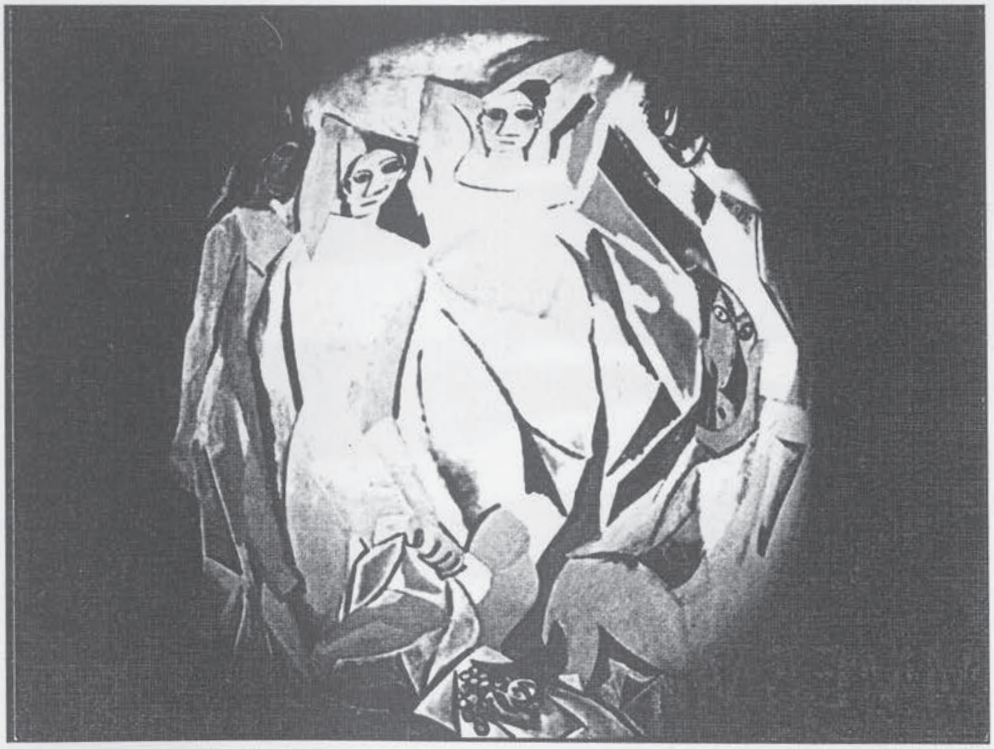


Figure 77
Art distortions.

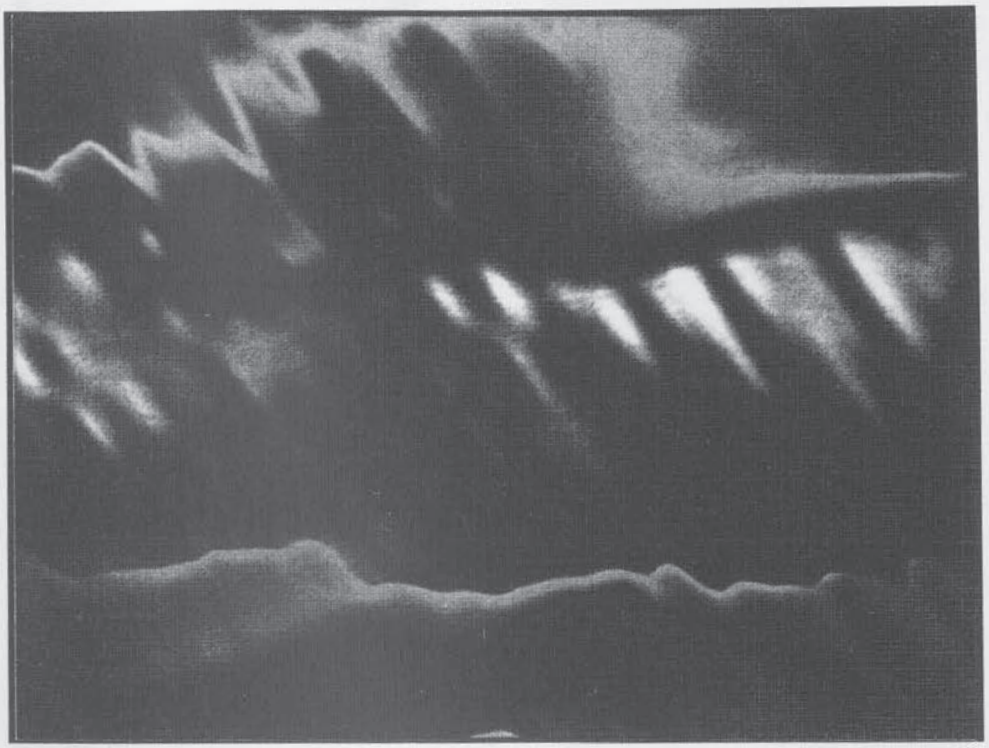


Figure 78
Techno-surreal landscapes.

Figure 78 to 83
Script: *Our visual landscape has become saturated with images screaming for our attention as Virilio stated: images have become munitions, weapons which attack our visual senses.*



Figure 79
Techno-surreal landscapes.



Figure 80
Techno-surreal landscapes

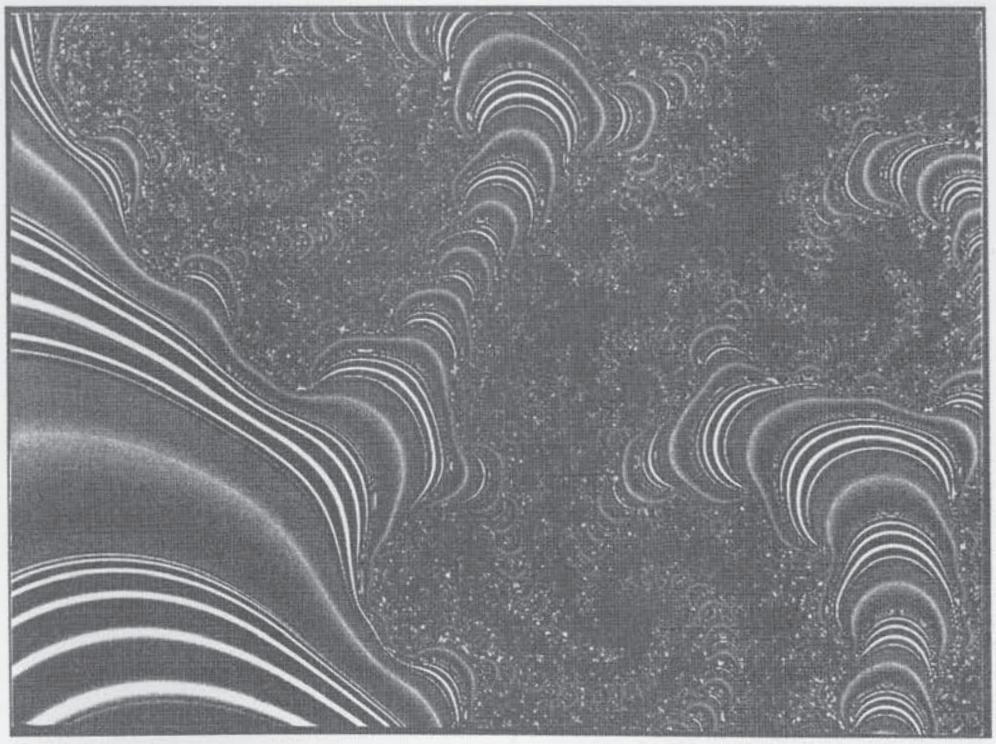


Figure 81
Techno-surreal landscapes.

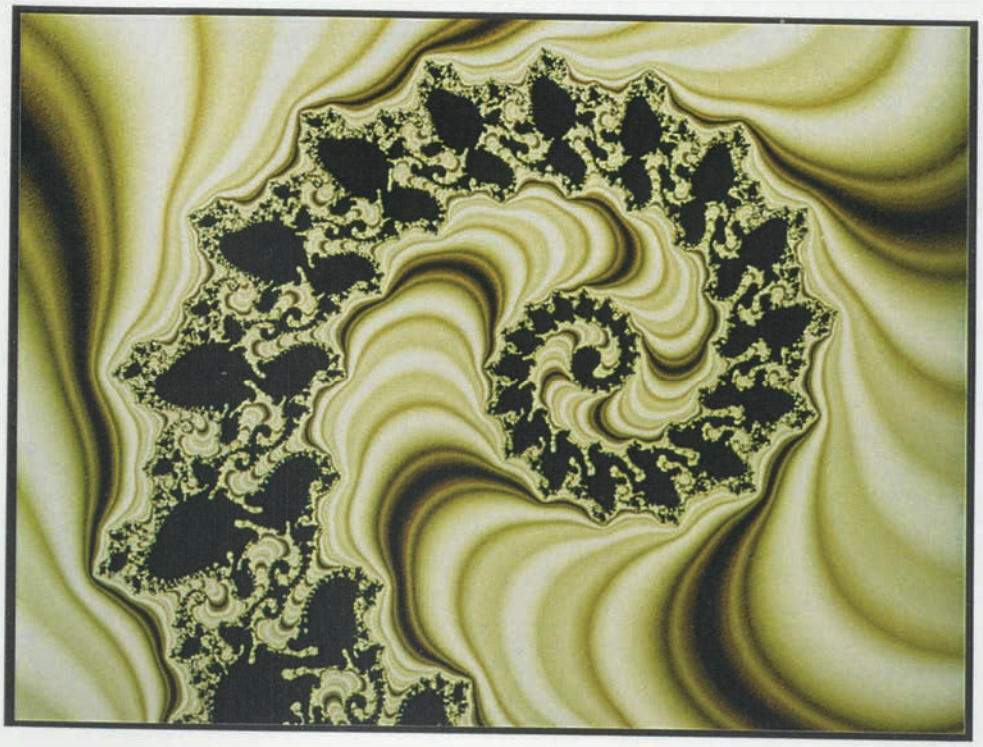


Figure 82
Techno-surreal landscapes

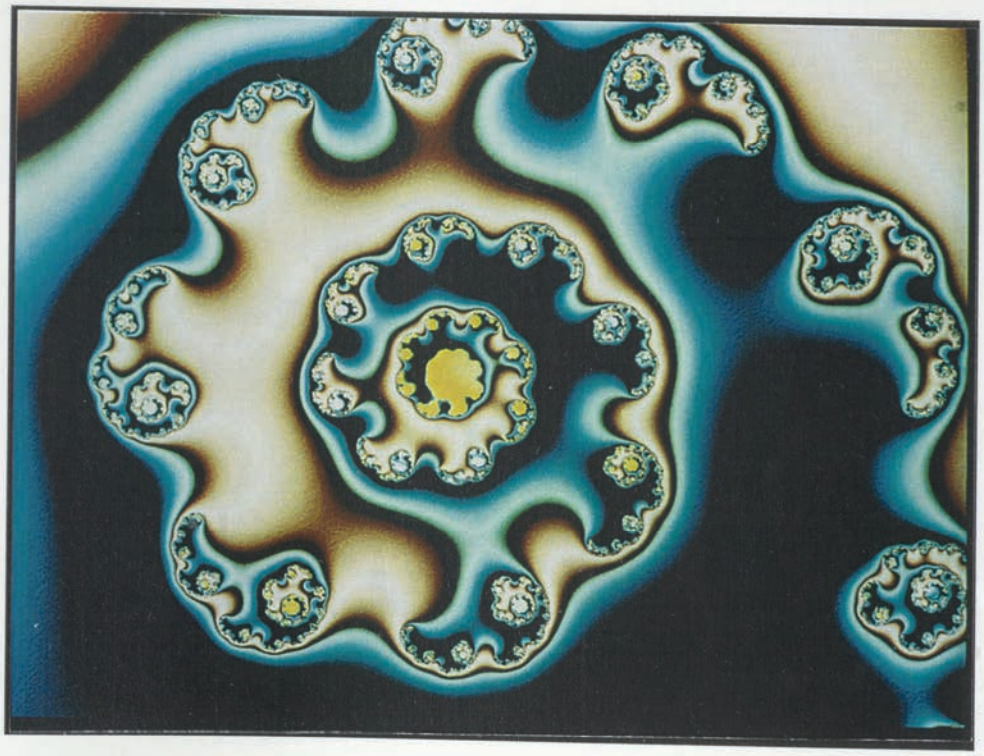


Figure 83
Techno-surreal landscapes.

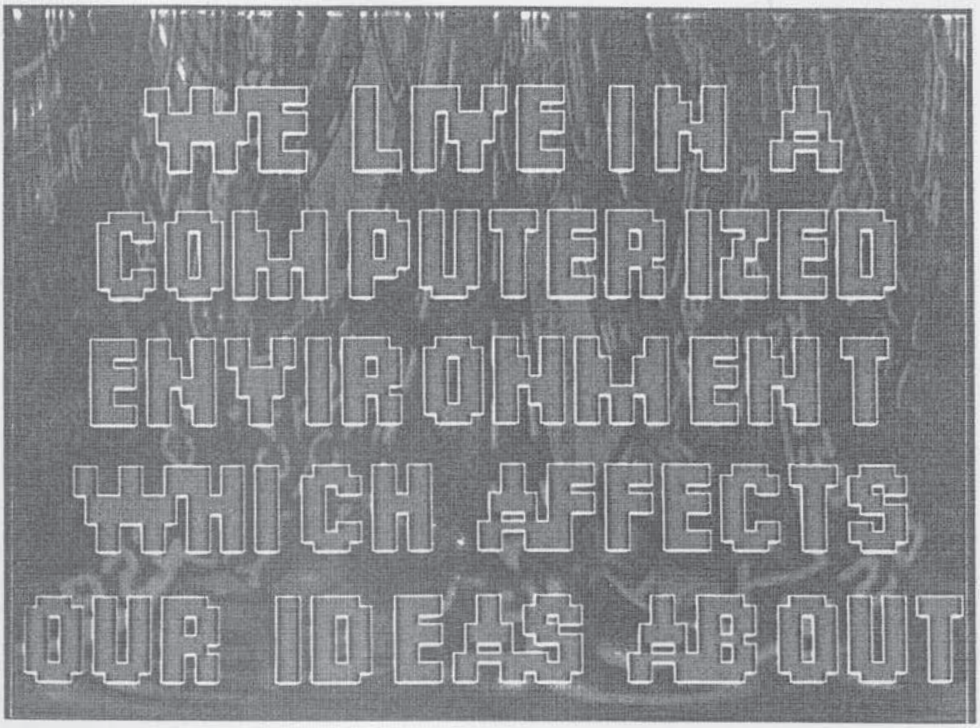


Figure 84
Computerized environment.

Script: *This computerized technological environment not only alters our visual senses but also our psychological and metaphorical relation with computers.*

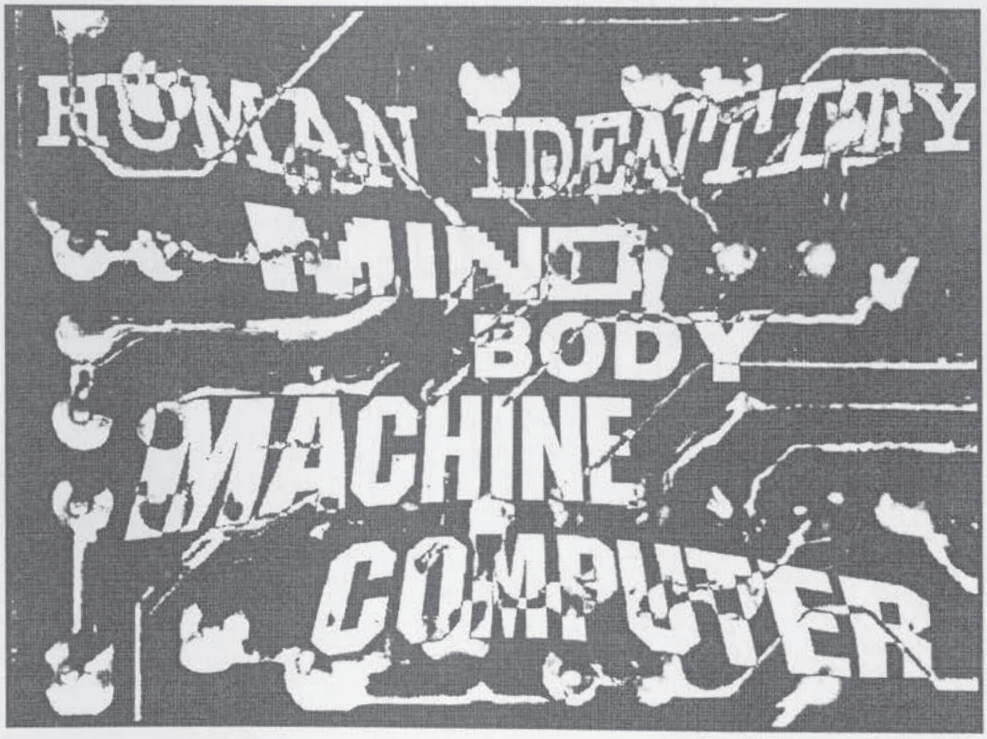


Figure 85
Metaphorical relation.

Script: *In this computerized environment human identity, mind and body is metaphorically questioned in relation to machine—the computer.*

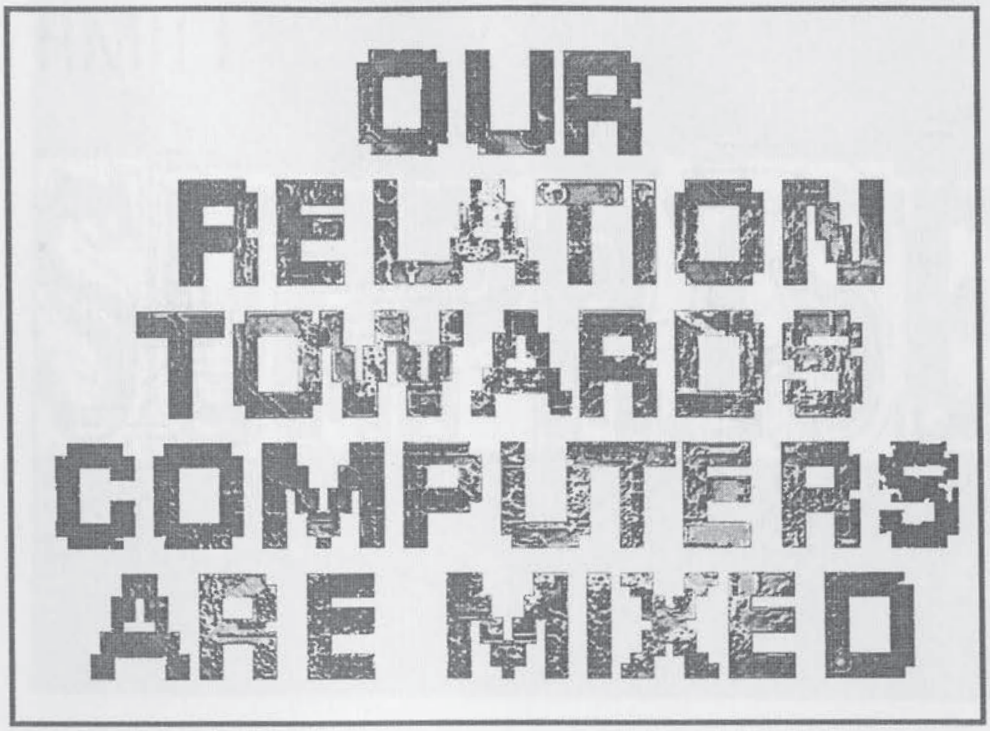


Figure 86
Psychological stance.

Script: *Psychologically our relation to computers is mixed.*



Figure 87
Delight.

Script: *On one level we are filled with delight, surprise, fascination, amazement, awe and wonder*

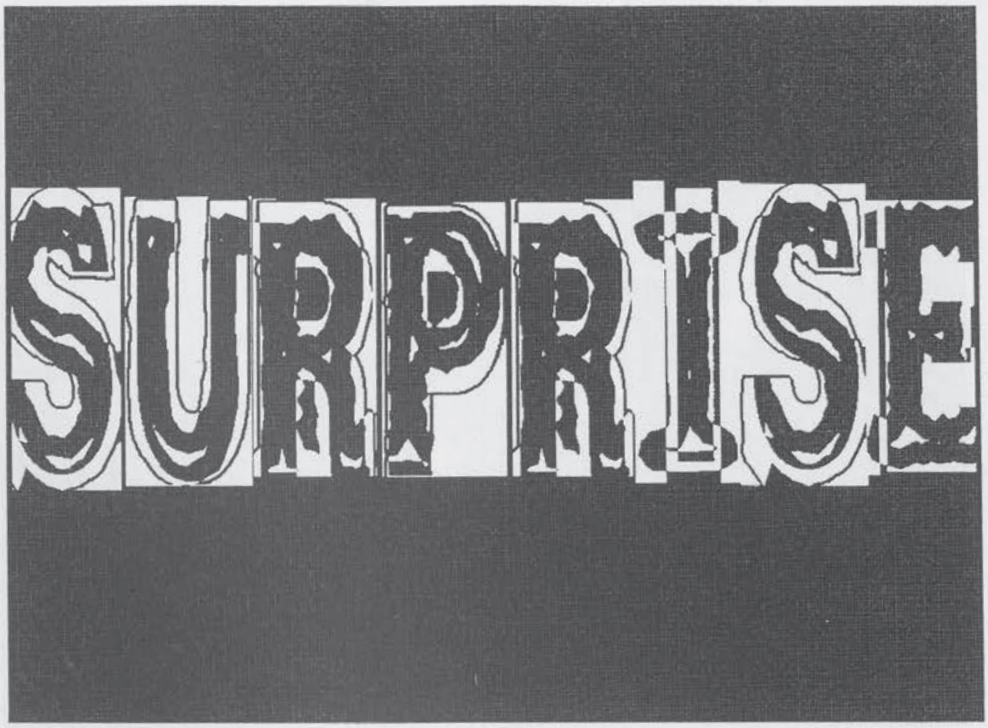


Figure 88
Surprise.

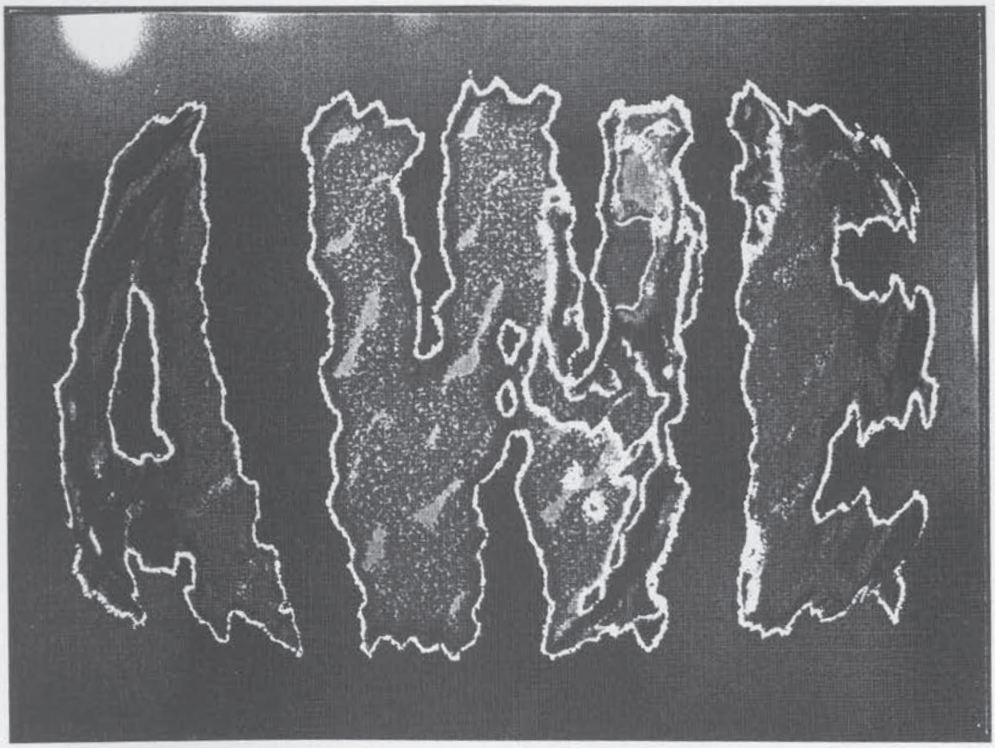


Figure 89
Awe.

The imagery in these frames are dramatic in colour attempting to evoke the feeling of awe.

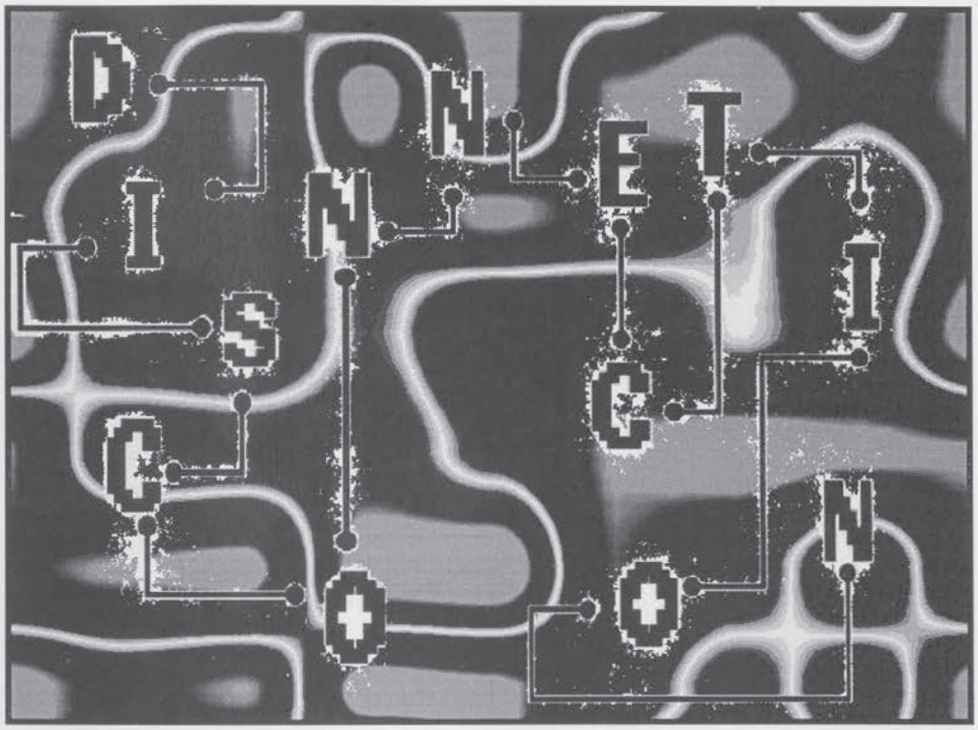


Figure 90
Disconnection.

Figures 90 to 92
Script: *On another level we feel disconnected from such technology. We fear it. We are alienated by it due to ignorance .*

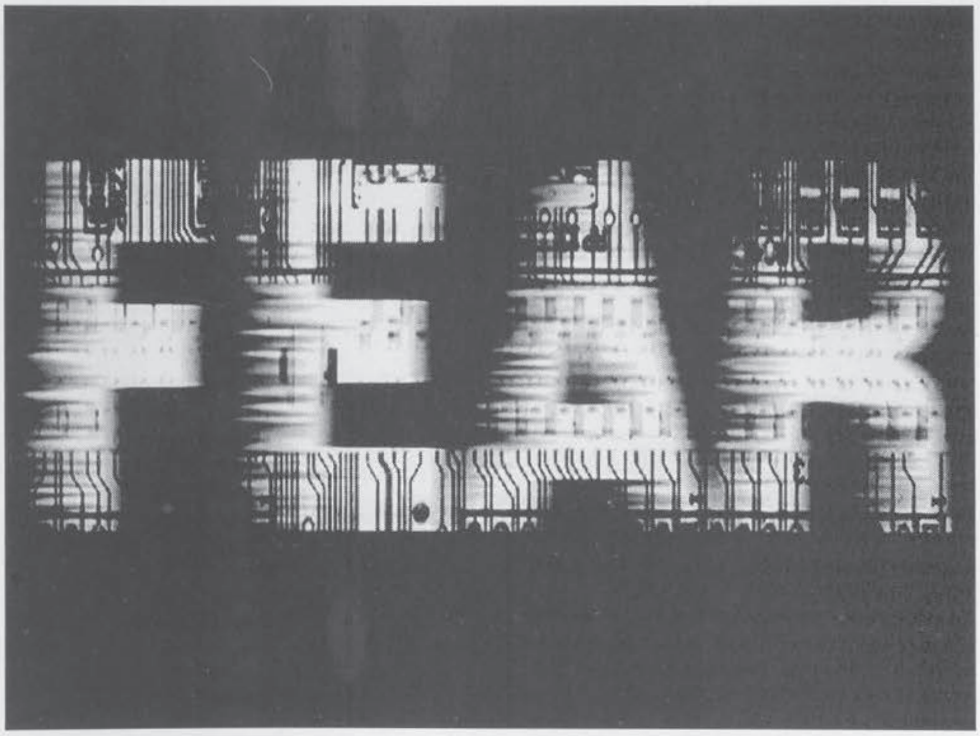


Figure 91
Fear.

This frame depicts the word 'fear' filled with imagery of computer circuits–the feared element.

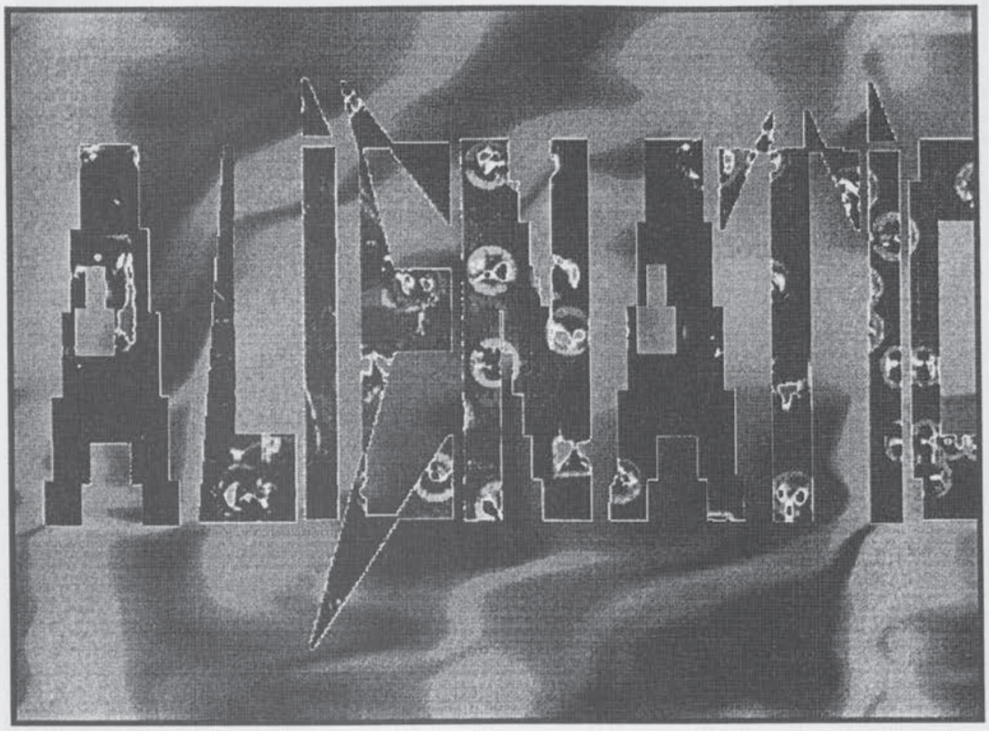


Figure 92
Alienation.

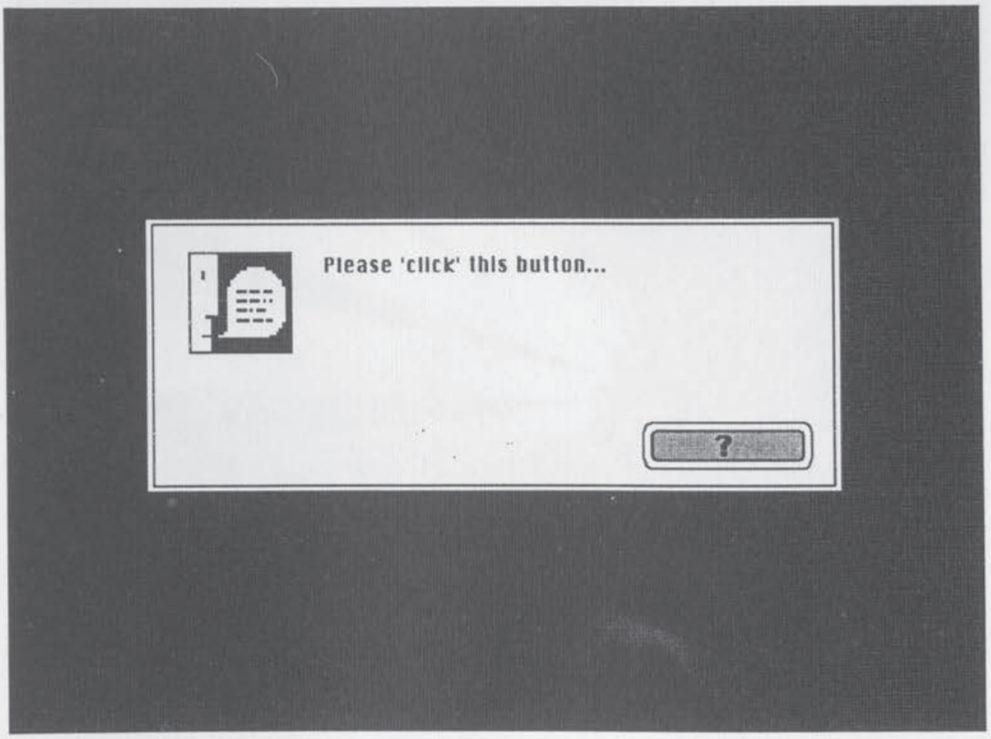


Figure 93
Unknown message.

This frame requests viewer participation by 'clicking' on the '?' button.



Figure 94
Crash!

Script: *Crash! Fear of data-loss, fear of destroying the computer.*

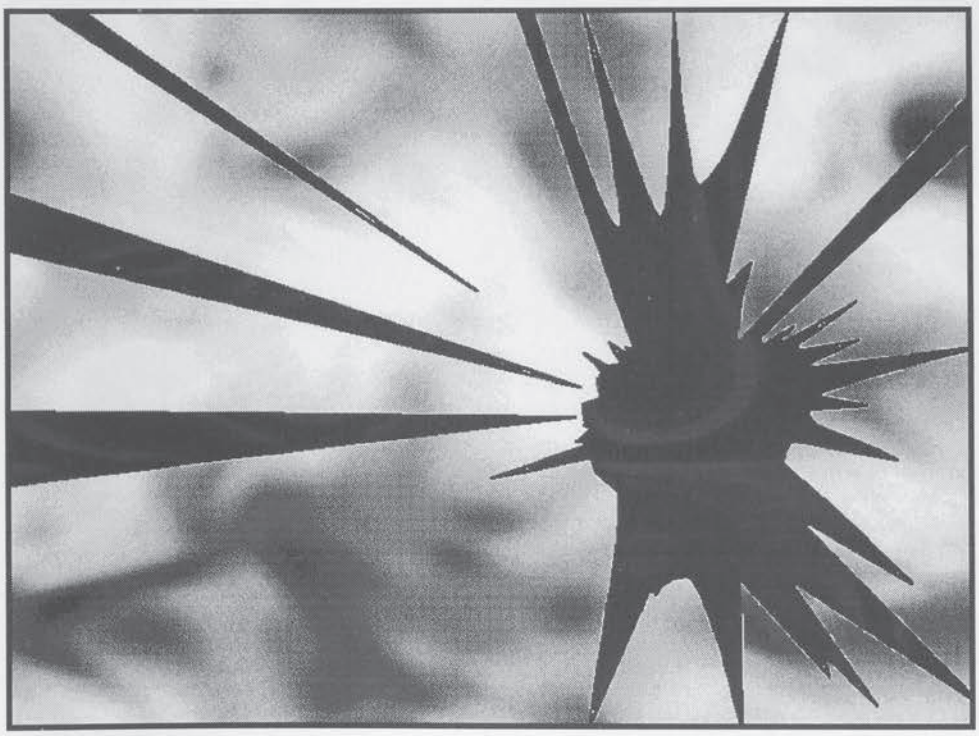


Figure 95
Bang!

Figures 95 to 97
The imagery design for these frames is violent in colour and form evoking the instability of computer devices, crashes due to viruses, insufficient power (RAM) and/or electrical power failures.

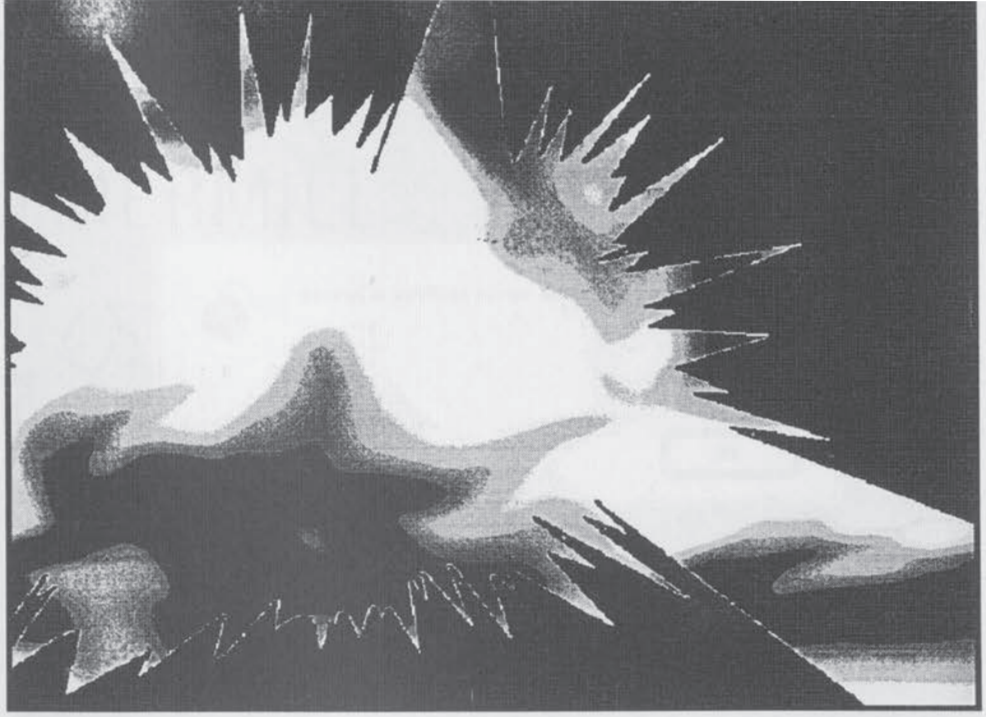


Figure 96
Bang!

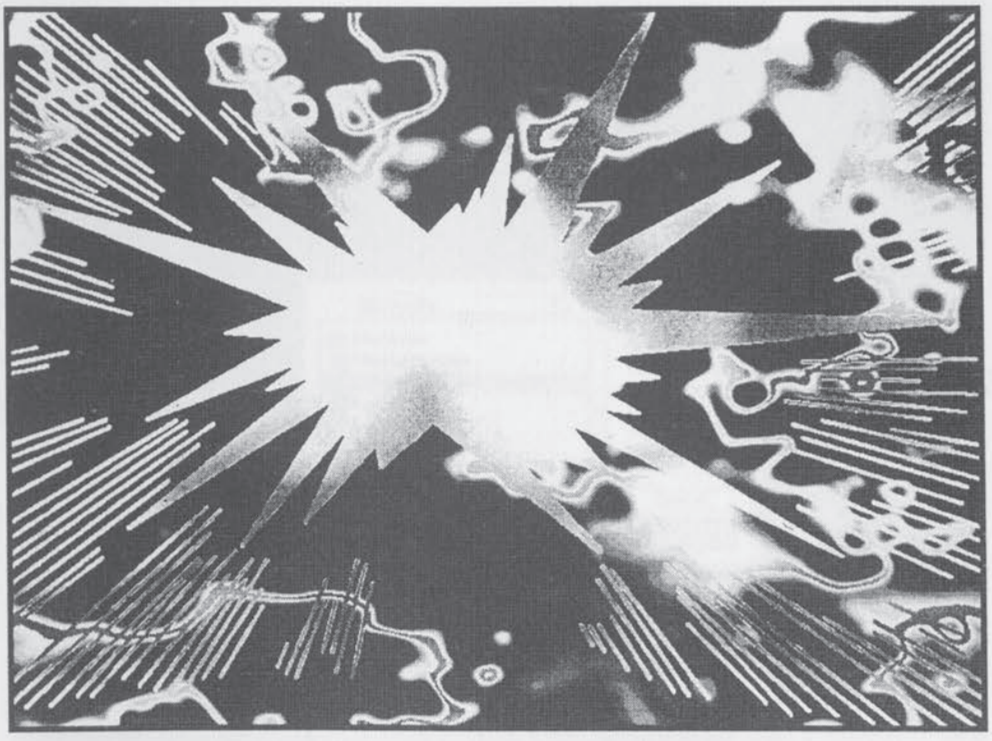


Figure 97
Bang!

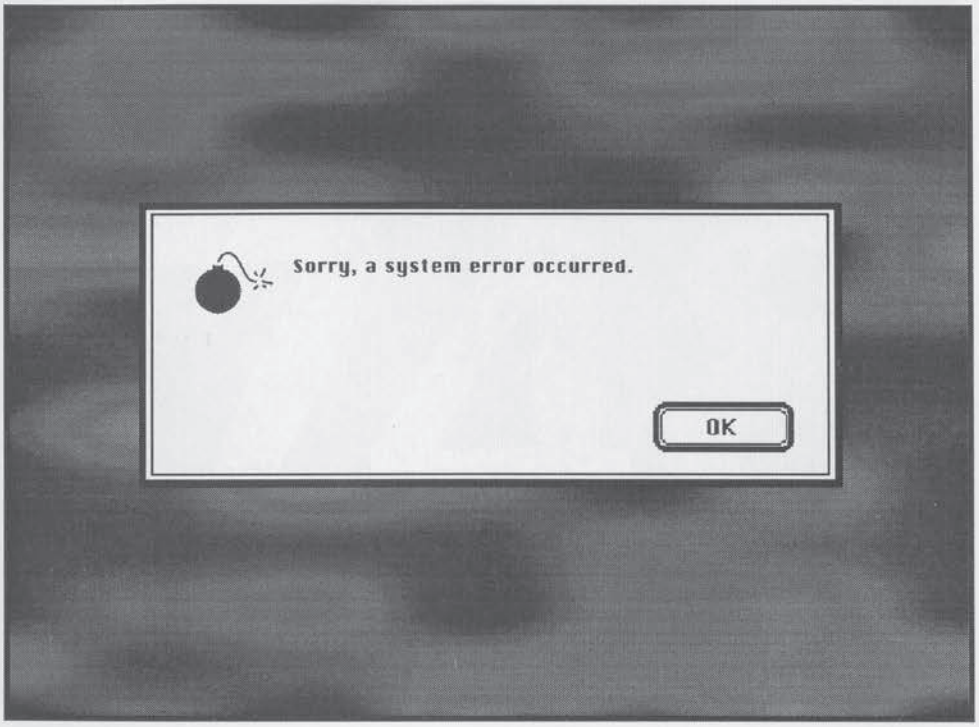


Figure 98
System error.

This frame is ironic in tone, as the computer message states: it is the machine that created the crash and not the participant (viewer), who clicked on the '?' button.

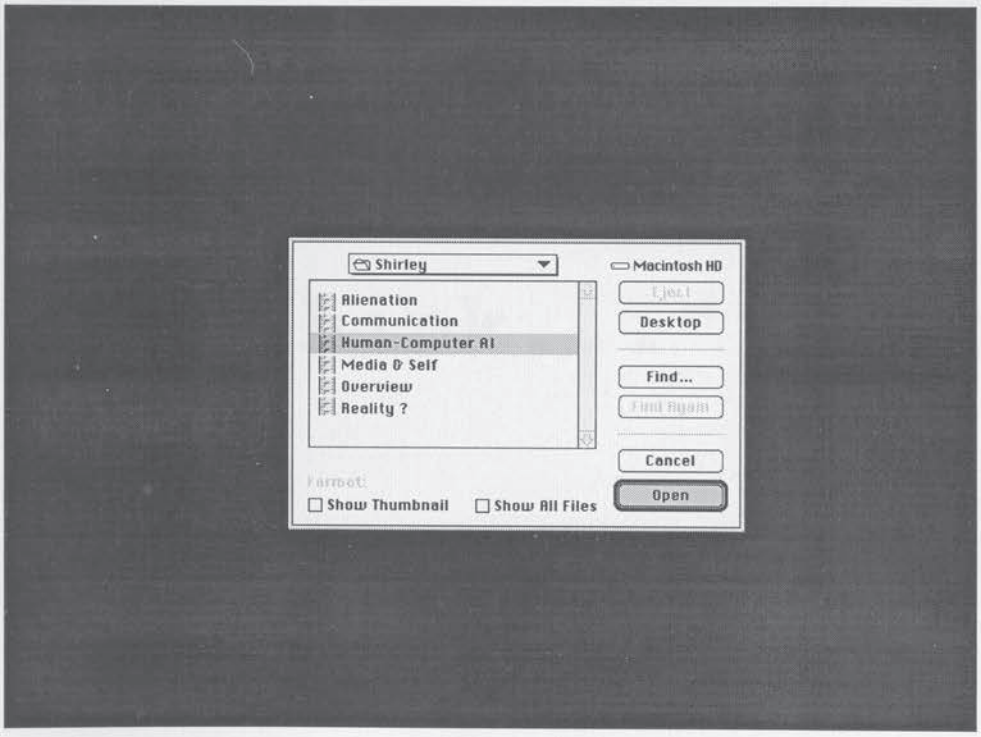


Figure 99
Human–computer AI.

This frame introduces the following issue, the metaphorical connection between humans and computers.



Figure 100
1748.

Script: *From a metaphorical stance humans have always yearned to understand what makes them think, feel and be. The human brain, has often been referred to as the latest technological preoccupation.*

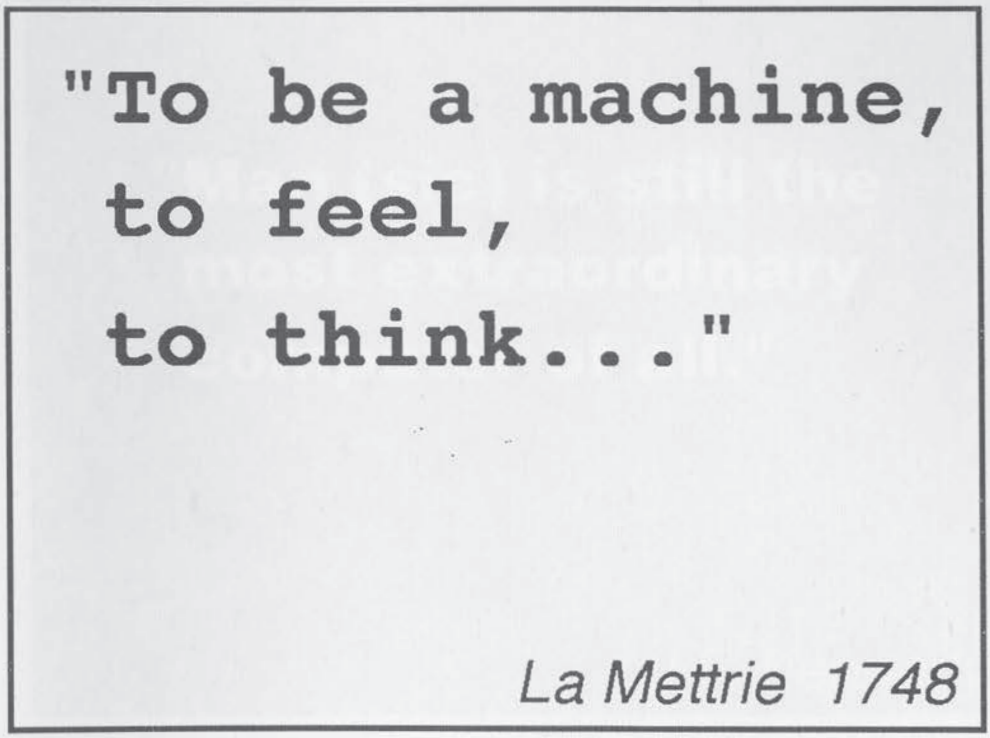


Figure 101
La Mettrie.

Script: *In 1748 La Mettrie stated 'To be a machine to feel, to think ...'*

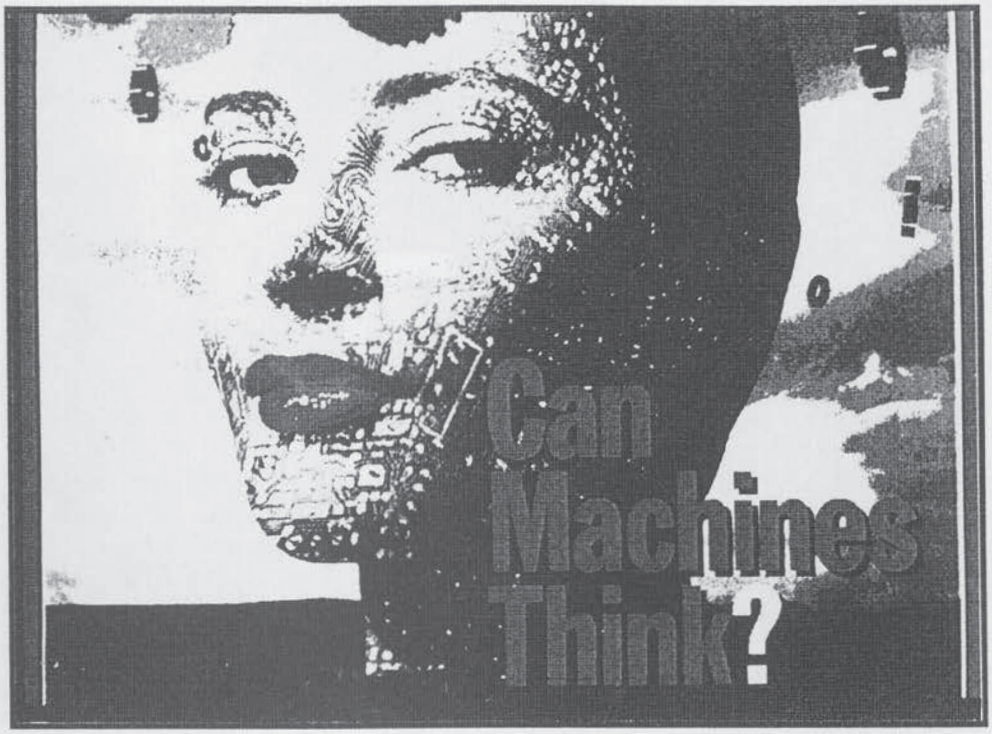


Figure 102
Can machines think?

Script: *In 1996 Time magazine covered its front page with an oversimplified statement, questioning human intelligence, stating that machines have the potential of human intelligence.*

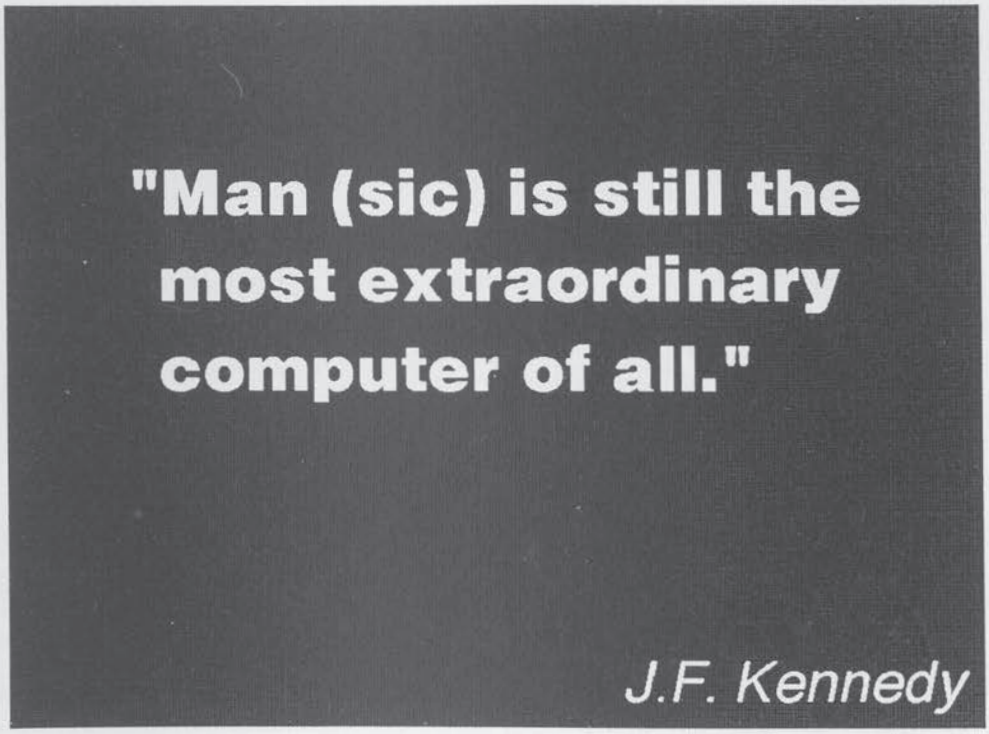


Figure 103
Untitled.

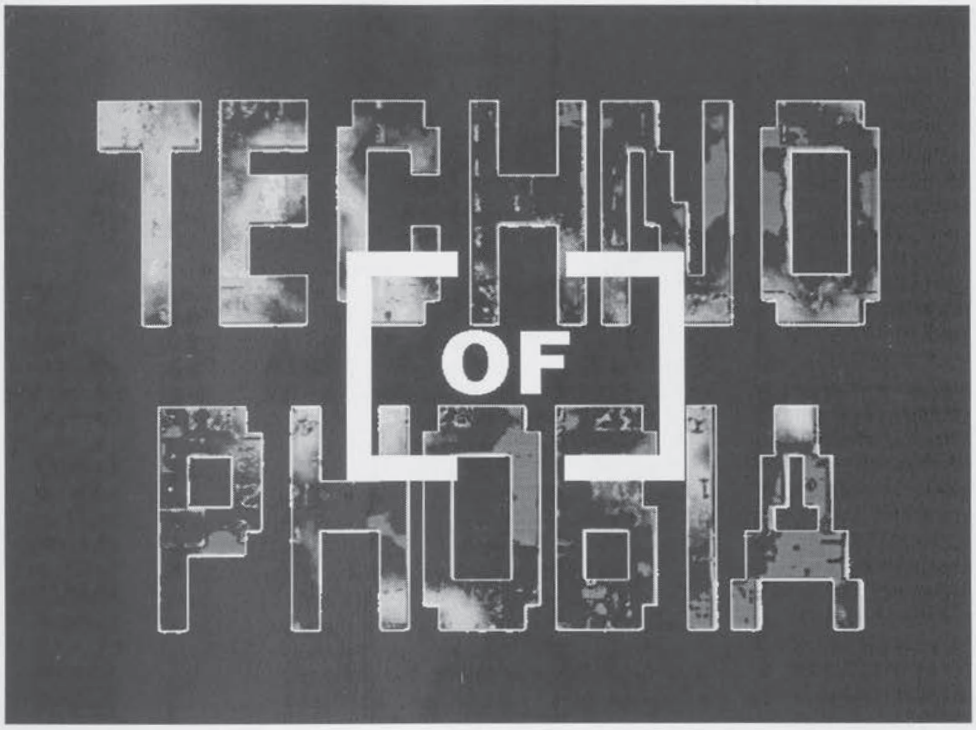


Figure 104
Technophobia.

Figures 104 to 108
Script: *Such metaphors promote technophobia of computers. We fear the ultimate myth or success of artificial intelligence—the development of electronic brains.*

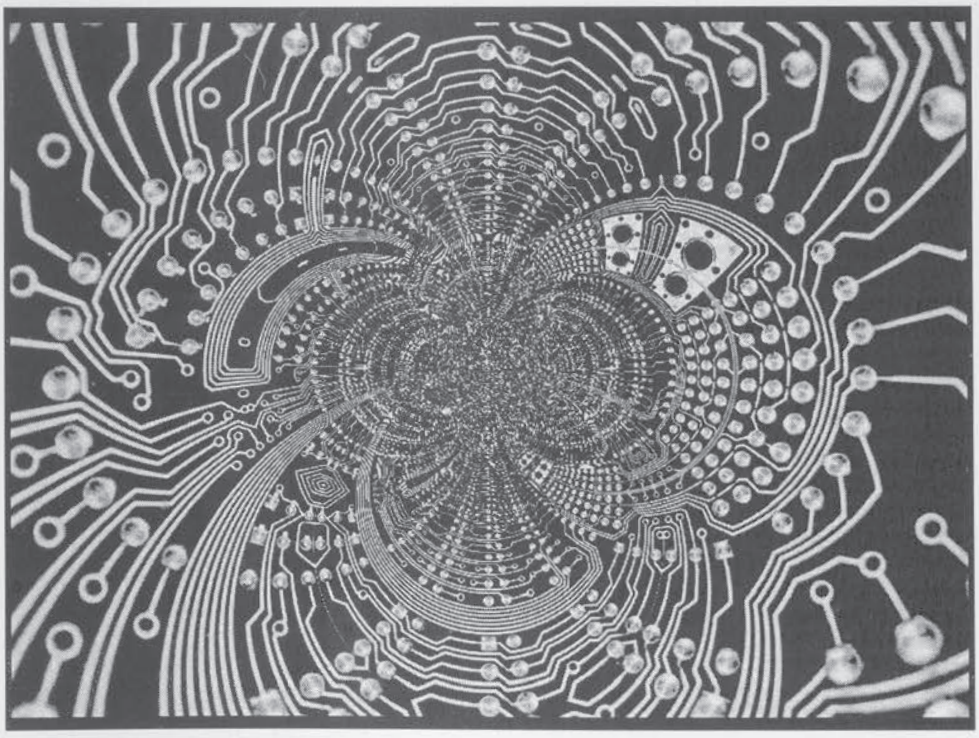


Figure 105
Electronic circuit.

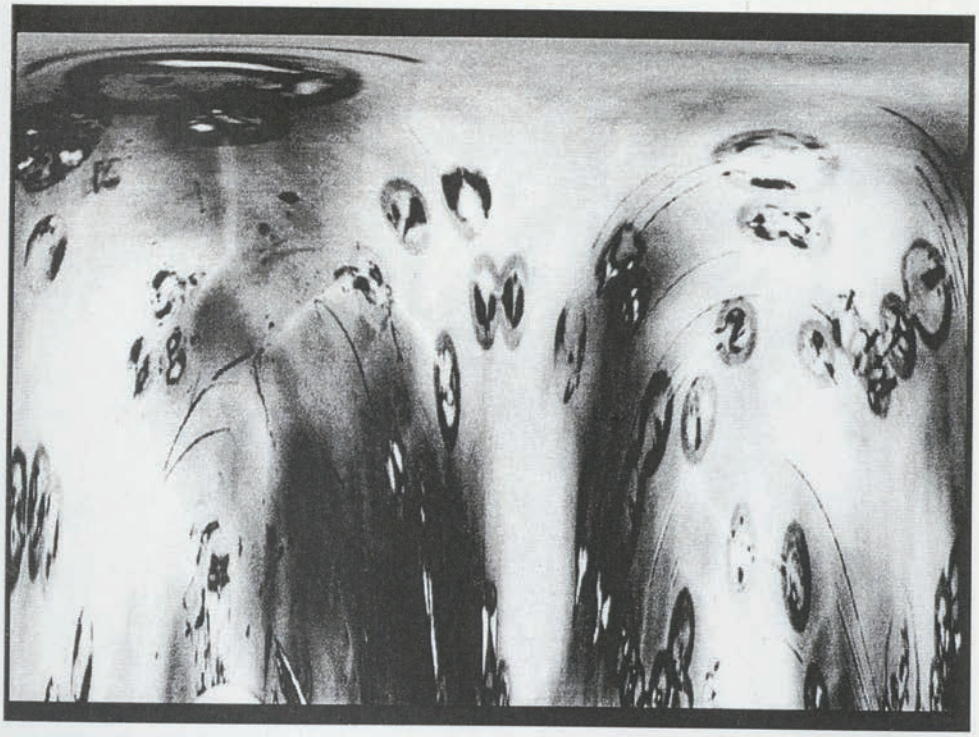


Figure 106
Electronic landscape.



Figure 107
Brain.

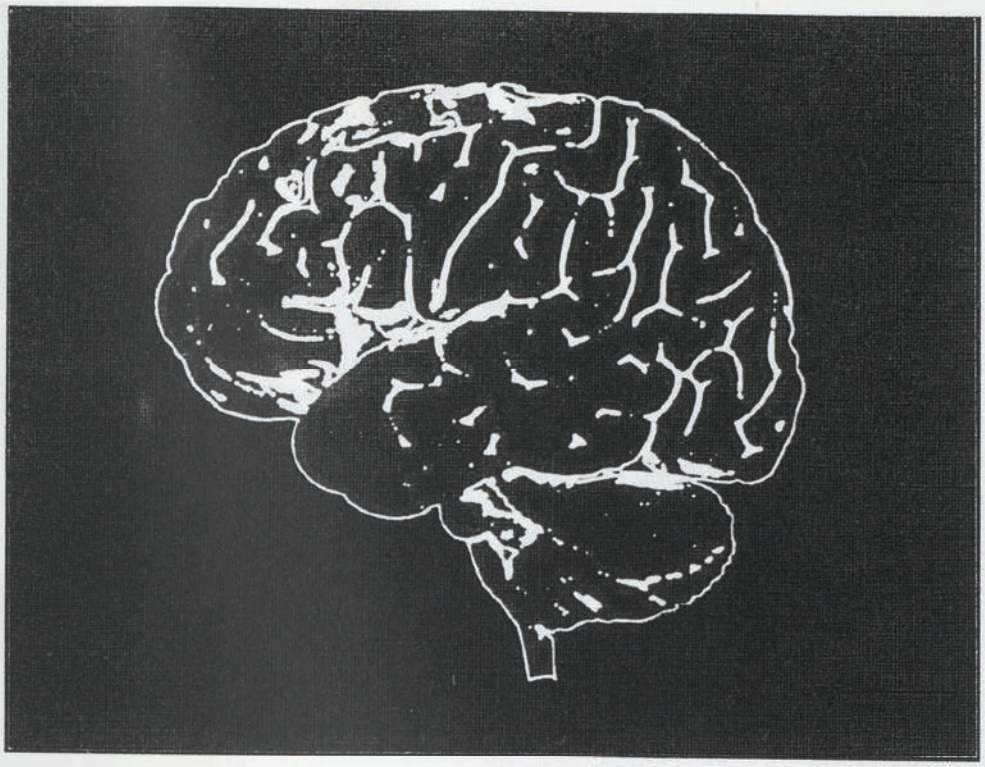


Figure 108
Brain.

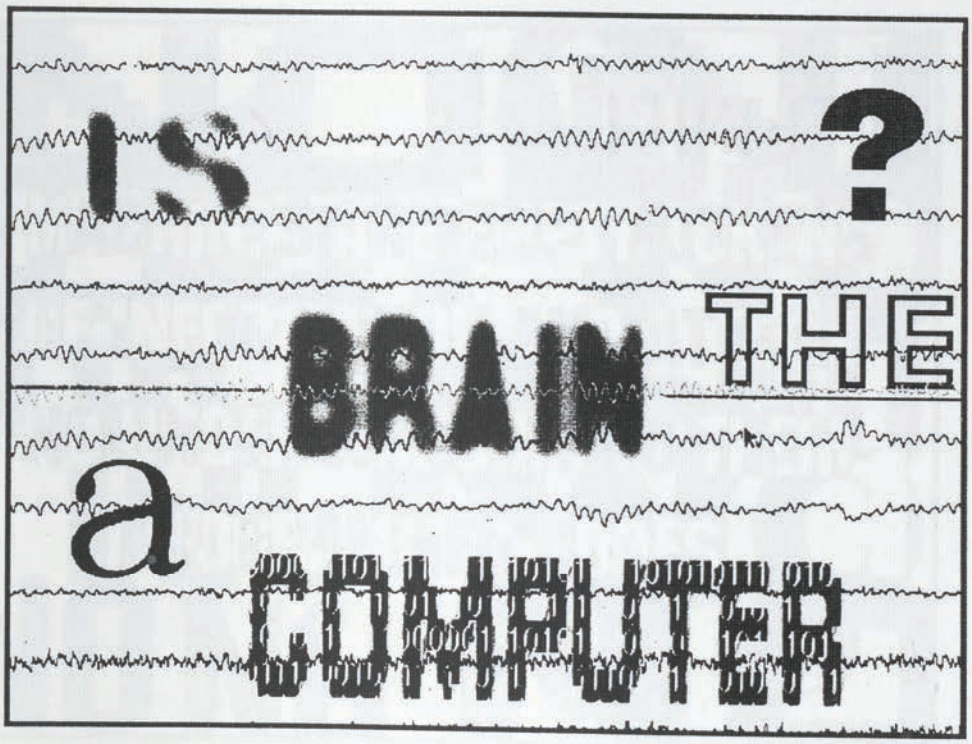


Figure 109
Is the brain a computer?

Figures 109 and 110
Script: *In 1990 Bergmark stated: Is the brain a computer, is the computer a brain? Such a superficial statement deserves a simple answer, no!*



Figure 110
No!

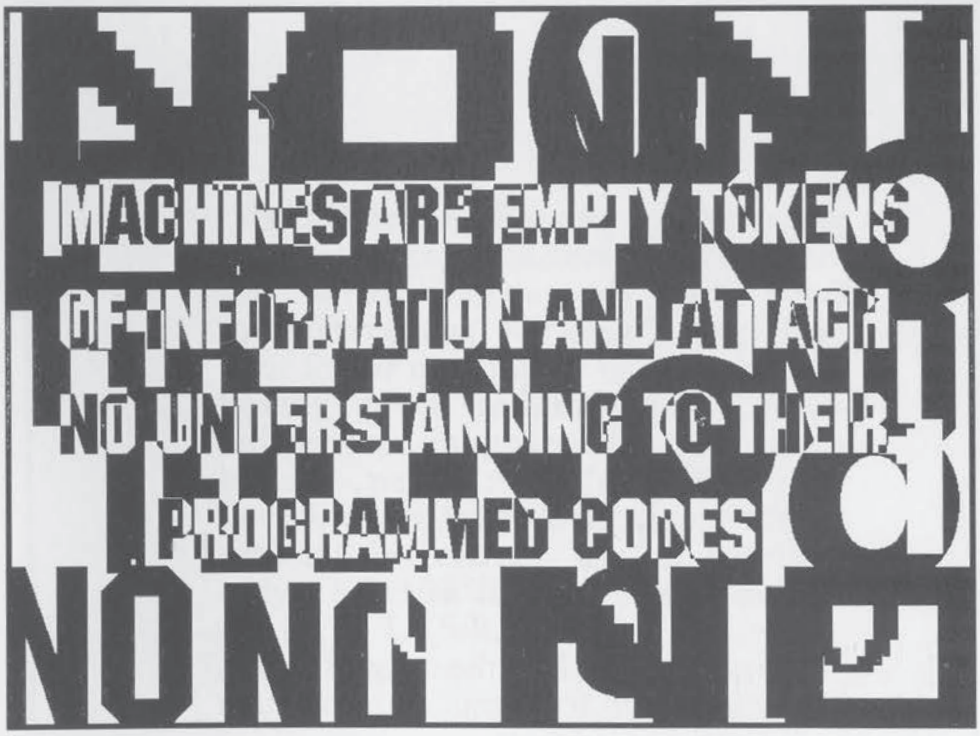


Figure 111
Machines are empty tokens of information.

Script: *Through this study I have come to the conclusion that machines, computers, are empty tokens of information and attach no understanding to their programmed codes. Computers only manipulate numbers, people connect them to meaning.*

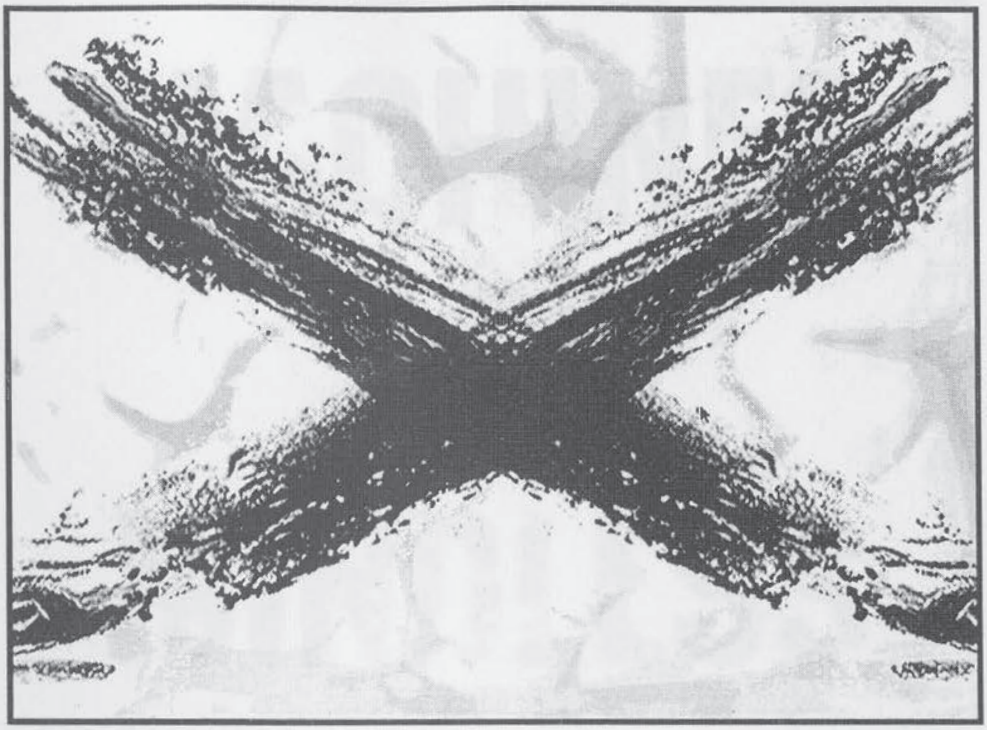


Figure 112
Untitled.

ĭ′ntèll|ĕct *n.* Faculty of knowing and reasoning; understanding; person, persons collectively, with good understanding; **~ĕ′ctūal,** (*a.*; **-lly**) of or for or needing or using intellect, having good understanding or intelligence, enlightened, (*n.*) intellectual person; **~ĕ′ctūalĭsm** *n.*, doctrine that knowledge derives from reason, (excessive) use of intellect only; **~ĕctūă′lĭtў** *n.*; **~ĕ′ctūalīze** *v.t.* [F or L (foll.)]

ĭntĕ′llĭg|ence *n.* Intellect, understanding; quickness of understanding

Figure 113
Untitled.

Script: *Computers are more precise but human emotional life remains unique. Humans don't compute, they understand intentionally. Consciousness is doing something that mere computation cannot do.*

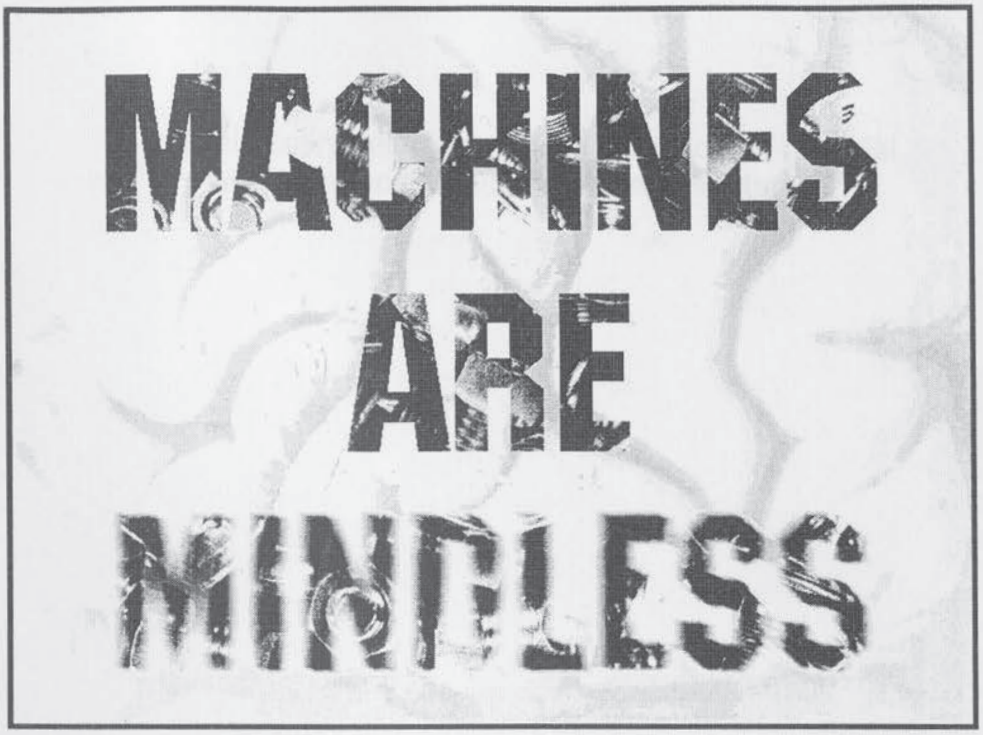


Figure 114
Machines are mindless.

Script: *Computers are mindless. Even in a technologically advanced state of evolution that humankind might finds itself in, the human soul will command supreme.*

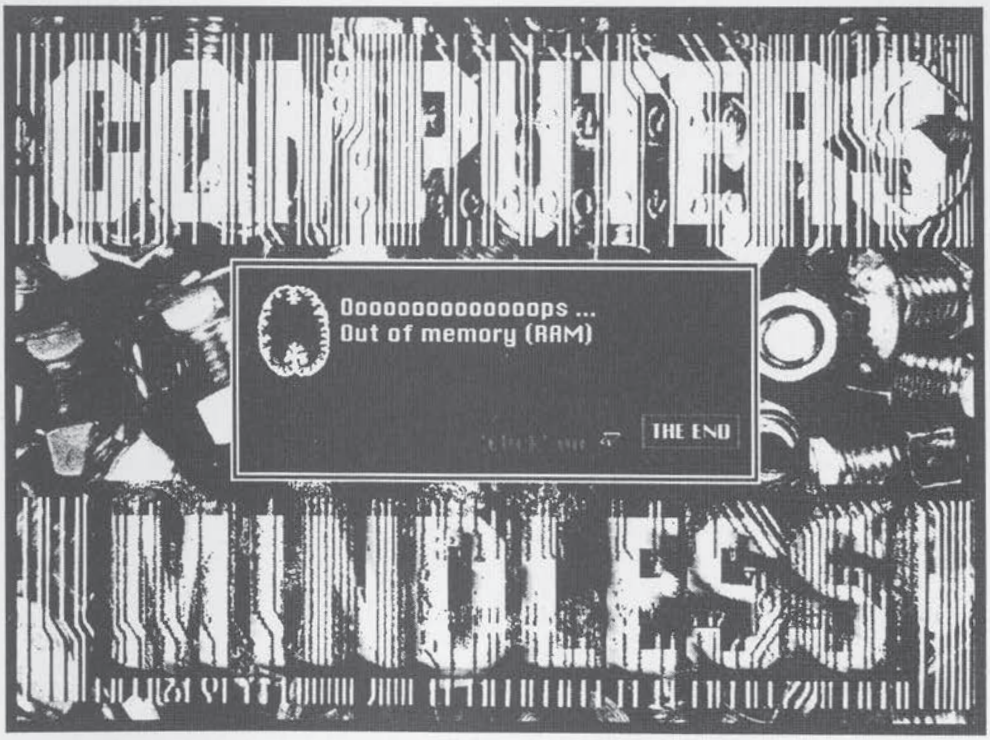
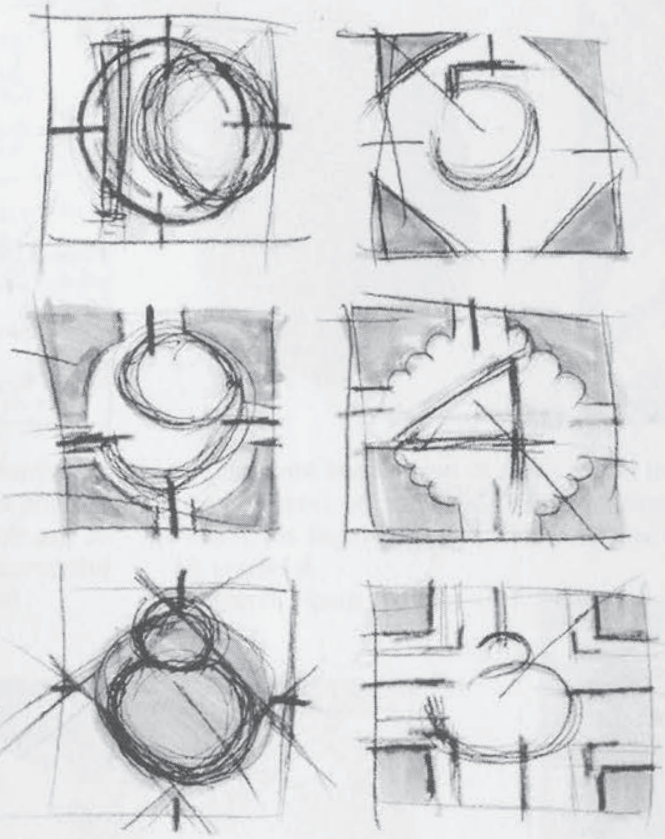


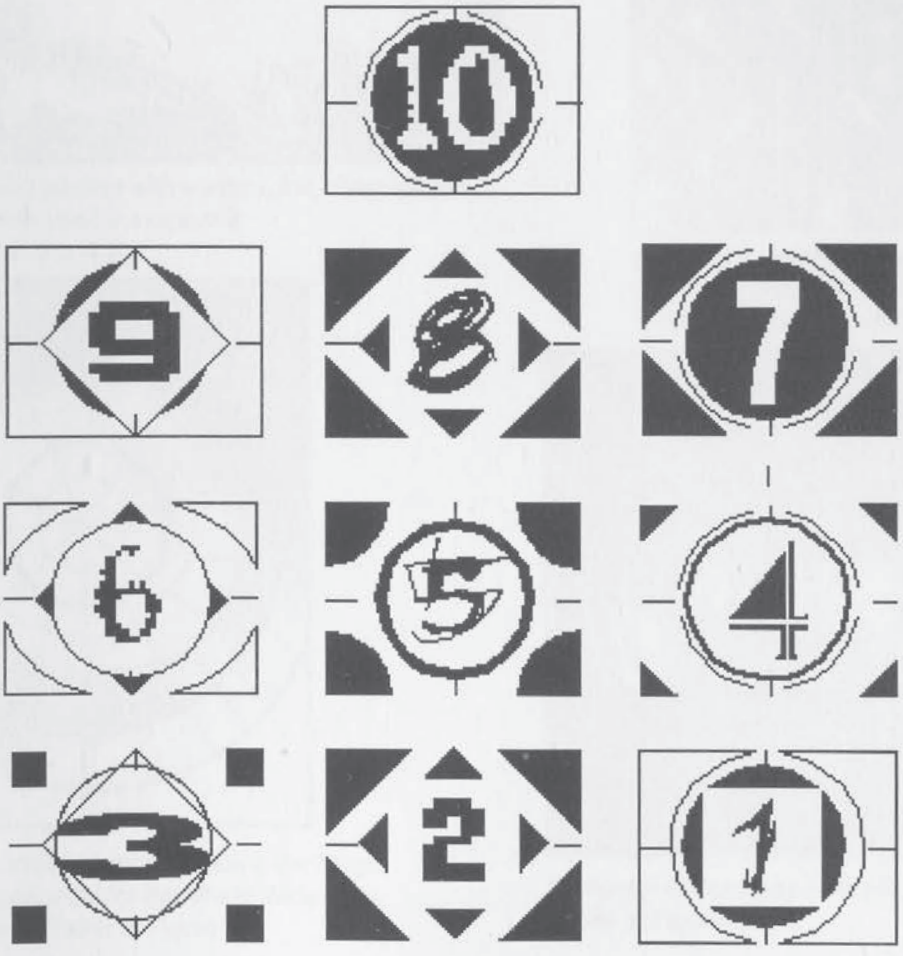
Figure 115
Oooooooooooops ... out of memory (RAM).

This frame depicts an ambiguous statement. 'Out of memory (RAM)' as if the computer *did* have memory, a mind, such a statement depicts the programmer's/designer's ironic use of language in the designing of computer error messages.

D. Preliminary selected sketches and source material with reference to multimedia representation.



The presentation begins with decending numbers.
(Refer to Figures 2 to 11)





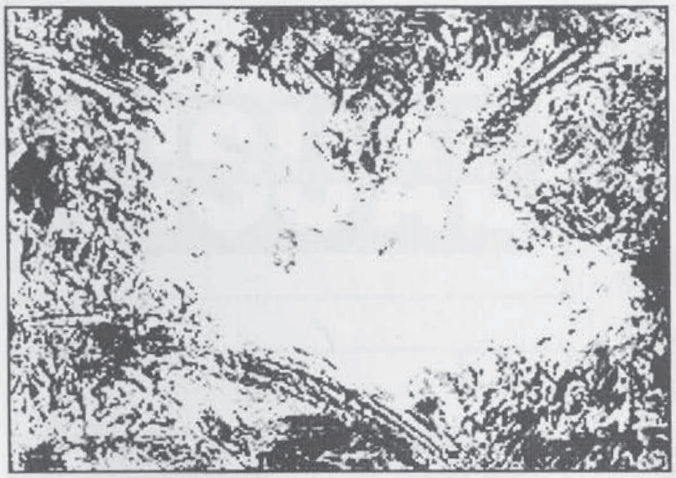
Map image used in number 4, referring to time, space and distance, elements which are all 'wired' together via computer technology (the Internet).
(Refer to Figure 8).



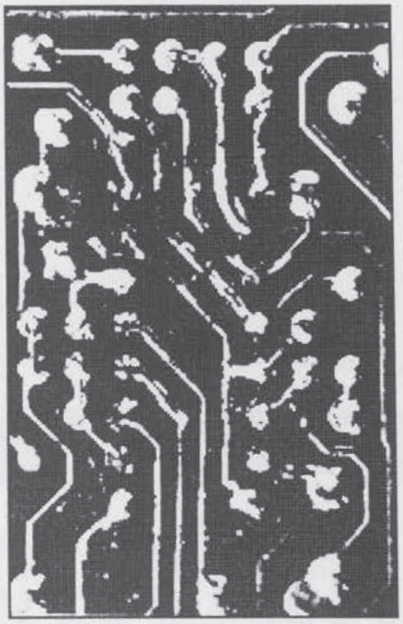
Finger-print image used in number 5, referring to the human touch, the finger-print, that which is universal.
(Refer to Figure 7).



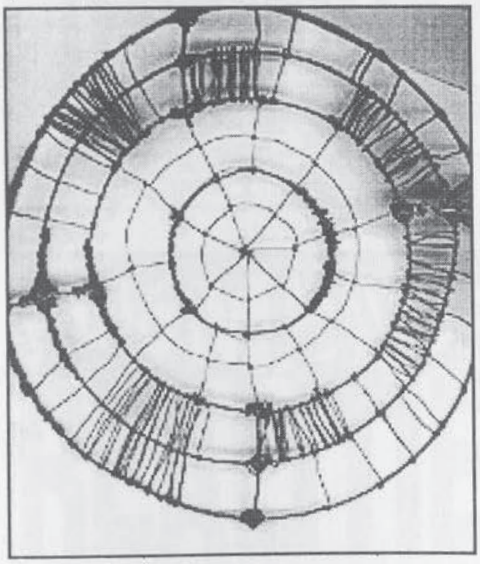
Cork texture used in number 8, an element of tangibility.
(Refer to Figure 4).



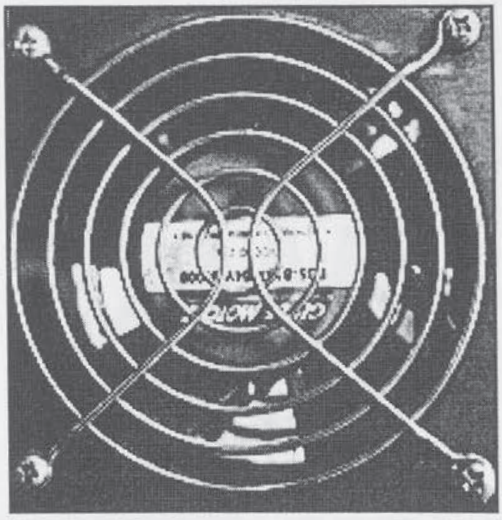
Textured drawing created with washes, ink, charcoal and paste on fabriano, used in number 9.
(Refer to Figures 3 and 4).



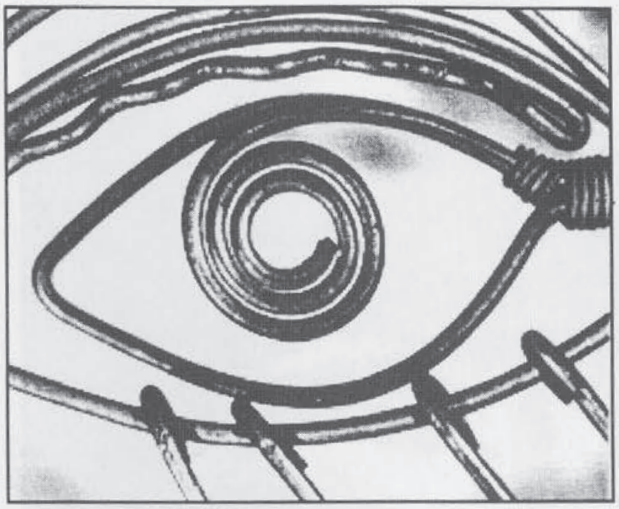
Computer motherboard, circuit used in numbers 10 and 3.
(Refer to Figures 2 and 9).



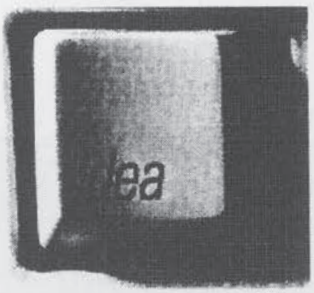
2-dimensional metal element, echoing the shape of a web, metaphorical for the World Wide Web, used in number 7.(Refer to Figure 5).



Computer device used in number 2.
(Refer to Figure 10).

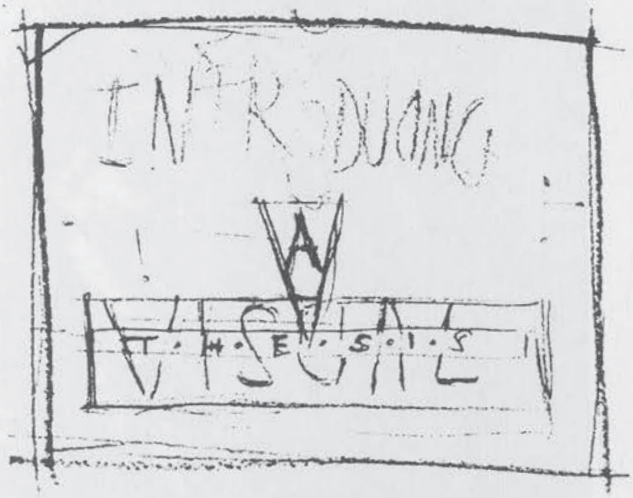


2-dimensional metal element of eye, used in visual introduction frame. (Refer to Figure 12).

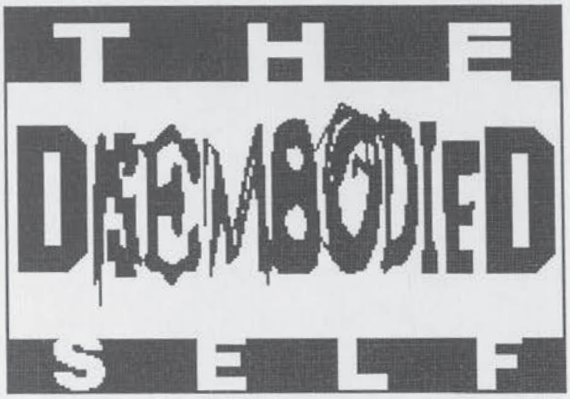


Computer punch key altered and used between the words humanity and technology. (Refer to Figures 13 and 16).









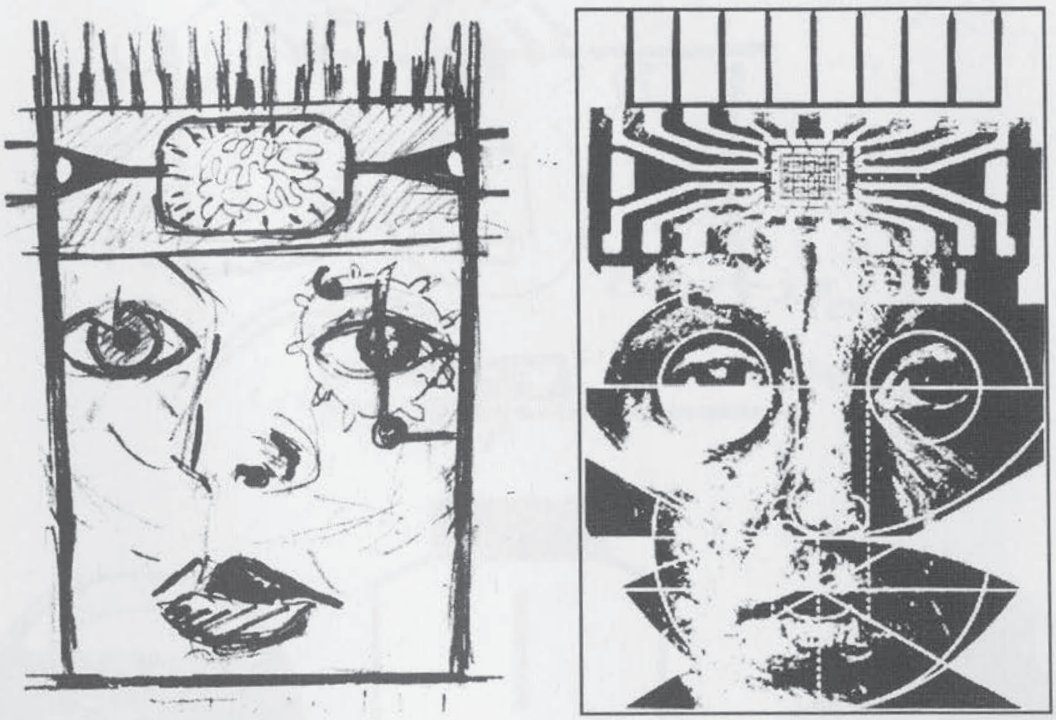




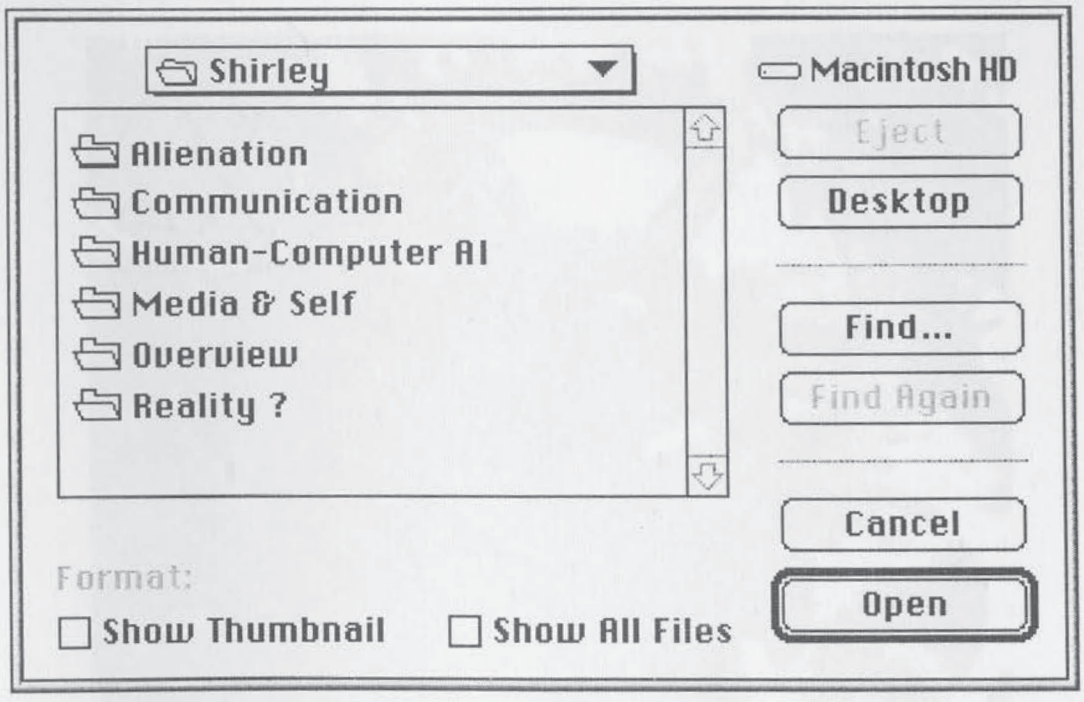
Black and white initial stRuctural designs prior to colour and texture developments. (Refer to Figures 12 to 16).



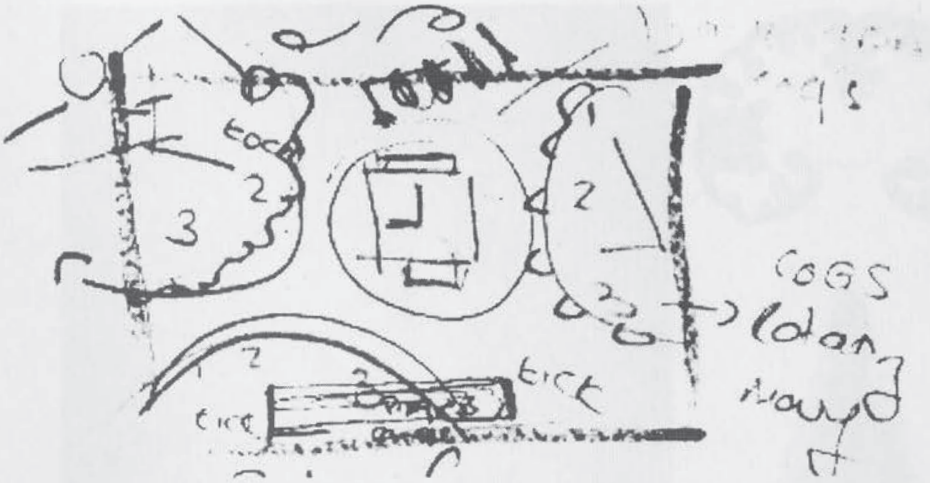
Charcoal drawing on fabriano, scanned and edited with various computer software.
(Refer to Figures 17 and 60).

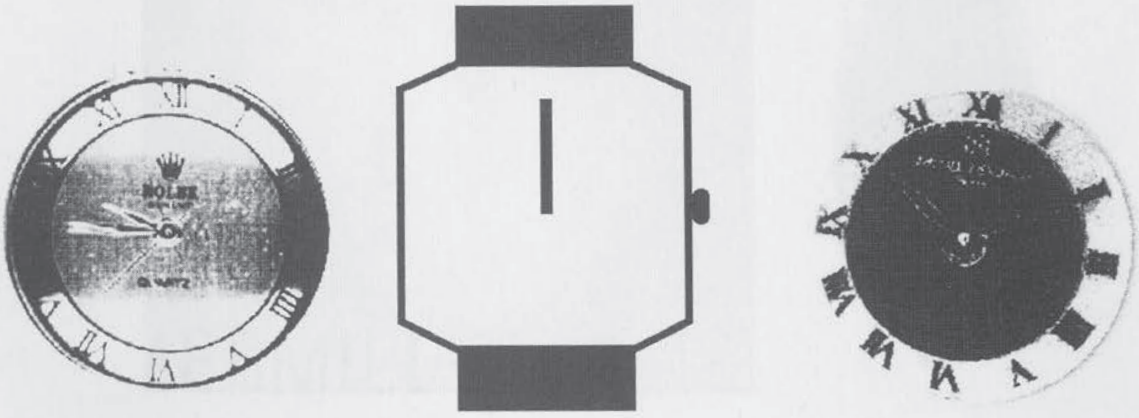


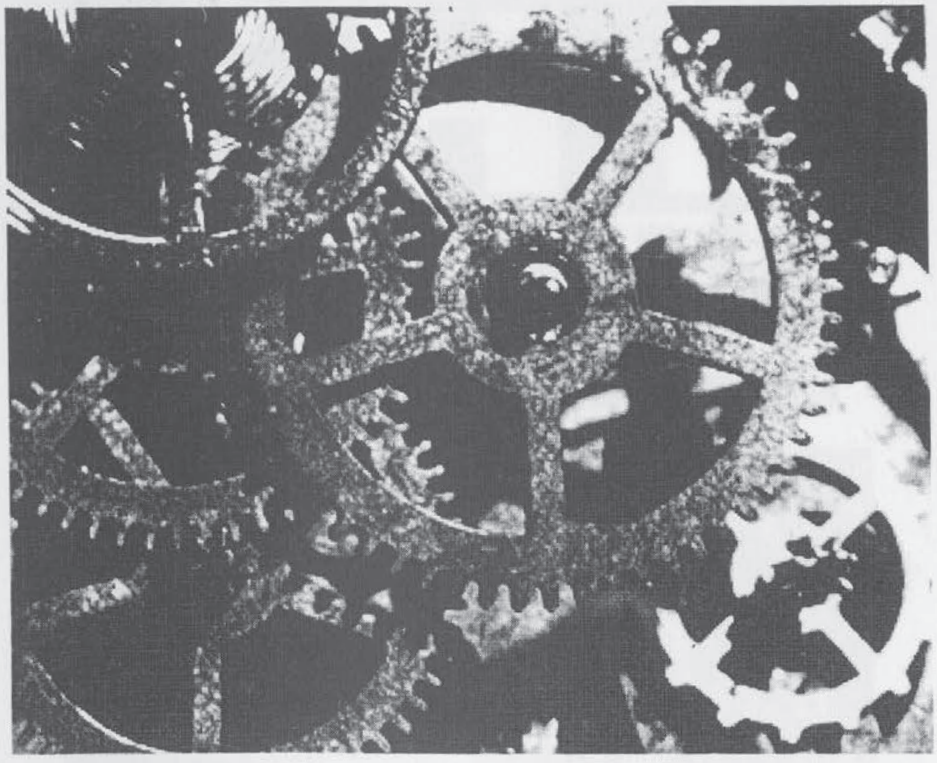
Initial sketch with reference to the connections between the mind and computer (AI). (Refer to Figure 17)



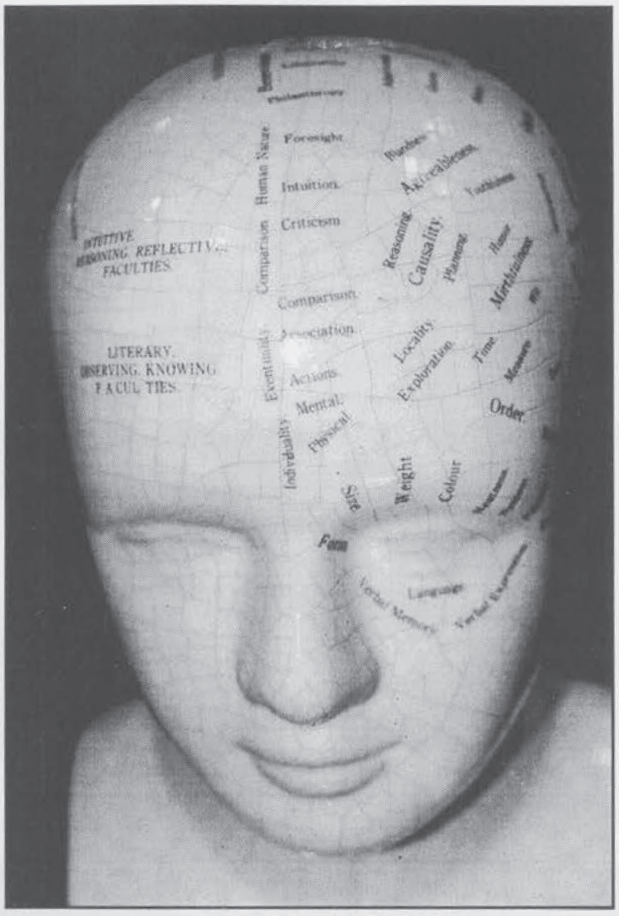
The command interface design is intentionally used as a structural device throughout the multimedia presentation, linking various issues. (Refer to Figure 99).

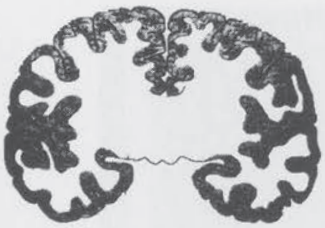






Cogs and watches represent time, the waiting for files to be processed and read by the computer. The use of the computer clock icon is enlarged and used as a design element. (Refer to Figures 21 to 23)

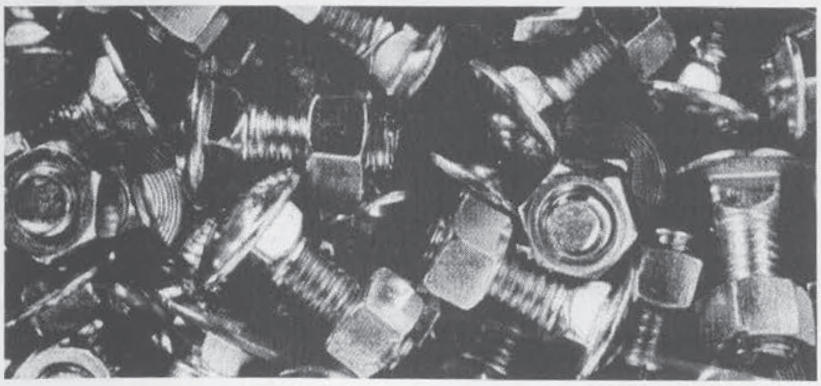




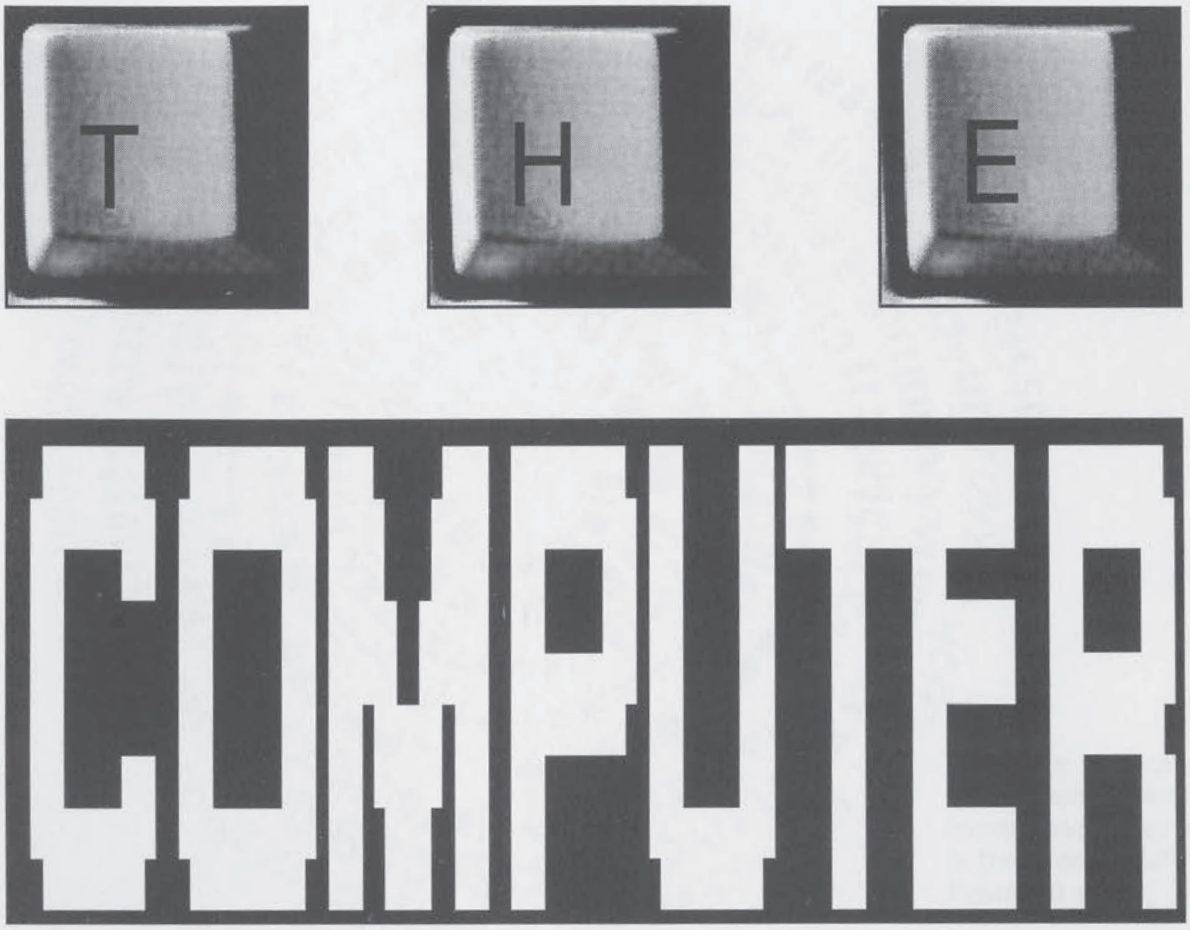


Anatomical self-photographed and sole and brian imagery (Refer to Fgures 24 and 25).

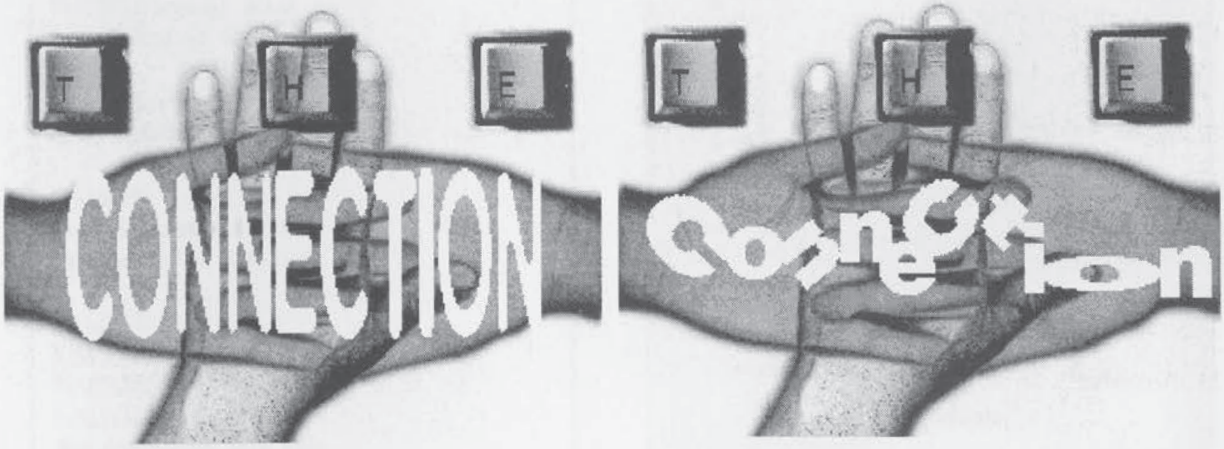
THE MACHINE



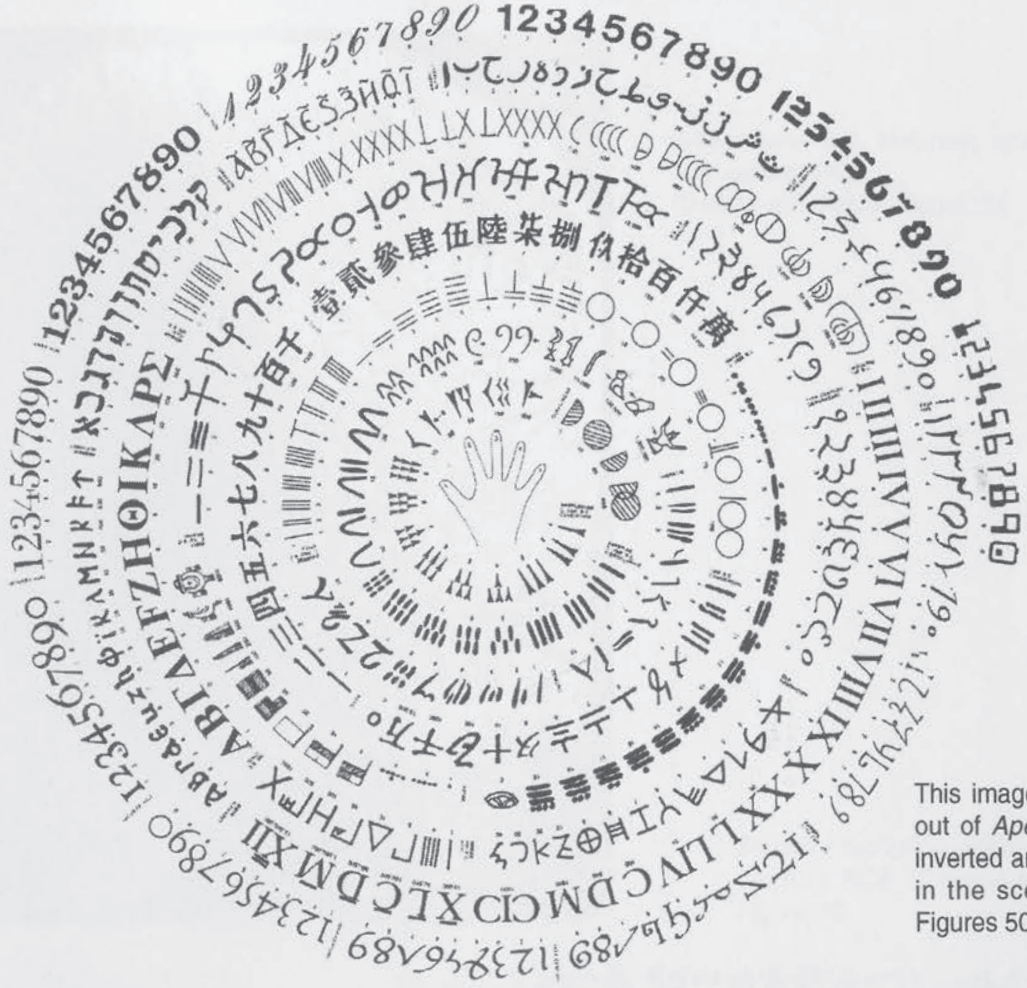
Initial black and white tupe design for the words 'The Machine' and scanned cogs cut and pasted into words. (Refer to Figures 26, 114 to 115).



Initial black and white type design for the words 'The computer'. The use of computer punch keys is a design element within the image. (Refer to Figure 27).



Variations of the word 'connection'. Hands were scanned into the machine and layered over one another. The final image consisted of hand-drawn hands. (Refer to Figures 28 to 31).



This image was scanned out of *Aperture* 1992:18, inverted and rotated within the scene. (Refer to Figures 50 and 51)

```
BREMNER/BREMNERMULAR: Access to server denied.
You are attached to server BREMNER.


F:\LOGIN>pmail
Bad command or file name

F:\LOGIN>bremner mular
Bad command or file name

F:\LOGIN>bremner/mular
Bad command or file name

F:\LOGIN>
F:\LOGIN>bremner/mular
Bad command or file name

F:\LOGIN>
F:\LOGIN>
F:\LOGIN>
F:\LOGIN>bremner/mular
Bad command or file name

F:\LOGIN>login bremner/mular
Enter your password:
```

This computer printout refers to the Dos scene. (Refer to Figure 49).

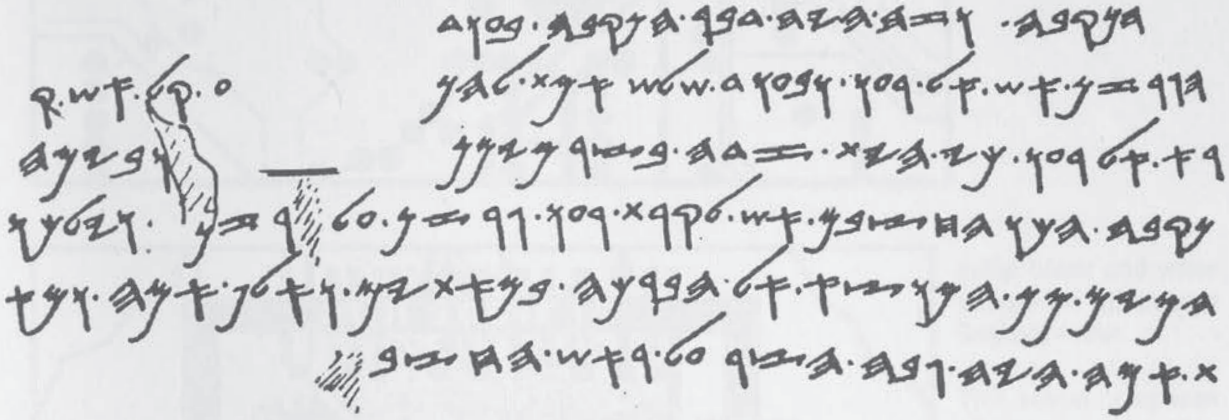


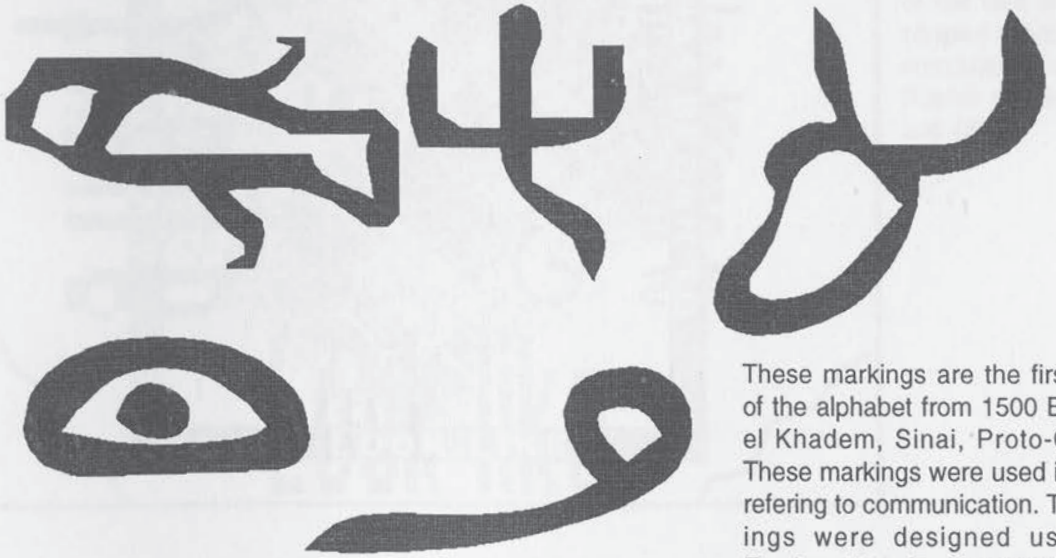
These computer punch keys were self-photographed and used in the designing of the words 'communication' and 'where all cultures connect'. (Refer to Figures 51 and 52).



Gezer calendar, Hebrew, end of 10th century BCE
(Source material for Figure 50)

Siloam Inscription, Hebrew, late 8th century BCE (Source material for Figure 50)

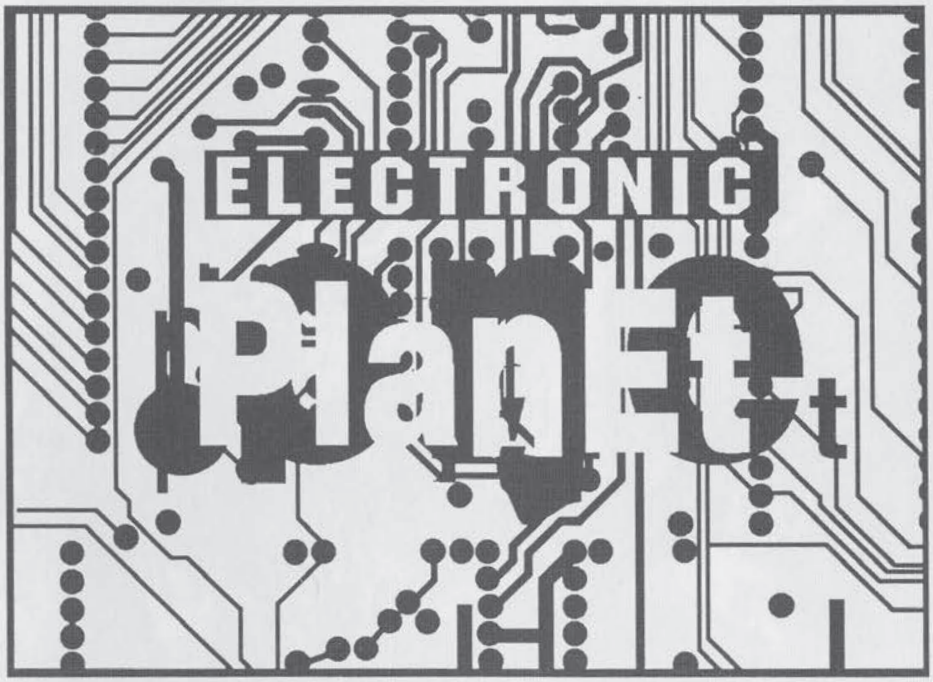


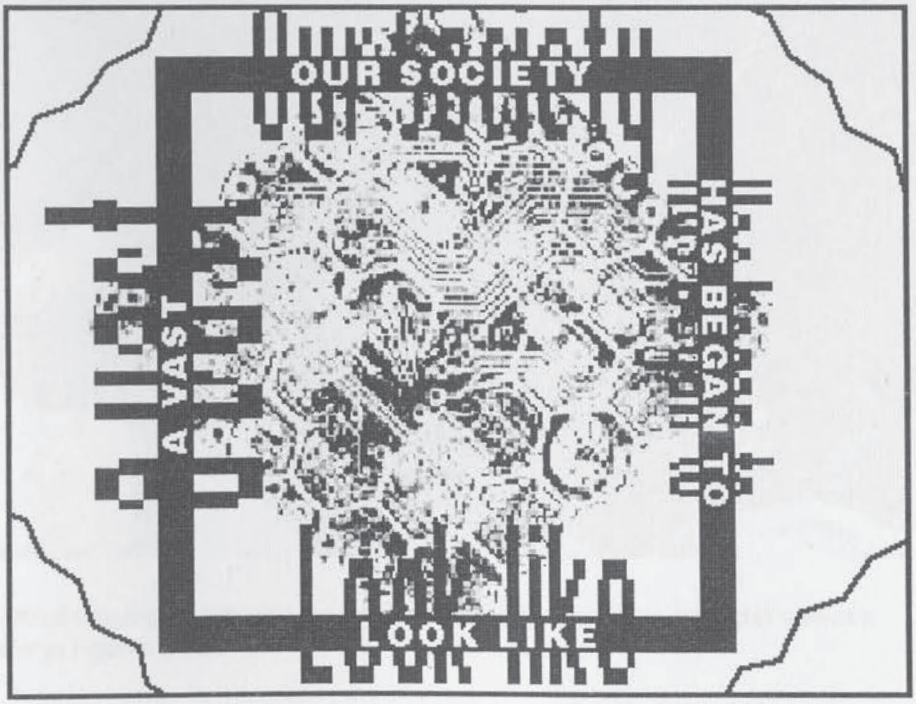


These markings are the first markings of the alphabet from 1500 BCE Serabit el Khadem, Sinai, Proto-Canannite. These markings were used in the frame refering to communication. These markings were designed using Aldus Freehand 5.1. (Refer to Figure 50)



Initial black and white design for electronic planet frame. The use of computer circuits is evident which is layered over a rotating earth in the multimedia scene. (Refer to Figure 46)





Initial black and white design for 'Electronic Beehive' frame.

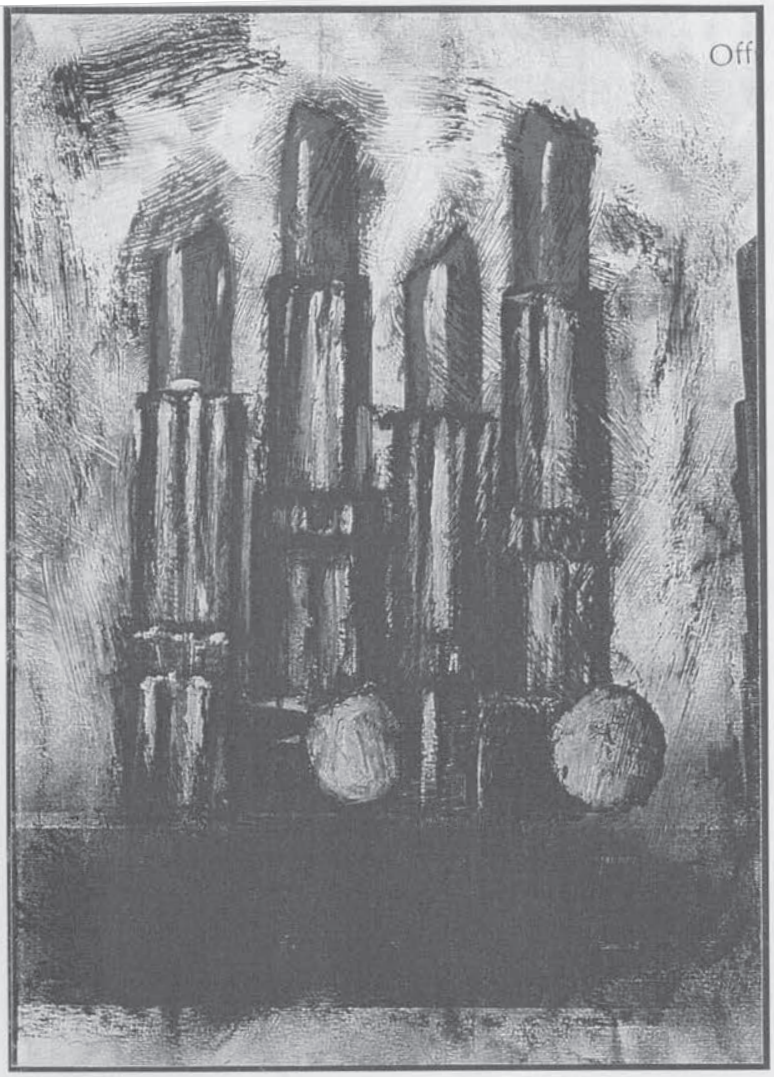
This scene comprises of the use of beehive shaped elements and computer circuits. (Refer to Figures 47 and 48).



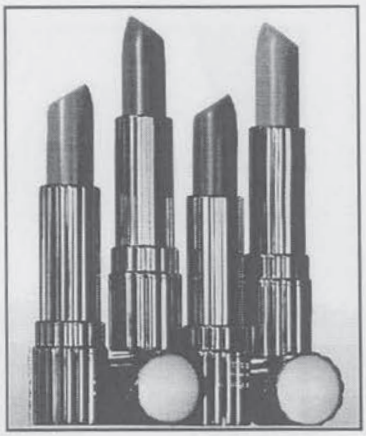
Charcoal drawing on fabriano, scanned and edited with various computer software.
(Refer to Figures 55 and 61)

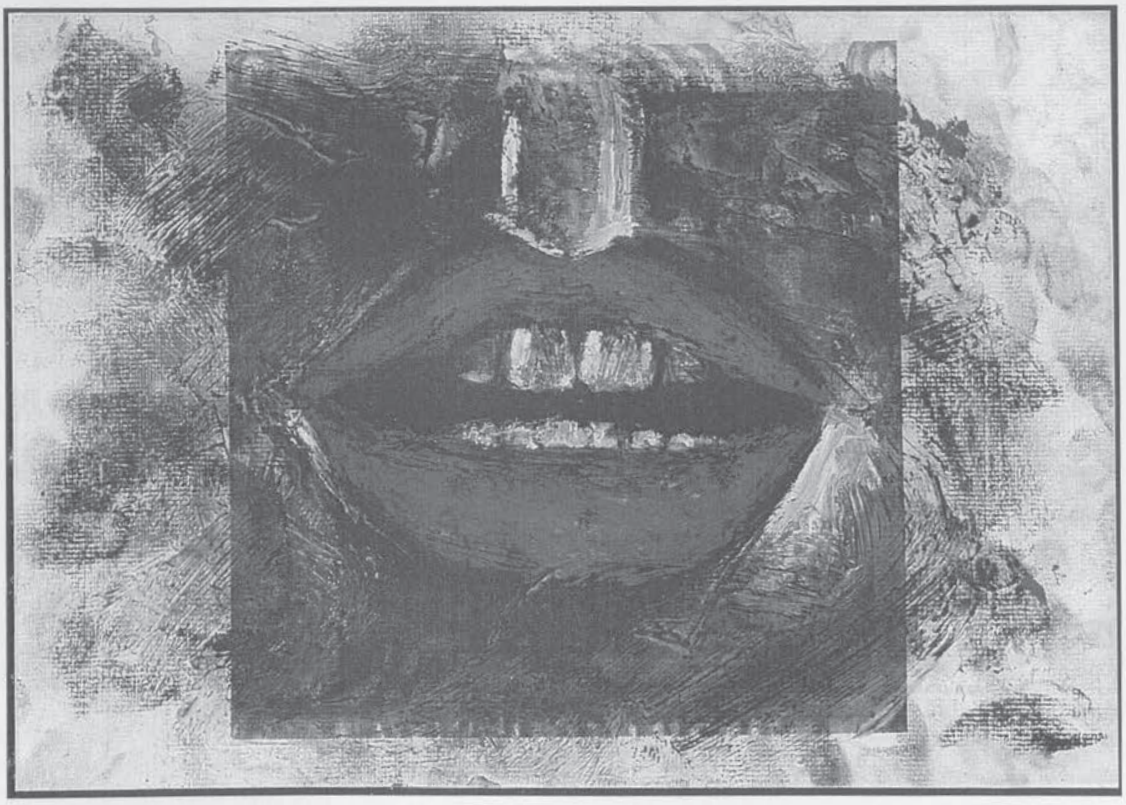


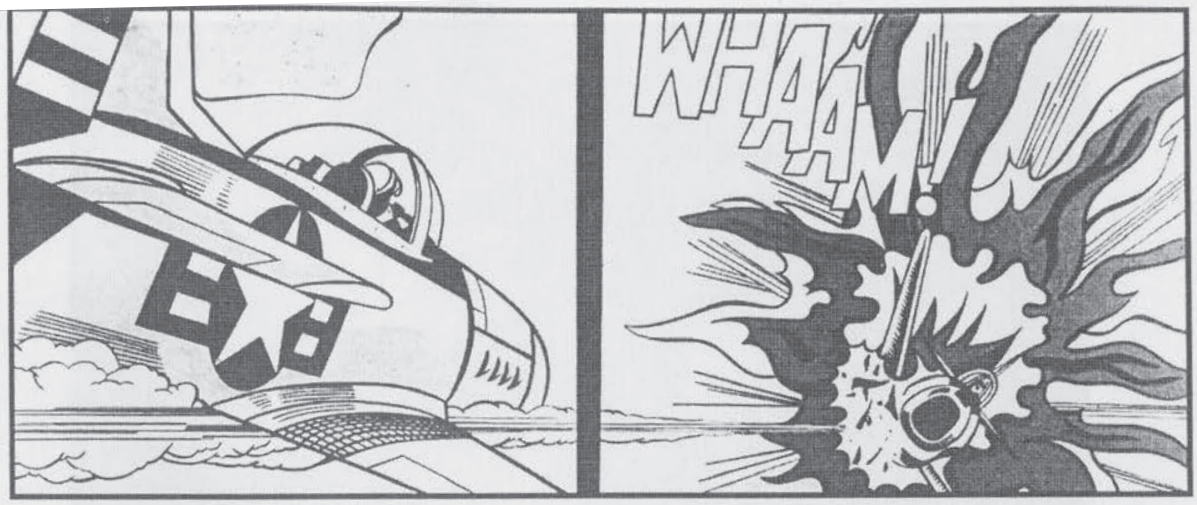
Digitized face, bitmap layered over hand-drawn face.
(Refer to Figure 57).



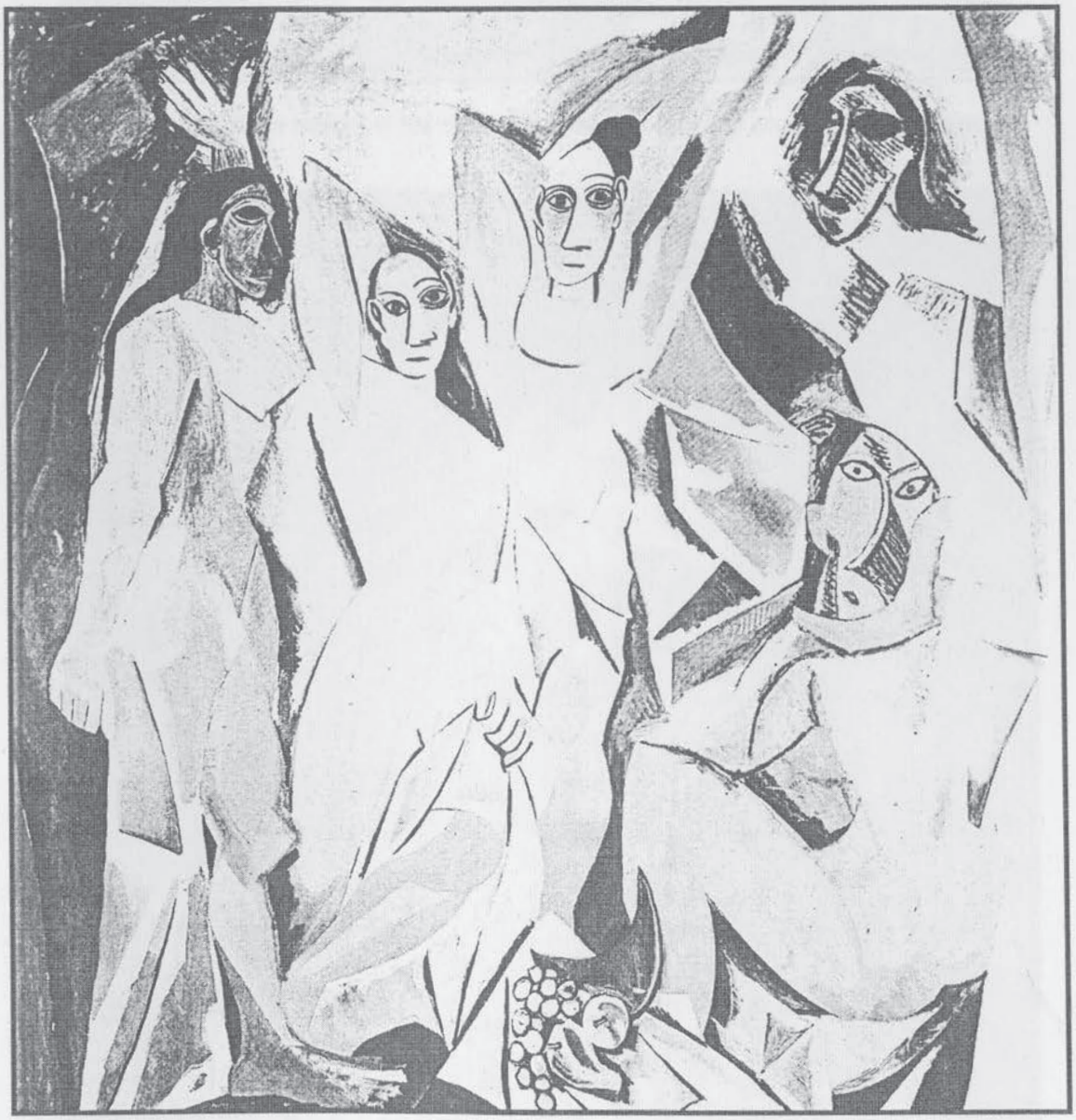
Hand drawn images used for mass-media scene. Images drawn on fabriano with ink, charcoal, oils and paste.(Refer to Figures 63 to 65)







Roy Lichtenstein *Wham* 1963
This image was scanned and altered in colour and form, the word wham and the aeroplane were removed. (Refer to Figure 37) (Hendrickson: 22)



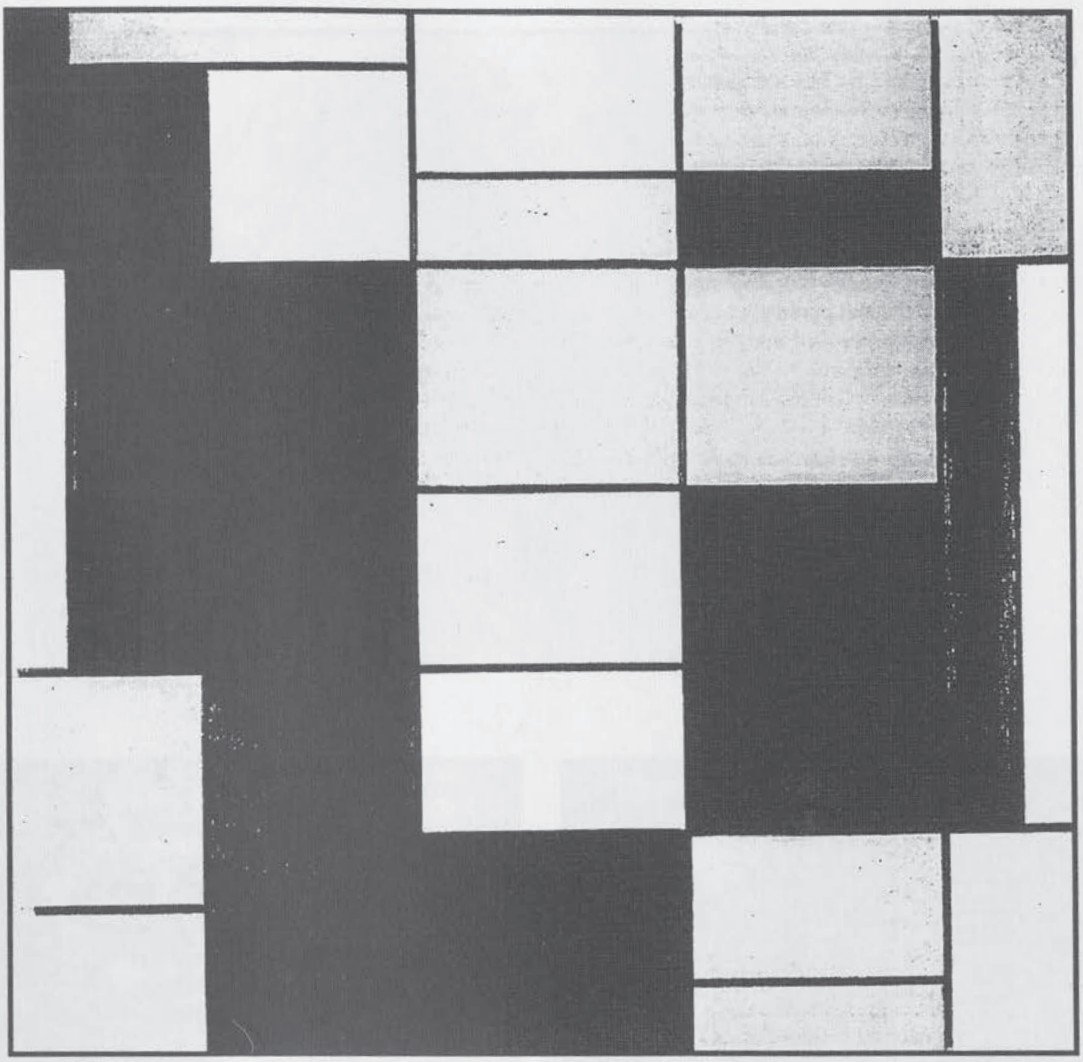
Picasso *Les Demoisele De Avignon* 1917
Imagery used in this scene refers to the distortion of visual forms. (Refer to Figures 74 to 77)
(*Discovering the great paintings* 1992 32:9)



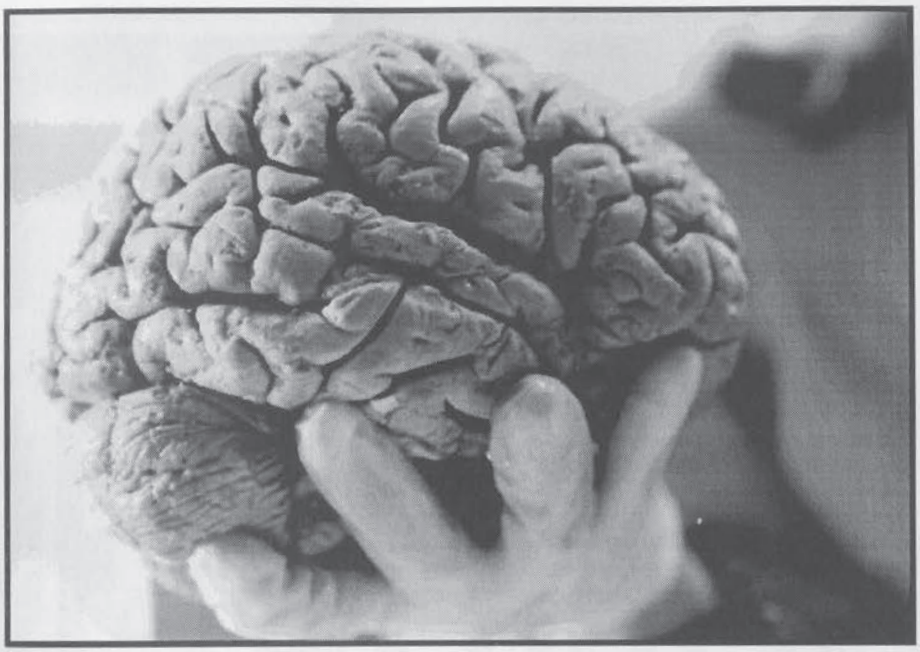
A frame from a scene refering to the 'mask' of media, this data was corrupted and destroyed during 1995.

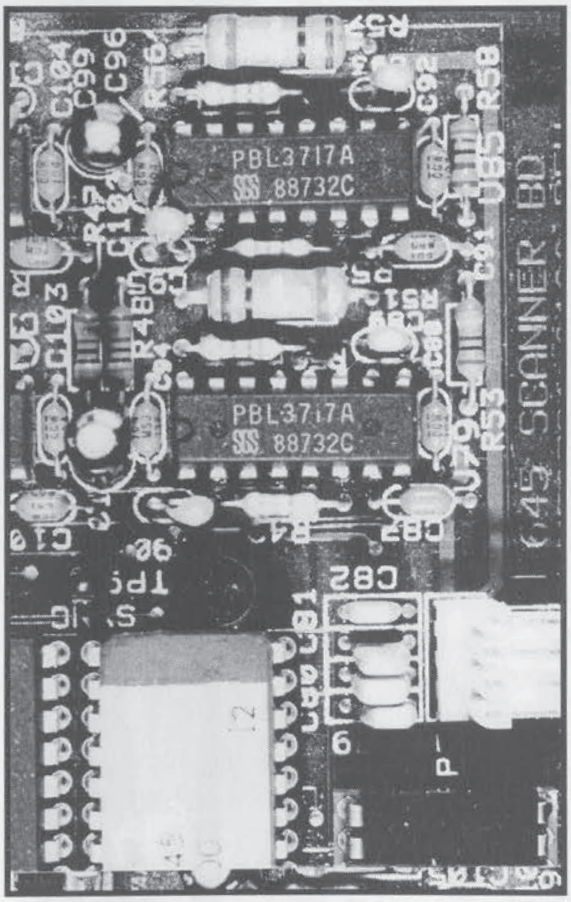


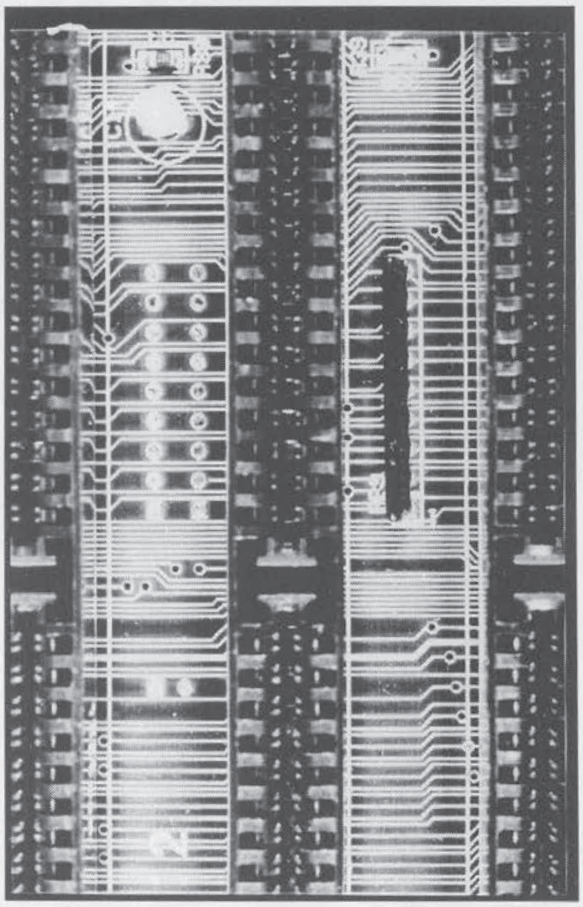
Self painted with imagery referring to Picasso's artworks (Refer to Figure 74)



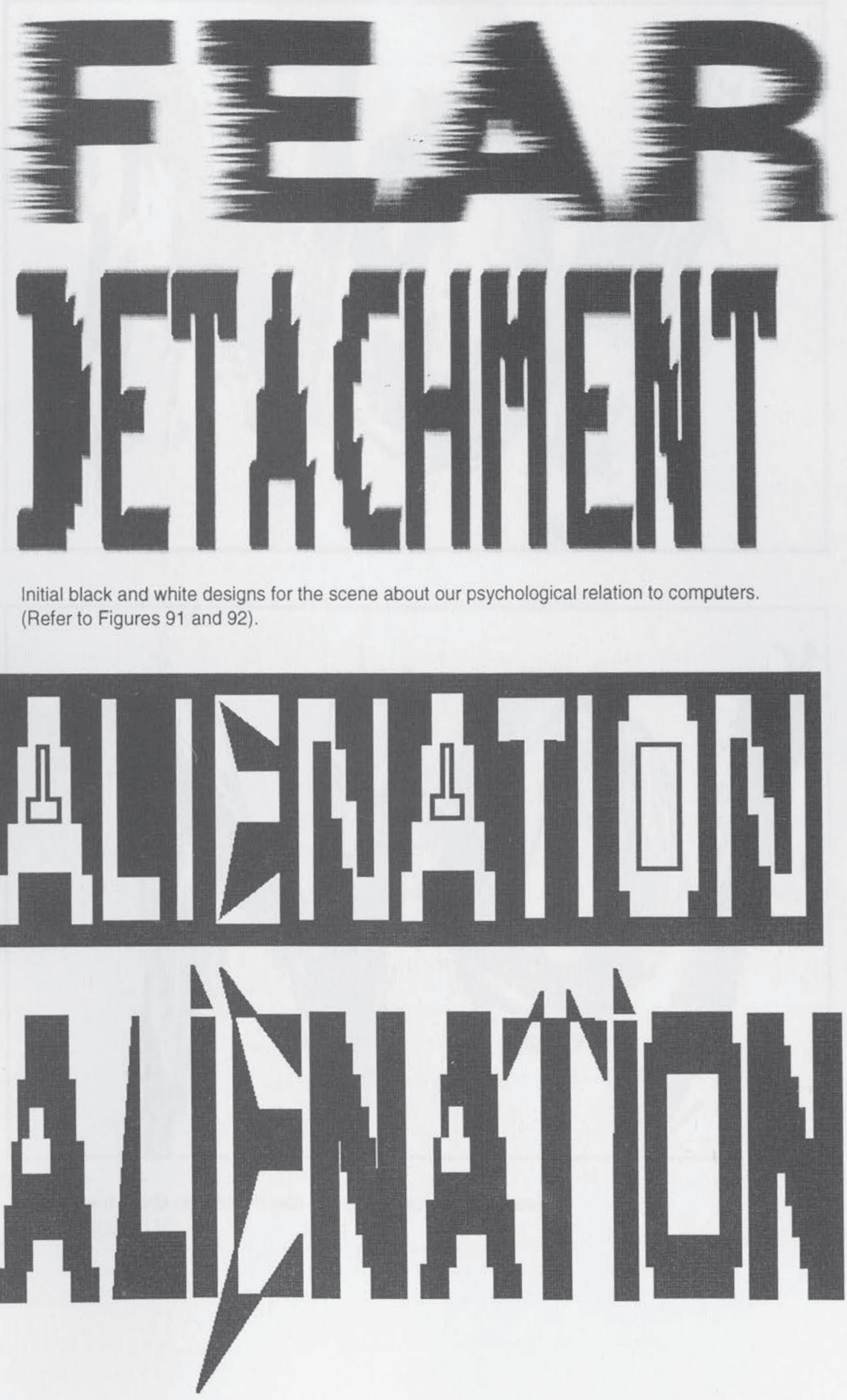
Mondrian *Composition with Red, Yellow, Blue and Black* 1919.
Oil on canvas, 90 x 91.
(Blotkamp:172)





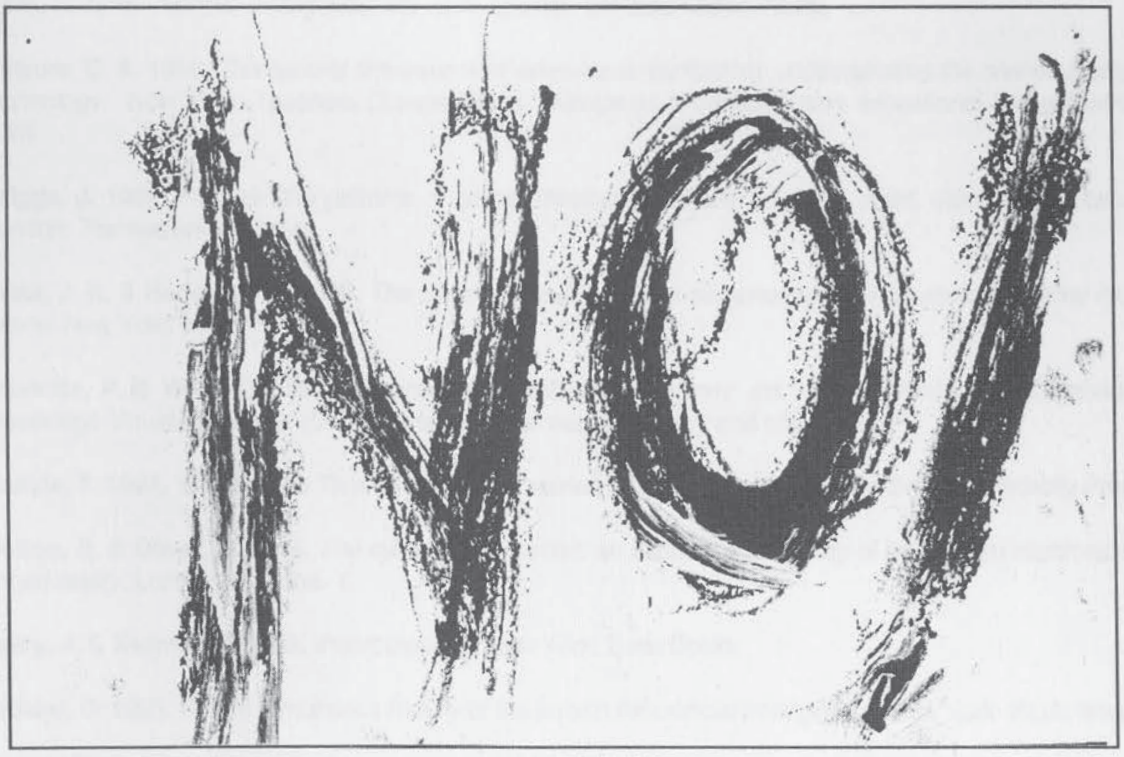


Photographs of a preserved brain and computer circuits used as source material in the designing of various frames referring to artificial intelligence. (Refer to Figures 91 and 115).



Initial black and white designs for the scene about our psychological relation to computers. (Refer to Figures 91 and 92).





Hand-drawn words on fabriano with inik, paste, acrylic and charcoal.
(Refer to figure 110).

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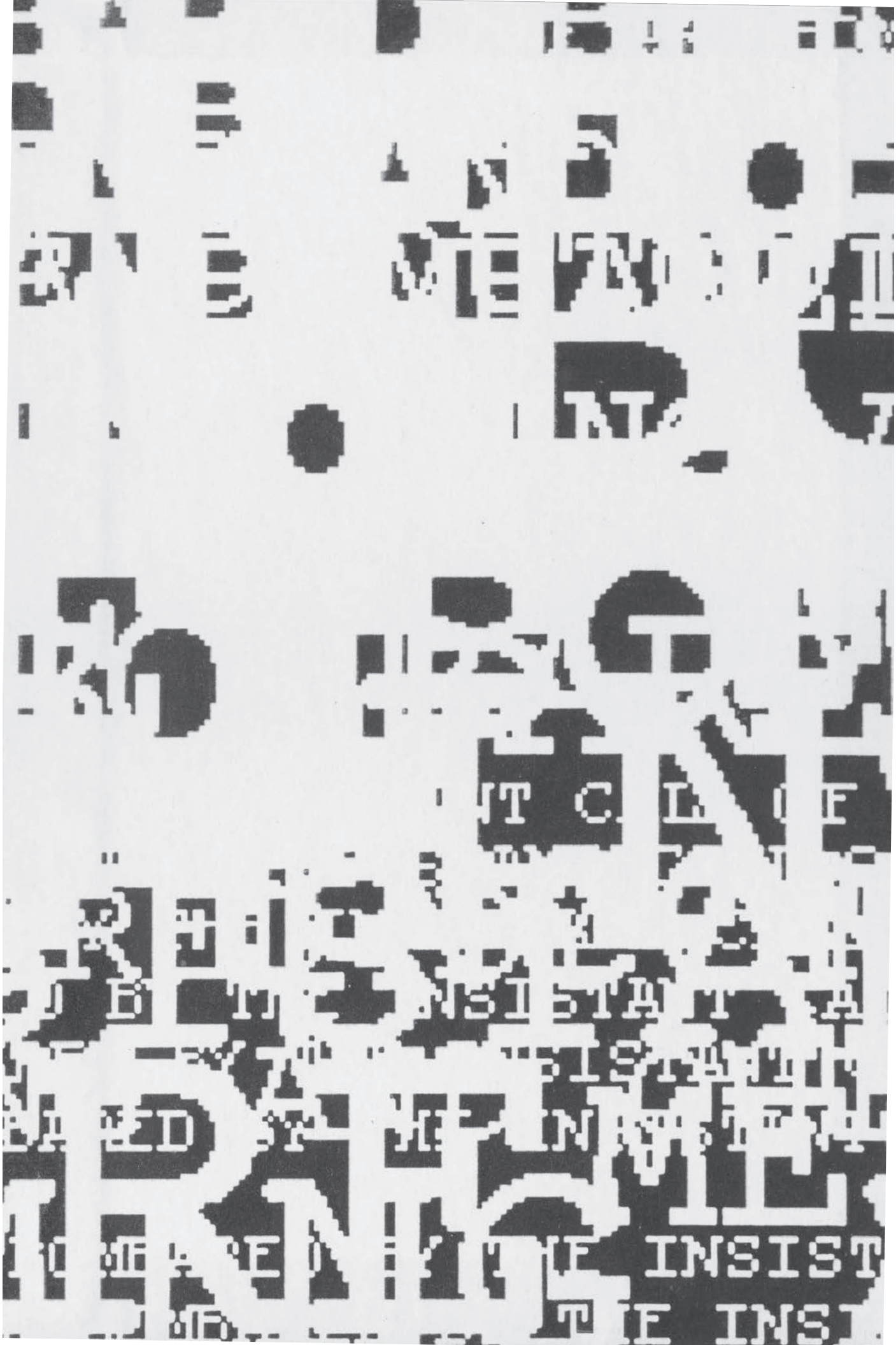
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