

Film, Video, and Digitality: An Analysis of Cultural Form in Time-based Media

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The two accompanying DVDs were burned using iDVD 4.0.1 on an Apple Macintosh eMac. They should be playable in most commercial multi-region DVD players and multi-platform computer software DVD players.

(In Reference Order)

DVD One: Chapter One

Cave (1996) installation documentation (0.34)

Three televisions, stands, three suspended mirrors, one diffusing screen

Exhibited as an installation in:

F. Godfrey, Butchers, Stoke Newington High Street

10-15 December 1996

DVD One: Chapter One: Cave

up for it (1999) (with Lucy Renton) installation documentation (0.26)

Printed posters 70cm x46cm

Exhibited as an installation in:

estate Livingston, Scotland, 4-29 June 1999

Funding bodies:

The Scottish Arts Council, West Lothian Council, University of Southampton

Also exhibited as an installation in:

'Theatre of Myth, Theatre of Memory'

Clublands

24 Camberwell Road 23-25 Sept 2000

Funding bodies: London Arts Board

DVD One Chapter One: up for it

some, but not much (1999) installation documentation (0.17)

Exhibited as an installation in:

estate Livingston, Scotland, 4-29 June 1999

Funding bodies:

The Scottish Arts Council, West Lothian Council, Southampton Institute

DVD One: Chapter One: some, but not much

Advice (2001) installation documentation (0.31)
Latex lettering (Arial bold) on Perspex light box, 1.5x2m
Exhibited as an installation in:
Proof
The Glasshouse
Bermondsey, London
Private commission
(Appendix 1: DVD)

DVD One: Chapter One: Advice

Foyer (2000)
DV file (4.35)
Screening:
Atavistic Ratchets
Lewisham Arthouse 14 January 2000

DVD One Chapter One: Foyer

Fyr (2000)
DV file (1.24)
Screening:
Atavistic Ratchets
Lewisham Arthouse 14 January 2000

DVD One Chapter One: fyr

IS (2002) (music: Barbara Morgenstern)
DV file (2:57)
Released on:
Kleiner Auschnitt DVD monika records (monika vision) DVD 2003

DVD One: Chapter One: IS

Ticklish performance documentation (3.07)
Sound: Kev Hopper, Phil Durrant, Richard Sanderson
Collaborative performance at:
Impakt Festival, Utrecht, Netherlands, 13 May 2000

DVD One: Chapter One: Ticklish: Ticklish live in Utrecht

Ticklish performance documentation (5.52)
Sound: Kev Hopper, Phil Durrant, Richard Sanderson
Collaborative performance at:
Spitz 109 Commercial Street, London E1, 17 May 2000

DVD One Chapter One: Ticklish: Ticklish live in London

Ticklish performance documentation (1.05)

Sound: Kev Hopper, Phil Durrant, Richard Sanderson

Collaborative performance at:

Triskel Arts Centre, Cork, Ireland, April 25 2001

DVD One: Chapter One: Ticklish: Ticklish live in Cork

Chapter Two:

input_output (excerpt) (2002-3)

DV file (4.27)

excerpts in sequence

Screening:

GOG_BOT Media Art Festival

Enschede, Netherlands, 30 October – 6 November 2004

DVD One: Chapter Two: input_output

untitled improvisation with Ryuko Kuwajima (2004) (3.32)

Sound: Ryuko Kuwajima

Performance excerpt, also DV File,

Screening:

GOG_BOT Media Art Festival

Enschede, Netherlands, 30 October – 6 November 2004

DVD One: Chapter Two: untitled improvisation with Ryuko Kuwajima

Chapter Three:

***slaptop* (2002/3) (6.16)**

DV File

Screening:

GOG_BOT Media Art Festival

Enschede, Netherlands, 30 October – 6 November 2004

Also released as CD-R media on Ticklish CD *Here Are Your New Instructions*

Textile Records, Paris, January 2005

DVD One: Chapter Three: slaptop

See also:

Foreign Correspondence (DVD Two: untitled sonimage feedback performance)

Chapter Four:

blip kino (2001) performance documentation
with Phil Durrant
Triskel Arts Centre
Cork April 26 2001

DVD One: Chapter Four: blip kino: blip kino 01
DVD One: Chapter Four: blip kino: blip kino 02

Soap Bubble Set performance documentation
2 excerpts from live performance: light pool, ensemble
With Steve Beresford, Adam and Jonathan Bohman, Tom Chant, DJ Food,
Ether Festival
Royal Festival Hall (Purcell Rooms) 11 March 2003

DVD One: Chapter Four: Soap Bubble Set: light pool
DVD One: Chapter Four: Soap Bubble Set: ensemble

scopac versus the No Orchestra (performance documentation)
2 excerpts from live performance: rhythm image, hand image controller
With Dominic Murcott
Battersea Arts Centre 8,9,11 May 2003

DVD One: Chapter Four: scopac versus the No Orchestra: rhythm image
DVD One: Chapter Four: scopac versus the No Orchestra: hand image controller

DVD Two:

DVD Two is entirely devoted to the installation work 'Foreign Correspondence' a sound image installation by Rob Flint
Exhibited as an installation in:

Leuix Communs Festival
Instant Chavirés
7, Rue Richard Lenoir
Montreuil
Paris 16 October – 14 November 2004

DVD Two: 'Lieux Communs Festival Information' (slideshow)

DVD Two: Project Proposal (slideshow)

NB: titles for individual excerpts are for the purposes of documentation and easy identification in the thesis, and do not refer to titles given to separated sections as individual works

DVD Two: Projector One: video documentation: house drawing (1.02)

DVD Two: Projector One: video documentation: vocal sounds (2.06)

DVD Two: Projector One: video documentation: vocal sounds 2 (1.34)

DVD Two: Projector One: video documentation: traffic transition windows (4.25)

DVD Two: Projector One: video documentation: breath (1.19)

DVD Two: Projector One: video documentation: scribbled column (1.04)

DVD Two: Projector One: video documentation: feedback sound image (0.34)

DVD Two: Projector One: video documentation: scribbled speech (1.23)

DVD Two: Projector One: video documentation: feedback sea (0.35)

DVD Two: Projector One: projection diagram

DVD Two: Projector One: untitled sonimage feedback performance (4.43)

DVD Two: Projector Two: projection diagram (slideshow)

DVD Two: Projector Two: projector 2 excerpt (1.06)

Introduction:

This research is the product of several revisions. The original research questions were modified by rapid changes in the video medium, and by changes in the direction of my own practice, which is located in the field of live video performance. What began with an intention to analyse video as a cultural form and a digitally encoded technology had developed into a division between the theory and practical work, so it became necessary to redefine the several different lines of enquiry, in order to bring the two together in relation to one another.

I needed to locate and reflect upon my own work in the context of other earlier non-objective moving image experiments. These include the 'visionary film' tradition – which suggests that moving images offer an insight into the neural processes of the seeing eye and brain; the tradition of "expanded cinema" – as outlined by Gene Youngblood, which defines early forms of experimental combined media; the Structural/Materialist challenges to visual illusion exemplified in writing and work by Malcolm LeGrice, Peter Gidal, and others; and early experimental works of 'image-processed' video, like that of Paik and the Vasulkas. In addition to situating my own work, I wanted to examine these practices and debates in the light of emerging art in hybrid, digitally encoded media forms. The examples discussed here have therefore been selected on the basis of their usefulness to the research aims, rather than attempting a definitive survey of the specific fields.

Addressing digital media through the modernist notion of art practice dedicated to identifying the specific characteristics of a medium prompted a further question: of whether electronic media, including video, function as a representation of a real event, or as representation of an electronic flow or the movement of bits. Through my own practical work, I wanted to determine whether the processed, non-figurative electronic image can form a valid part of an analytical art practice, and if performance – with collaborative and spontaneous working methods in sound and moving image – can engage with these questions by linking automated playback media to human action. I also wanted to compare the relationship of electronic sound and moving image in new multiple media forms with early and contemporary works deploying their combination, asking if this convergence of modes and media is redefining the critical definitions of contemporary popular culture and avant-garde art.

The resulting artwork is diverse in form, and much of the research has been dedicated to the difficult task of drawing theory and practice together. All examples of my own work referred to are marked in bold, and documented on the two DVDs that accompany this thesis. I have selected specific examples for discussion, and left out some others, particularly in the case of the many live works, where I have included only some representative excerpts. These examples are referred to throughout, and although I begin with a very early work,

I have not stuck rigidly to chronology, as the remaining chapters are organised thematically, and the different activities that comprise my practice were often conducted concurrently.

In the first chapter, the research questions are developed in relation to some early work that preceded the research, looking at metaphors of flow and interruption in writing about television, through a comparison between the installation work Cave and David Hall's *A Situation Envisaged: The Rite*. These ideas of flow and interruption are developed as exemplary of contrasting theoretical attitudes to new information and communication technology in, for example, Raymond Williams and Gilles Deleuze. This chapter concludes with some of my works that experiment with flow and interruption to address the uses of modified and processed sound and image media using Lev Manovich's concept of 'ontological montage'. As a development of these aims, The chapter concludes by introducing the live manipulation of the image in combination with sound and music through my activity with the group Ticklish.

In the second chapter, an analysis of the characteristic properties of the video medium looks at the use of electronic feedback in art and popular culture, music, and video. The image-processed tradition of video art is also compared to the "visionary" tradition in experimental film through the relationship between electronic patterning and retinal and hallucinatory 'after images.' The combination of feedback imagery and electronic sound is practically explored through the live work introduced in the first chapter and in a comparison between audio and video feedback using works by Alvin Lucier and David Hall to analyse the use of feedback as a form of flow and of interruption.

The third chapter deals specifically with sound-image combinations, looking at the contrasts between the idea of supra-sensory links between sight and other senses in the historic discussion of the synaesthesia phenomenon, the concept of "visual music" as a motivating idea in early abstract and animated film, and the arbitrary, but exact collisions of different modes typical of combined digital media forms. Because of the direction of the practical work, this research tends to focus on sound and image relationships based on movement and rhythm, rather than pitch and colour, as in the work *slaptop*, which is compared to the handmade film work of Len Lye.

The fourth chapter discusses the use of moving image and sound in live performance, from early 'light organs' through psychedelic light shows and expanded cinema forms, to the recent use of automated and software-based means of manipulating sound and image. The importance of musical forms as a continued cultural modulation of the visual image is asserted. Linked to this, the interface through which electronic media can be "performed" is analysed through the popular example of the DJ and the VJ and experimental works like Steina Vasulka's *Violin Power* and Michel Waisvisz' gestural devices. My own performance works are used to develop the problematic definition of 'presence' in

live performance linked to Benjamin's delineation of the 'aura' of the artwork. The introduces a critical analysis of my most recent art work, the audiovisual installation *Foreign Correspondence*, in which I attempted to address the various research questions as a productive resource for making new work from more established ideas. The work is concerned with the juxtaposition and dislocation of sound and image, aware of the traditions of synaesthesia and visual music, but imitative of neither. As an installation it also returns to questions raised in the earlier installation work of the first chapter, but redefines them in the light of intervening research activity and practice.

Chapter One:

My research into video and digital media grew out of work in other forms. This chapter describes the development of the research questions from these earlier works, in particular the debates on 'flow' in relation to electronic media, and various models of artistic intervention, and most specifically interruption. The relationship between broadcast public media and artistic models of critical practice are discussed through an examination of Raymond Williams critique of television 'flow' and Gene Youngblood's more utopian vision of the "videosphere" – his modification of Teilhard de Chardin's evolutionary "noosphere". The contrast between these two models is central to the question of whether critical and analytical work is possible using processes that are part of the dominant structures and codes of public media. The chapter concludes by introducing my work using video for performance that will be addressed throughout the following chapters, particularly in Chapter Four

Early Work: Cave

The **Cave** artwork was motivated initially by personal experience. A childhood spent in a religious sect that enforced a total separation from radio and television, provoked in adulthood an interest with its social form mediated by distance, and experienced only through indirect attention, overheard in public places, glimpsed through home and shop windows. This primary experience is more influential on my interest in video than television or the cinema, neither of which I experienced directly until early adulthood, despite being otherwise immersed (at school) in a culture mediated by the cultural forms of those technologies, which were relayed to me in a second hand form through the conversation of other schoolchildren.

My first use of video was therefore concerned with broadcast television, used in a direct and technically unsophisticated way, in an installation work entitled **Cave** (1996) (**DVD One: Chapter One: Cave**) which was exhibited in a former shop in Stoke Newington with a window facing onto the street. Four monochrome televisions at different heights, tuned to the four terrestrial channels then available in England, were partly obscured by suspended mirrors facing the screens that had the effect of blocking the image, but of amplifying the flickering light in the otherwise unlit space. It was viewed from the outside by passers-by, rather than being entered as a gallery, and therefore subject to casual attention, rather than to the intentional scrutiny of a deliberate gallery visitor.

Created before my study for a research degree began, I have assessed it again in the context of my current work concerned with live and spontaneous ways of using the video image. Although the screens were deliberately obscured it was not an attack on television as such. The experience I attempted to represent in **Cave** – its name a reference to the Platonic allegory – derived from seeing a group of living room windows at night during a world cup football game, flickering

in unison, as the same television signal was watched concurrently in different homes. Combinations of different kinds of distanced looking were taking place that echoed the description of consciousness as a displaced projection in Plato's original story (Plato, in Lee, 1955: 316). In seeing the flickering shadows from outside the several living rooms I was witnessing the light traces of an event that was occurring in layered and concurrent forms. This was a social experience on so many different invisible sofas, but also the light traces of physical events that were happening many miles away on a football field. And - since most of the flickering was due, not to the actions in the game, but to abrupt cuts between shots - to editing - in the television studios, it became increasingly difficult to locate a single source for the event, the further back one attempted to trace its origins. I had little knowledge of the technical means by which the electronic television signal became pictures and sound on the television itself, but in that process, too, the multiplicity of micro-events undermine the idea of a singular moment of viewing in favour of a more complex temporal event.

As well as questioning the location of the 'event' being witnessed, the experience seemed to typify the strange social phenomenon of a mass media environment - a condition of being united in isolation. What I also did not understand at the time was how that isolated but still collective experience would very soon be further fragmented by the increased number of cable channels and the rival computer screen of the internet that would make the condition of mass concurrent viewing increasingly less likely.

But nostalgia for a lost communitarian 'wholeness' of television viewing was not the purpose of the installation. I was interested in the simultaneous event of the viewing and the game. The concept of simultaneity is addressed in various works of Futurism and Constructivism, and particularly in the post-cubist painting of Sonia and Robert Delaunay, whose 1912 'Windows' series develop the theme of simultaneous views. Robert Delaunay's *Window on the City, No. 4 (Les Fenêtres sur la Ville)*, of 1910-11 for example, shown in the influential Armory Show in New York in 1913, uses a post-cubist technique of planar fragmentation to create a fractured spatial depth that is nonetheless linked by its title to the pictorial form of the window looking onto a world beyond. Delaunay's concept of colour simultaneity derives from Michel-Eugene Chevreul's influential essay *On the Laws of Simultaneous Colour Contrasts* (Chevreul: 1839), which had been a powerful force on impressionism before Delaunay, and was to provide the groundwork for later links between Gestalt psychology and colour theory (Buckberrough, 1978:103). Chevreul's theory is concerned with the way combinations of colours interact to create new colours in the optical field. Although this suggests a preoccupation only with colour contrast in the Delaunay's work, the persistence of modern urban subject matter, in addition to the self-conscious metaphor of the window, suggests another simultaneity - of diverse multiple modern social experiences - in addition to the formal perceptual experience of combined colour. The influence of Henri Bergson on the development of painting in the early twentieth century is extensive, and the notion

of simultaneous and multiple states is central to his concept of time conceived of as duration (*la durée*):

I do not measure duration, as seems to be thought; I merely count simultaneities, which is very different (Bergson, 1910:108).

Bergson's new conception of time and conscious time is itself influenced by the new technologies of moving image. Elsewhere he compares perception directly to the new technology of cinema, with its fragmented and reconstructed recreation of the experience of duration (Bergson, 1907:332).

So although Delaunay's interest in simultaneity seems linked to a synaesthetic quest for a spiritual colour-language examined in following chapters, he rejected the mystical account of colour as an isolated and universalised essence, as Buckberrough relates (Buckberrough, 1978:103). Instead, the work moves between that (neo-Baudelairean) part of modernism preoccupied with the contemporaneous as symbolic content, and the (neo-Bergsonian) attempt to transcribe the experience of modernity in abstract terms. As a product of an anti-modern fundamentalism, I too, was interested in the social abstraction of the events that determined the flickering light and colour, and in finding a way of representing that experience in combined form, though not in the subjective form implied by Bergson's *durée*. **Cave** is concerned with a post mechanical modernity of simultaneous wired and wireless transmission and reception, which I identified with the dense and complex simultaneous events of the city in Delaunay's painting.

I was keen to examine the idea of events that owe their existence to being the object of a particular kind of attention. While programmed content may absorb the viewer and/or the listener, television and radio transmit their broadcast out into space regardless of the presence of any sentient audience. This mute and impersonal address is a determined characteristic of electronic media. All content seems to be subordinate to that fundamental fact, although interactive broadcasting seems slowly to reshape it. Raymond Williams, analysing the comparatively new phenomenon of mass broadcast television in 1974, wrote of radio and television as "...systems primarily devised for transmission and reception as abstract processes, with little or no definition of preceding content." (Williams, 1974:25) As a marker of this dominance of formal totality over specific content Williams outlines the transition from the cultural form of the 'programme' with its roots in theatrical entertainment, based on planned breaks and intervals, to that of continuous 'flow':

In all developed broadcasting systems, the characteristic organization, and therefore the characteristic experience, is one of sequence or flow. This phenomenon, of planned flow, is then perhaps the defining characteristic of broadcasting, simultaneously as a technology, and as a cultural form (Williams, 1974:88).

There is a correspondence therefore, between the cultural form of the medium (and institution) of television as described by Williams, and its form at the level of the physical means by which video (and therefore television) is output. Although he gives a broad history of the development of television technology (Williams, 1974:14-19), Williams does not occupy himself in detail with the electronic means by which an image occurs on a television/video screen, but the same characteristic of flow, rather than sequence is true at that detailed level, as is demonstrated by a comparison between film and television. While film is based on sequential images rapidly displayed, video is generated by means of light and sound broken up into information condensed in a continuous electronic signal. This parity of technical and formal characteristics is not based on chance, of course, because the cultural form of material broadcast from a potentially limitless source brings about the possibility of moving images that flow continuously, rather than being presented as a finite programmed sequence. Williams' concise historical vignette identifies the determination to unite photographic technology with electronics that is the driving force behind the development of the television medium. Williams is writing before the mass application of networked and computerized forms of the video image, but this same commercial will – to combine new or developing technologies with existing cultural forms – can be identified in a number of contemporary hybrid examples, particularly in media whose primary social role is entertainment. And the idea of flow, of an experience of flow, and a flow that emanates continuously from something, is a metaphor still relevant to their usage.

Flow and intervention

Television output is also segmented, as John Ellis and Jane Feuer have both pointed out as a modification of Williams' position. (Feuer, 1983, in Kaplan, 1983) The flow propensity Williams observes relates to a basic characteristic of mechanical technology – accentuated in digital technologies – of output duration being unrelated to human fatigue, in contrast to the programmed human concert performance model with which he compares television broadcast. This 'flow' characteristic dominates the viewing experience. Thus the medium of television is apprehended (negatively, for Williams) as something whose identity supersedes or obscures its defined content. As he points out elsewhere in the same text, the tendency, in describing an experience of televisual viewing, is to say that one was 'watching television' prior to defining what was actually being watched (Williams, 1974:94). Jane Feuer writes, summarizing Williams:

Indeed, the central fact of television may be that is designed to be watched intermittently, casually, and without full attention (Feuer, 1983: 13).

Feuer looks at the social and technical form of television through the concept of the live broadcast. She compares Williams' 'flow' with Herbert Zettl's emphasis on the live broadcast as the essence of television form (Zettl, 1978), which

likened it to the live moving electron scan that 'draws' the video tube image. Zettl relates this to the Bergsonian concept of *durée*, appropriately enough, for the Delaunay comparison which I have given above. But, argues Feuer, Zettl is confusing essence and history, and the concept of the live broadcast is, at least partly ideological, an attribute determined by the industry. The 'liveness' exists as a condition of our separation from the event, whether the image and its source are temporally identical or not.

For a critical art practice this abstract impersonal continuity raises the problem of how to maintain a critical distance from the experience of flow phenomena, instead of simply reproducing it. Williams opposes 'naturalising' the flow experience in a manner he sees in media theory, particularly that of Marshall McLuhan, whom he accuses of a technological determinism (Williams, 1974:126-130), that universalises technological effects as social causes. By way of example, a direct contrast to Williams' materially grounded scepticism can be found in Gene Youngblood's McLuhan-influenced writing on television in 1970:

Television is the software of the earth. Television is invisible. It's not an object. It's not a piece of furniture. The television set is irrelevant to the phenomenon of television. The videosphere is the noosphere transformed into a perceivable state. "Television," says video artist Les Levine "is the most obvious realization of software in the general environment. It shows the human race itself as a working model of itself. It renders the social and psychological condition of the environment visible to the environment." A culture is dead when its myths have been exposed. Television is exposing the myths of the republic. Television reveals the observed, the observer, and the process of observing. There can be no secrets in the Paleocybernetic Age (Youngblood 1970:78).

For Youngblood, Levine, and others the importance of the television medium lies in its interconnectedness and the utopian social possibilities of the network. The technology is part of a spiritual evolution. The concept of the noosphere (from the Greek 'nous' – mind) derives from Pierre Teilhard de Chardin whose book; *The Phenomenon of Man* (de Chardin, 1959) is an important influence on Expanded Cinema. The noosphere is –

...the film of organized intelligence that encircles the planet, superposed on the living layer of the biosphere and the lifeless layer of inorganic material, the lithosphere. The minds of three-and-a-half-billion humans—twenty-five percent of all humans who ever lived— currently nourish the noosphere; distributed around the globe by the intermedia network, it becomes a new "technology" that may prove to be one of the most powerful tools in man's history (Youngblood 1970:57).

Written in 1939, de Chardin's book was published in English twenty years later, and is a powerful conceptual influence on McLuhan and media theory (see

McLuhan, 1964:263). De Chardin's concept describes a developmental trans-human consciousness, a Catholic incorporation of evolutionary science into a deistic framework.

A contrast runs through the current discourse on new media art, with recent renewed interest in McLuhan in the work of writers like Lev Manovich. Williams, Zettl, Youngblood, and Feuer's comments were made when most national television broadcasts usually terminated late in the evening. The concept of 'flow' anticipates today's continuous twenty-four hour broadcast, and the continuity of online and networked computers, view-on-demand subscription channels, and non-linear hard drive video recorders. McLuhan's cybernetic account of television, and Youngblood's influential book anticipates and influences the later utopian discourse of cyberspace as a liberating extension of human subjectivity. But there is a conflict in the political definition of that experience. The McLuhanist or cybernetic model sees the new interconnected technologies, not as tools of oppression, but as the means by which freedom is to be attained. The language is not that of resistance, but of an ecstatic openness to the new media environment. Where Williams sees passivity, Youngblood sees new communication extensions to the noosphere.

Youngblood does not define flow, but it occurs several times in a positive descriptive context, significantly in quotations from light organ pioneer Thomas Wilfred "...the universal rhythmic flow..." (Wilfred, in Youngblood, 1970:345) and intermedia artist Stan VanDerBeek:

The purpose and effect of such image flow...is both to deal with logical understanding and to penetrate to unconscious levels, to reach for the emotional denominator of all men, the nonverbal basis of human life (VanDerBeek, in Youngblood, 1970: 387).

Later, Stan Brakhage's 'Dog Star Man,' is described by Youngblood as an experience of "synaesthetic/kinaesthetic flow of color, shape, and motion" (Youngblood, 1970:80). Again, 'flow' is an experiential description that naturalises the experience of moving image media.

For Williams flow implies an uncritical compliance, where for Youngblood flow is an experience of unity, a concept of wholeness that verges on mysticism. Youngblood's models are derived from cognitive science, but *Expanded Cinema* attempts to synthesise new technology, cybernetics, and new theories of perception into a cosmic framework of millennial change – "The Paleocybernetic Age witnesses the concretization of intuition and the secularization of religion through electronics." (Youngblood, 1970: 137). In this same spirit, Ronald Pellegrino, a disciple of Youngblood, and product of the same cultural milieu dedicates his manual of audiovisual intermedia experiment, in 1983: "...to the electron, its energizing source, and all who take delight in it" (Pellegrino, 1983 *unnumbered foreword*).

Youngblood continues to stand by his environmental metaphor for the video and mass mediated world. In 1984 he argued:

...if photography lends itself most strongly to the notion of art that says that art is obsolete, then video surely stands as the paragon of that posture. It is truly a “medium” in the environmental sense, like language, like water, and it will have reached cultural maturity only when its ambient and pluralistic status is taken for granted (Youngblood, 1984, online).

The differing usage of the concept of flow, and the degree of human agency attributed to it, highlights distinctions between the Marxist-influenced critique of new media as a socially produced phenomenon, and the evolutionary account of human technological development. In one, technology is alien to the physical body, products of the abstractions of capital and the commodity form, and the model of critical art is of resistance, interruption, intervention and shock, exemplified in the non-affirmative negative dialectics of Theodor Adorno, while the other sees new forms of media as sensory extensions out of the body onto the world, in language characterised by metaphors of consciousness extension, expansion, and imminent epistemic change, exemplified in theorists of media like Marshall McLuhan, or Buckminster Fuller, who introduces *Expanded Cinema*. The influence too, of Teilhard de Chardin and Norbert Wiener, is strong. While both instances share an ideal of vanguardism or counterculture, the first is critical of the very instruments of mass mediation: “The basis on which technology acquires power over society is the power of those over whose economic hold over society is the greatest” argues Adorno (Adorno, Horkheimer, 1944:121). The second more closely resembles the “pioneer” (Greenhalgh, 1990) moderns of early twentieth century Europe – Marinetti’s Futurism, for example – for whom what is to be resisted is the very resistance to technological change itself. It poses to the question, central to modernist discourse, of whether technology, and the abstract relations thus implied, is a tool of revolutionary change or repetitious oppression.

Writing a “...brief history of flow” in 1998, Sean Cubitt connects the domestication, commodification, and naturalisation of electrical current with the development of the flow metaphor, identifying it latterly with a “free market, anti-state anarchism” espoused in the writings of new media “libertarian entrepreneurs” in journals like *Wired* and *Mondo 2000* (Cubitt, 1998: 129-132), and there is no doubting its connection with a depoliticised analysis of subjectivity in the writing of Mihalyi Csikszentmihalyi, in which flow is presented as the model of “optimal experience” and the key to active happiness, according to Csikszentmihalyi:

The flow experience is important to understand because it provides a key for understanding the strivings of the self and the quality of individual well-being... It also helps explain which institutions increase order and which

produce order in consciousness, and hence gives us a clue to the development of sociocultural evolution (Csikszentmihalyi, in Csikszentmihalyi, 1988: 35).

Csikszentmihalyi's model is increasingly utilised in psychological models of Internet interaction, and theorists of new media interfaces, games and software, have variously adapted his work. In fact his model of flow does not in fact include the television viewing experience, which is characterized by passivity incompatible with the engagement necessary to fulfil Csikszentmihalyi's own criteria (Csikszentmihalyi, 1988: Introduction).

Interventions in Television

Other artists have worked with real time broadcast monitors. Before video recording and replay was available outside of the specialist television studio, artists who used video technology were necessarily engaging directly with television as a medium. Nam June Paik (1932-) and Wolf Vostell (1932-), used magnets to deflect the photon charge, and other modifications to distort the image on the cathode ray tube in a 1963 exhibition: *Exposition of Music—Electronic Television*, at the Galerie Parnass in Wuppertal, Germany. Paik and Vostell's interventions were Dadaistic, Fluxus-type challenges to the authority of the instrument itself, but for Paik this activity would develop into further works of video image-processing and more complex technical intervention in the screen picture, via the direct synthesis of video signals in his work with Shuya Abe (see below). More recently, too, though unknown to me at the time of constructing *Cave*, David Hall had used multiple continuous broadcast television streams in his work *A Situation Envisaged: The Rite* (1980):

Sixteen domestic TV receivers are arranged in a circle; each facing away from the viewer into the enclosed space; each playing a different TV channel from the next. A videotape playing on a revolving monitor is glimpsed at the centre through small gaps... each so fine that vision is restricted... suggesting an attempt to assemble information coherently as the viewer moves from one to the next. In doing so, the continuum is broken. Expectations of narrative progression are both implied and rejected... sometimes phasing (by coincidence) with the movements of the viewer, sometimes not. Fragments seen are of private ritual... The work confronts issues of power and the individual; the public and the private; the viewer and the viewed... (Hall, 1980, online).

The work forms part of an evolving series begun in 1978. When shown in a survey of a decade of video at the Museum of Modern Art in Oxford in 1990, the work, now titled 'The Rite II' was described thus:

...fifteen monitors built as a single block – a monolith – close to a wall. All screens but one face the wall, and are not seen, but reflections of modern

broadcasting output on the wall form an 'aurora' of moving, changing, light around the stack. In the centre, on the only screen to be viewed, is an image of the moon panning from one side to the other. This image, composed of 30 vertical lines similar to the earliest television transmissions of the late 1920s – was originated on a disc scanner identical to the first 'camera'/transmitter invented by John Logie Baird in 1925. The sound is derived from multiple broadcast channels, and composed as a musical score (Hall, 1990:39).

Hall acknowledges the primacy of televisual culture to the experience of work using video. In the MoMA Oxford catalogue he quotes David Antin's assertion that "...the television experience dominates the phenomenology of viewing and haunts video exhibitions the way the experience of movies haunts all films" (Antin, 1975 in Hall, 1990: 29). Hall's earlier work is also concerned with drawing attention to the monitor, either by problematising its visible content, or by disturbing its placement (See Rees, 1999:87). Installation is one of the methods through which he intends to reflect on its overlooked objecthood. In a short essay accompanying the MoMA Oxford retrospective, he says:

The immediate perception of a single video monitor screen is as a kind of window (unavoidably a television window). At the moment of attention the viewer assumes a total disregard for the TV as object. But the introduction of a second monitor (or more) into the visual field presents a monumental problem. There are not just two, there is a conflict. Is one screen given attention, or is the other? (Hall, 1990:30).

That this comment was written as recently as 1990 highlights the rapidity with which mixed and multimedia forms have altered the contemporary television and video image. The context of concurrent screens is now a commonplace domestic experience, particularly on the computer screen 'desktop' where moving images of different forms are displayed together in a manner that Jay David Bolter and Richard Grusin have dubbed 'hypermedia' (Bolter, Grusin: 1999). From this development it would seem that either the introduction of a second moving image might no longer present the "monumental problem" that Hall asserts, or that (as Bolter and Grusin avow) the visual forms of new media are, in fact, currently in the process of disrupting older paradigms. Multiple screens and viewpoints are certainly now a central characteristic of the dominant visual media, through the development of the Graphic User Interface (GUI) of the personal computer. This form is then re-absorbed back into older medium of television, as in the way CNN or other news channels present multiple information and picture-in-picture windows concurrently. Multiplication does not necessarily dislodge the Realist image from its dominance, nor does it draw attention to the medium or means by which the two (or more) images are brought about. The 'flow' characteristic of Williams' analysis might be said to persist rather than being interrupted by numerous image combinations.

Referencing Williams, as Hall also does, Sean Cubitt argues of *Situation Envisaged: The Rite II*, that by eliminating the segmentation of conventional broadcast content, Hall renders TV “profoundly utopian”:

At once focusing on and undermining the nature of TV as flow, as a medium without content, he makes us aware of the processes in which TV produces itself as content, and us as its subjects, while simultaneously removing the chains of subject formation, subjection, that normally bind us to the administration of time, the time-budget, of TV (Cubitt, 1993:89-90).

The term ‘utopian’ is used ambiguously. Cubitt compares *Situation Envisaged* to the work of Peter Gidal, in its refusal to depict an illusory world beyond the screen, but he leaves unanswered the question of how representing the phenomenon of flow does not itself form part of the flow, and if, or how, it negates it. For Cubitt’s analysis the utopian nature of the medium depends on the lack of any image, begging the question why television screens could be used at all. In **Cave** the television broadcast is discernable only at the points when the flow is interrupted (and this is true of Hall’s “Rite...” also). The more perfect exemplar of Cubitt’s interpretation of Williams’ model would be the electric light, whose current flow is so unmediated by human activity and intervention that it appears as a constant signal.

In the installation **Cave**, the screens were not arranged to challenge the dominant context-excluding single screen in the way that Cubitt reads in Hall, but rather to isolate the concurrence and disparity of the many separate domestic experiences of an otherwise entirely uniform broadcast output, in addition to drawing on the experience of television as something seen only in the flicker of human action through other peoples windows. Nor did it subscribe to the quasi-Bazinian realism of which Jane Feuer accuses Zettl (Feuer, 1983: 13-14). It was not so much the “live” event of the football game giving rise the flickering light on the different rooms that interested me, but the other ‘live’ event of their being given attention concurrently in so many different places. This distinction was not successfully resolved in the work and I was not an experienced video artist, having given the medium far less attention than Hall, but I was interested in the domestic context of television viewing alongside other everyday social activity. The position of being separate from the viewing context provides it with a limit, giving it a whole-ness not visible when attention is absorbed by specific content. The sense of flow, unlike the supposedly participatory or absorptive flow of Csikzentmihalyi, is dependant on the imposed distance from the segmentation of programmed subject matter.

Representing The Event

Work using electronic media always has a relationship to the flow of electrons, whether fore-grounded or not, but a flow can also be seen in the cultural forms it enables. In **Cave** I was interested in broadcast and public media as the site,

rather than the representation of an event. I developed this in works made for a group show – *estate* (1999) – in Livingston, a Scottish New Town, near Edinburgh, Scotland. The first of these works – a collaboration with artist Lucy Renton – entitled **up for it (DVD One Chapter One: up for it)**, consisted of posters in the style of the rave dance party posters that were fly posted on all available walls in most British cities at that time, announcing events with hyperbolic names like ‘Paradise’, ‘Heaven’, and Utopia’. These were pasted over the boarded-up windows of a disused building that was the focus for the show. The artists’ statement for the catalogue reads:

Often the expectation of events is as real as the events themselves.
Entertainment in its simplest form is about creating anticipation.
It is a risky strategy since the disappointment can be proportional to the desire created. The task is always to redirect it. We know the things advertised on the posters don't exist but they could. Its important to believe it might be so.

The work was intended to address in a distanced way a culture that had been widely popular and personally influential, and to link it critically to the utopianism of the New Town projects. The advent of “acid house” rave and warehouse parties had transformed white pop music culture in way that has some parallels with the punk music of the late 1970s. The use of the word Utopia aims for the knowing hyperbole of the circus poster, which recognizes the extravagance of the claims it makes. Rave culture, despite moments of temporary autonomy – and my own enjoyment of it – seemed also to embody a profoundly post-political echo of the earlier counterculture. It was that counterculture reduced to a speechless rhythmic essence. Steve Redhead (1990) has written critically on the way in which the underground rave culture became quickly incorporated into mass commercial entertainment, while retaining its utopian language.



Figure 1: *up for it* (1999) installation shot showing posters on boarded windows in Livingston, Scotland, for the show 'estate'

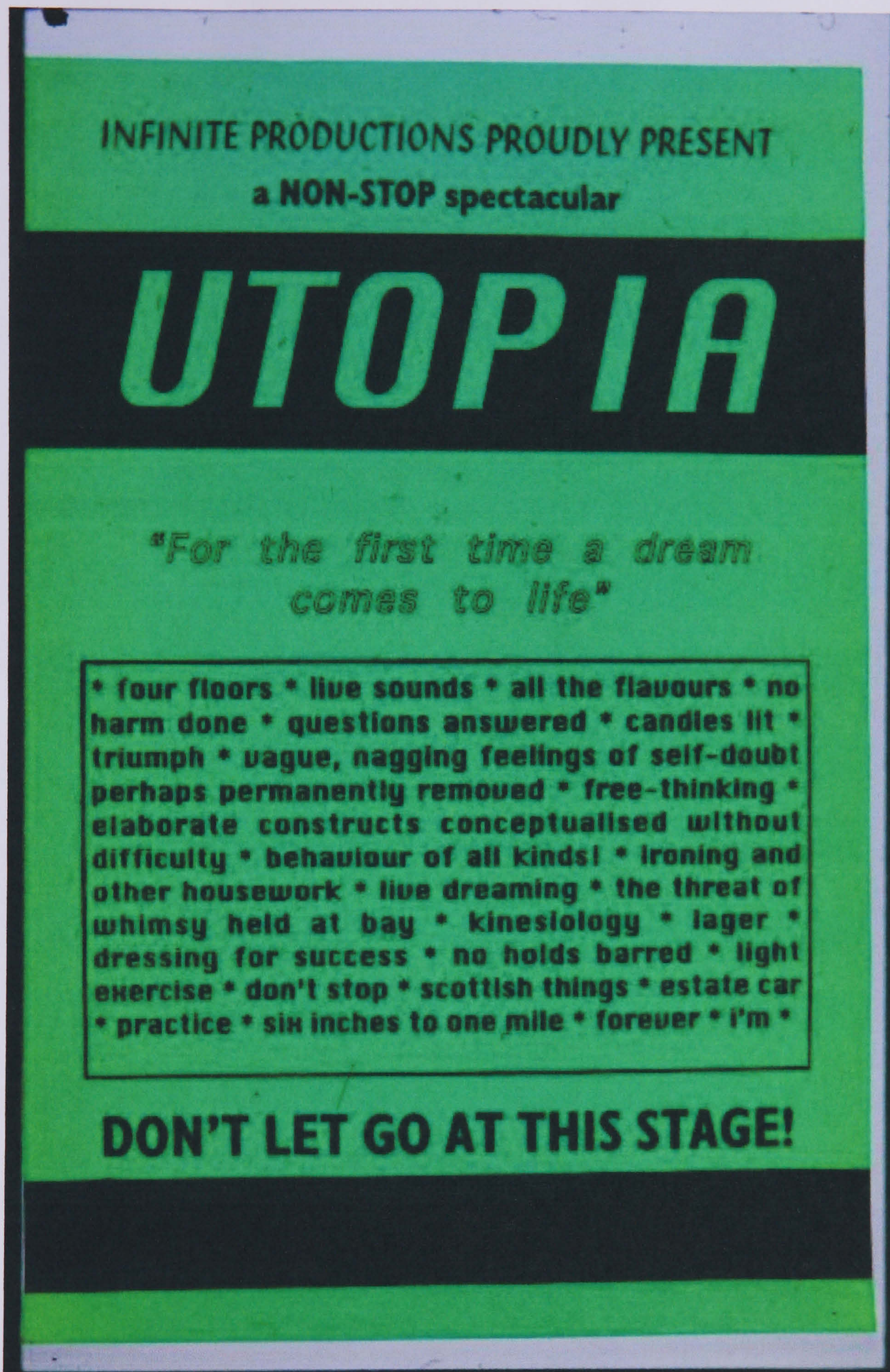


Figure 2: individual poster for *up for it* (1999) showing text.

In the same exhibition a sound work - **some, but not much** (1999) (DVD One: **Chapter One: some, but not much**) took the infrared movement-triggered switch (PIR) from a security lighting system and used it to switch on the recorded sounds of a party - muffled chatter, the clinking of glasses - from inside the building. The accompanying DVD serves to show the location, and give a sense of its operation. This ran continuously, triggered by anyone passing the building. The sound played from a Compact Disc player inside the uninhabited building, and the auditory 'spectators' proximity to the infrared beam had the effect of tripping a passive switch to open the connection between the flow of sound output and the loudspeaker. No attempt was made to conceal the infrared motion detector in its position on the wall of the building. Nor was it intended to conceal by illusion the fact that the convivial sounds coming from inside were directly produced by the act of approaching the building. Thus it was not structured as a deception, despite the representational use of sound, but as a clear re-purposing of the existing function of infrared security triggers used for policing access to public and private spaces.

The artist's statement reads -

Things overheard often have a power that is lacking in direct forms of address. The very fact of knowing that we are not being spoken to makes it somehow more authentic, but paradoxically more ambiguous. As children we became used to hearing things that do not concern us directly. Sometimes it can be reassuring, ("life is going on elsewhere, too...") and sometimes more sinister ("...but I'm not included"), but it is always fascinating.

This was intended to be more than just an allegory of social exclusion in its evocation of a party to which the listener had not been invited, and to evoke, through minimal interactivity, the agency of the overhearing subject in bringing the absent event into being. As in the **Cave** piece, I tried to mimic the ambiguity of the condition of distance or separation, exploring how that serves to bring into being a contingent wholeness to the disparate kinds of experience from which one is being excluded.

A number of sonic artists have used recording and replay technologies to transform the experience and meaning of an existing place. In 1999 Janet Cardiff, in the East End of London, created *The Missing Voice (Case Study B)* (1999), a work that consists of a recording to be listened to by a single individual walking a prescribed route around the Whitechapel area. The experience of using the

headphone piece shares something of the personal address of **some, but not much**, in the way the experience of the sound work becomes entangled with other environmental sound. In the Janet Cardiff piece, this leads to a weaving of the recorded material with the entirely contingent sounds of the world beyond the headphones to the extent that it becomes hard to extricate one from the other. Cardiff's is an extended narrative piece too, so the comparison is limited. In **some, but not much**, the experience of the work takes the form of a discovery by the observer/audience that they are a cause of the sound, or at least of its being accessed or switched on.

Unlike the intimacy of Cardiff's headphones, though, the sound source in **some, but not much** is out of reach inside a boarded up building. This exclusion or distance from its causation is a necessary condition of its existence. Richard Murray Schafer defines sound removed from its natural context as 'schizophonia' (Schafer, 1977:88). Here the schizophonia is made clear and linked to the dissociation from the event itself. Ontologically the existence of overheard things is defined by the action of listening. As with the television world of **Cave** that owes its existence to networks beyond the screen, it is given unity only in as far as it appears in the field of attention. This too, is distinct from the quasi-Bazinian notion of live-ness as realism that Jane Feuer critiques in the writing of Zettl (Feuer, 1983). It is not dependant on the synchrony of an event and its representation, but an event that is constituted from the synchrony of a number of other events in the field of representation.

The continuous twenty-four hour daily functioning of **some, but not much** creates the event from its blind repetition of an unlikely juxtaposition. Like the hidden broadcast images of **Cave** the sound is not produced by the action of the listener, instead being accessed from a constant flow, but it's function is inseparable from the presence of the listener/spectator at the particular time. A differing model of flow might be found in Gilles Deleuze, where it is the break in a given flow that defines the human:

What is it that moves over the body of a society? It is always flows, and a person is always a cutting off [coupure] of a flow. A person is always a point of departure for the production of a flow, a point of destination for the reception of a flow, a flow of any kind; or, better yet, an interception of many flows (Deleuze, 1971).

In **some, but not much**, the overhearing subject is both the interception and the point of departure for the flow of automated sounds of the social sphere beyond them. The problem with Williams' implication, based on the wholly accurate attribution of the flow characteristic to broadcast television, that flow is a necessarily malign entity, leaves little room for the subjective negotiation of flow itself. This negotiation may be a more useful model of subjective agency in a mass mediated world, accounting for the prevalence of liquid metaphors like 'surfing' used to describe the experience of (and interaction with) the Internet.

Like post-structural semiotics, it attributes agency to an encounter with meaning which is already existent, rather than autonomously created from scratch. This model of interaction with electronic media is developed in my live image performance works, and discussed in more detail in following chapters.

Expectation and Attention

My early works are linked by an interest in different kinds of expectation, including ones that are not necessarily those of a deliberate gallery visitor. This was not a rejection of the gallery as a way of framing artwork, but to engage with other kinds of attention - things overheard, seen unexpectedly, or for a limited finite period, and those kinds of passing attention that are more popularly paid to advertising, television, music, etc. Linked to this, I had an interest in the kinds of collective historical knowledge and codes that bring such expectations into being. The knowledge that enables **up for it** to make its meaning is culturally specific, the posters it emulates are recognised by those involved in the scene, for whom its promises - their hyperbole – so like the circus posters of the nineteenth century – are understood as deliberately excessive, a ritual into which they willingly enter. As Slavoj Žižek has described ideology, it is more than merely deceit, but requires a kind of willing collusion between the perpetrator of the ideological form and its subject. He gives the example of the safety demonstration on commercial airlines, in which the crash scenario outlined in the instructions functions, not to fully deceive, but to appease doubts in the minds of those willing and eager to have such doubts appeased (Žižek, 1992:6).

The representation of broadcast television as an abstract phenomenon in the **Cave** piece was an attempt to display its content in similar terms. Television content is drawn from - and contributes to – shared, collective forms of knowledge. These are manifested in the tacit recognition of those codes that distinguish different kinds of formats like “game show”, “docu-drama”, or “lifestyle”.

In a reductive emulation of this, I created a text work entitled **Advice** (2001) (**DVD One: Chapter One: Advice**). **Advice** is part of an ongoing series intended as a static screen-based counterpoint to work that uses moving images. In large scale sans serif lettering on a light box are printed the words:

Doreen offers some advice to Tina, and Graham attempts to heal the rift with his father, but the Vincents continue to fuel resentment at Jo's mistaken act of kindness. At home, Simon takes action to ensure Stella's safety, while Brian entertains an old acquaintance who may have sinister intentions. (See Figure Three below)

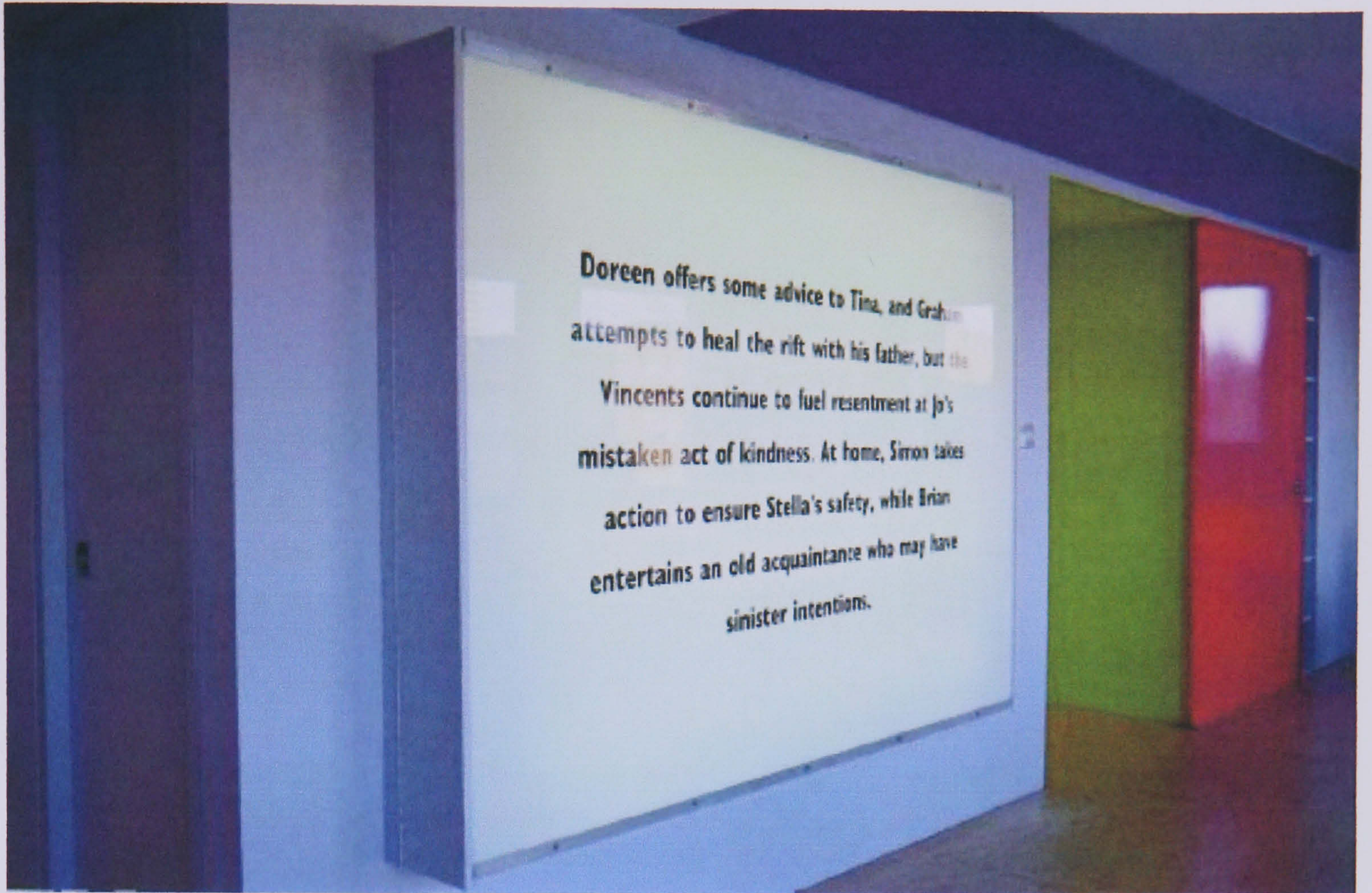


Figure 3: *Advice*, vinyl lettering on light box 1.5mx2m 2000

It was written in the manner of newspaper preview of television series or soap storylines, while referring to no particular instance. **Advice** is presented as flat sans-serif text on a large white light box. As with the posters of **up for it**, a deliberate ambiguity was sought. The light box is a screen, but its contents are static, impassive, flat and unyielding. The nature of the characters, and the events described are (among other things) an exercise in the limited means necessary to imply quite complex narrative strands, but also referencing - and exploiting - the tacitly internalised sets of codes that determine genre, or what in television production terms are known as programme 'formats'. By expanding the scale of the statement, it uses a familiar form in an unexpected way. British artist Fiona Banner has developed a comparable series of works in which she writes by hand on canvas a description of the film the artist is watching (*Top Gun*, 1995), while Emma Kay's *The Bible from Memory* (1999) evokes the gap between the object and its remembered form, by printing her attempts to recall the Bible's contents in the manner of a chapter and verse scriptural page.

In **Advice**, there is nothing in the work in that places it specifically as a television soap series, but it is consistently understood as such. This marked the end of a period of work that related very generally to broadcast media and the mediated world, and a focus on work that used the processed image and sound.

Image Flow and Process

The widespread availability, during the late 1990s, of digital video, DV compression/decompression (codec) standard, and the IEEE 1394 iLink or Firewire protocol for high speed data transfer, can be compared to the impact of the development by the Sony Corporation of the Portapak video camera in 1965. Suddenly the kind of production techniques that had been available only in specialist studios was available on domestic equipment on sale in consumer retail shops. In fact the effect of these changes is probably more widespread, and more rapid, than that in the 1970s, owing to the breadth and saturation of the consumer video market place since that time.

The following two works were produced with very little technical expertise in the video medium, and it may be argued that they do not escape the pitfalls of video 'effects'. They are products of DV codec, and of cheap home editing equipment. They are concerned with the processes of editing and a discovery of contrasting characteristics between analogue and digital. I was working with two particular characteristics in mind: firstly, the differences and similarities between optical depth, and the pictorial depth generated by additive mixing between two sources, which is a software simulation of optical depth; secondly, the role of sound as a marker of meaning, especially in rhythmic, or quasi-musical ways.

Foyer and **Fyr** (2000) (**DVD One Chapter One: Foyer, Fyr**) are both works produced from the same video source material, and are intended to be shown together separated by other works in the same screening, with the first work being **Foyer** so that the vowel-less version may be seen as a continuation of the same work, which it requires as part of its conceptual framework.

The video footage was shot on a handheld MiniDV camera in 1999, in the basement café of the *Neue Nationalgalerie* in Berlin, a building designed by Mies van der Rohe between 1965-68, whose interior is typical of International Modernism – undecorated, linear, with floor-to-ceiling glass separating wall/partitions. The initial intent was documentary: I wanted to record the concurrent variations in light in different rooms and places in the building. I pointed a static camera so that the image in the viewfinder included three vertical layers of glass partition, with a very complex combination of light sources and types of interior between café, foyer and gallery. The variations in light in front of, and behind the glass, prompted by movements of people within the space, have the effect of obscuring and revealing foreground and background in the combined manner of the Victorian stage illusion 'Pepper's Ghost', a layered matte in film, or an additive mix transition in video. Layers of space are combined in the image to create a visual depth at the same time as confusing fore- and background. This is a reversal of an old film technique. Influenced by the 'Pepper's Ghost' stage illusion, Norman O. Dawn pioneered the use of glass panes as a matting technique in film in Hollywood in the first decade of 1900, and developed from it

the techniques of painted matting and masking that would be standard practice in gradually more refined forms until the advent of digital imaging. (Rickitt, 2000: 189-209). Contemporary digital editing transitions are a simulation of these original optical effects.

When experimenting with the footage in digital editing software (Final Cut Pro on Apple Macintosh OS9) I realised that a particular segment of encoded DV video could be looped on the time line with an additive mix transition or cross-fade, such that the front and end points of the cut segment were not visible at any one point. The viewed video is experienced as a continuous flow, but one that contains constantly repeated events. The sound, which is the diegetic ambient sound of the original recording, is similarly cross-faded. The finished piece combines intuitive experimentation – moving clips around on the timeline with no specific objective – with a clear intentional goal – once the capacity for invisible looping was found, it was refined. This refinement involved finding the ideal transition length for maintaining an invisible suturing of the sections without doubling any of the visual content. The work intentionally exploits illusion, using the seamless integration of processed and shot video data to create a work that foregrounds the deception by a paradox, without revealing its edges, or limits. To an extent this would have been possible with any piece of footage edited repeatedly end to end, with equivalent lengths of front and rear cross fade, but I was interested in the combination of optical layering through the glass partitions in van der Rohe's building, with the encoded and programmed simulation of a filmic optical process in the editing software. Similarly, although such a work would have been possible using celluloid film and a optical printer, the loss-less editing of the DV digital software enabled quickly repeated trial and error to find the optimum lengths for cross fade.

There had been some critical discussion at the time regarding the tendency in recent video art, particularly installation works, for uncritical overuse of the loop (Beech, 2000). These thoughts were echoed by Marina Abramovich, reflecting on early videotape works in 2002 (Abramovich, in Beisenbach, et al, 2002:18). This sudden ubiquity was undoubtedly due to the new ease and exactitude with which it could be performed using editing software tools. Once, tape and film loops seemed to subvert, or at least de-naturalise the analogue sound or image:

Devices such as loops, or seeming loops... can, carefully constructed to operate in the correct manner, serve to veer the point of contact with the film past internal content (Gidal, 1976, in O'Pray, 1996:146).

Now the loop is characteristic of bit encoded forms of storage and playback, as Manovich writes (Manovich, 2001:314-317). Where repetition had been a distancing strategy in Structuralist/Materialist cinema, as well as in early experimental music, the ease with which it could be achieved with software tools had changed its status from a subversive to a passive act. Where once it had intervened, now it went with the flow.

The layering seemed a way to both use the loop and subvert it. Repetition is thus combined with a static sense of the image as a place in which the same events come and go over and over again, it is 'repetitiously unchanging' while remaining the same. It is intended to create a tension between the still image and the moving image. It references both the moving image, in which events unfold without repetition, and the still image, in which movement can be suggested, but which is itself static. The title was intended to reflect this by the choice of a space devoted to continuous passing through, a space that is not a destination. This also reflected the altered nature of the interface with encoded video whereby, despite the 'timeline' interface characteristic of most digital video editing software, the encoded file is a-temporal, stored as a non-linear pattern of bits.

A conscious reference point for this piece was *Tango* (1981) by Zbigniew Rybczynski, in which overlapped 'seamless' looped repetition of figures moved in and out of a space, achieving a similar paradox by different means but sharing a compositional structure with *Foyer*, of layered sequences of repetition whose end and start points are each different. It is in this sense a temporal *moiré* pattern, as discrete sequences move in and out of phase with one another. In *Tango* Rybczynski uses film with an optical printer, but the process anticipates the direction of his later work with video compositing and the development of what Lev Manovich calls "...*ontological montage*... the coexistence of ontologically incompatible elements within the same time and space":

Borders between different worlds do not have to be erased; different spaces do not have to be matched in perspective scale, and lighting; individual layers can retain their separate identities, rather than being merged into a single space... (Manovich, 2001:40).

For Manovich this concept is not exclusive to digital video, Rybczynski attains it through optical printing, but he argues that the logic of "ontological montage" inherent in the process anticipates and is realised in later digital compositing. He suggests that the multiple layering of time in *Tango*, while partly deriving from Rybczynski's experience in Poland of the "...overcrowdedness of socialist countries in the second half of the twentieth century..." (ibid:40), is also a symptom of the altered episteme of the computerised society:

Although all these works were created before digital compositing became available, they explore its aesthetic logic—for compositing is, first and foremost a conceptual, not only a technological, operation ... (ibid: 40).

This "ontological montage" does in fact have a much earlier historical precedent - In Rybczynski's work the effect of the temporal concurrence is rather like a motion image counterpart of the Renaissance fresco, like those of Masaccio's narrative of the life of St. Peter in the Brancacci chapel, where a story is told by repeated uses of the same figures in a single illusionistic space. Video

compositing enables this same co-temporality to be easily realised, as non-linear data is accessed without regard to sequence. This is a feature of what Manovich calls elsewhere “database logic” (Manovich, 2001:218-221) in which data is reduced to equivalence for the purposes of non-hierarchical storage.

Tango and *Foyer* share a compositional structure in which layered sequences of repetition whose end and start points are each different. *Tango* was later imitated by a television advertisement for Ariston washing machines, with the strapline “Ariston goes on and on and on...” as numerous figures continuously loaded, emptied and reloaded a washing machine in the same space without encountering one another. (Rees, 1999:96) Changeless and perfect repetition is here presented as a positive attribute for a domestic commodity.

The companion piece to *Foyer*, *Fyr* was intended to foreground the characteristics of the DV (this defines a digital video compression standard) medium in which the first work was made. I began by reducing the original pixel aspect ratio of DV PAL (720 x 576) to a very rudimentary 120 x 27 pixels and 2 x 8, as a means of reducing the visual information in the image, and cutting it into shorter sections before restoring it to the original 720 x 576. As I did this, I became aware of a change in the relationship between image and sound, as the former began to be dominated by the latter. Although the image was ‘processed’ the audio track, while cut to the new clip length remained unprocessed. Nonetheless it took on an intimately causal, though entirely abstracted relation to the image. Because the sound and image were recorded concurrently, they were causally related in the clearest and most unambiguous way, but here the causality was displaced and the murmur of conversation, and the clunk of plates and doors seemed to generate vertical movement in the ‘columns’ of colour created by the reduced horizontal pixel scale in a manner that resembles a metered sound visualisation on a volume control. The act of reducing the visual information had the effect of redirecting the attention given to the sound. To adapt the Deleuzean definition, the cut forces a new identity on the two parts and redirects their flow. The act of cutting and resizing the clips also forces a musical identity onto the visual material, as the motion appears synchronised to sound in a rhythmic relationship.

From this work I developed a new manner of working with sound and image clips, particularly using real time manipulation software like *Image/ine* (see Chapter Four) whereby sonic and visual tracks could be arbitrarily brought together in one DV clip. Then, when they are manipulated, processed or cut, they generate entirely new audio-visual relationships. The work *IS* (2002) (**DVD One: Chapter One: IS**) created in collaboration with German musician Barbara Morgenstern, was accomplished in this way. Commissioned for a commercial release on DVD (Morgenstern, 2003) the video was intended to avoid the pop video cliché of presenting the musician enacting the performance, by cutting unrelated images with the instrumentation in a rhythmic way. I began the piece by using an existing piece of video in which the video test frame ‘colour bar’ had been manipulated

using *Image/ine* (See Chapter Four p110-16) through layers of keying and image displacement. I de-interlaced the image so that the scanning lines synchronised with the musical phrasing, then I cut together a combination of found footage of motion, and still images, using intercuts to pick out instrumental features such as the Indian *tabla* that enters the music. A looped image of ice-skaters is then cut at differing speeds to echo the melodic pattern against the rhythm.

The cut creates an absolute link in the otherwise entirely arbitrary union of sound and image sources, and the more frequently the cut is made, the more intimately linked the relationship. Since there cannot be 'no' relationship between the sound and image a new relationship, based on the co-ordinates of the synchronous cuts in the otherwise entirely arbitrary sound and image track appears. This is central to the process of abstraction. By destroying one set of similarities a new set is created. It is also a basic principle of montage that the juxtaposition of two elements leads to a third, as Eisenstein recognised

...two film pieces of any kind, placed together, inevitably combine into a new concept, a new quality, arising out of that juxtaposition (Eisenstein, 1943:14).

The drive to organise phenomena in terms of similarity is also fundamental to both psychoanalytic and cognitive models of the psyche. The psychologist Klüver, writing on hallucinations in 1942, asserted:

The occurrence of similarities, i.e., the fact that there exist certain characteristics, factors, or processes that bind objects together and relate them in many specific ways, seems to be of such a fundamental nature that the psychologist Kries, considered it simply an expression of some basic property in the functioning of the central nervous system. Freud...was forced to the conclusion that the factor of similarity is of paramount importance in the mechanism of dream formation. (Klüver, 1942, in Klüver, 1966:83).

The organization of sound by processed image in *Fyr*, was developed into collaborative works that attempted to revitalise the processed image from the moribund application of 'special effects' into an analytical relationship between modes and media. Working with the processed image presents particular problems. The artistic use of image-processed video during the 1970s closely accompanied its technical development (see Gill, 1976, Miller Hocking, 1986, Furlong, 1983). When Nam June Paik and Shuya Abe developed their video synthesiser, it shocked the engineers at WGBH in Boston because -

The synthesizer ... was designed to do exactly what all the WGBH engineers prided themselves on avoiding. It contaminated the video signal (Fifield, 2000).

Using the processed image now in the early twenty first century has a very different relationship to mainstream visual culture, and to the commercial application which has since become much more ubiquitous. Domestic video cameras contain factory preset 'effects', and software like Photoshop and iMovie make digital still and moving image processing an everyday experience. Walter Benjamin's thesis on the photograph (Benjamin, 1936) does not develop the processed image as such, since his main concern is reproducibility and repetition as sources of the withering of the aura of the work of art, and the electronic image is based in repetition. But a comparison could be made with the incorporation of experimental technique – the particular character of the Paik/Abe, or Rutt/Etra video synthesiser tools for example – into software presets and special effects. Their grounding as techniques into a particular time and place is disrupted by their becoming ubiquitous, just as the incorporation of earlier formal avant-garde experiment in painting is incorporated – as Lev Manovich describes – into software (Manovich, 2001:301). When Woody and Steina Vasulka began using early electronic synthesiser hardware they were developing tools whose function was not yet socially determined. The processed image, in their many analytical videos (Vasulkas, 2004) investigated the structure of the medium, rather than simply layering programmed effects onto existing images. Now most of those processes are simulated by everyday software, their meaning is altered. Reviewing a Vasulkas screening in London in March 2004, Matthew Noel-Todd asserts:

The Vasulkas seem somewhat at odds with making their art in the contemporary world, where computer technology has long overtaken the processes and simplicity that made their early work so decisive. They inhabit a world where Apple can turn your pioneering life's work into an i-keystroke [sic] and you never again interact with technology on your own terms (Noel-Todd, 2004, online).

Noel-Todd exaggerates the condition of two important artists whose practice outside Britain is still very active, but the process of incorporation is accurately put. The processed image work contrasts historically with its opposite – the immediate, unedited 'long take' – more psychological video work by artists like Vito Acconci, Dan Graham, Marina Abramovich, and Bruce Nauman, whose influence can be seen in the work of Gillian Wearing and Tracey Emin, who were themselves influenced by Warhol's apparently disinterested film camera.

Peter Campus' *Three Transitions* (1973) creates a fusion of these two characteristic modes of use. Like Nauman, Graham, and Acconci, he addresses the claustrophobic space created by the crewless video camera. The artist is alone with the camera, and the works are relatively long takes, but Campus is also interested in the emerging technologies of video image processing:

In the first "transition," Campus records with two cameras simultaneously on either side of a sheet of paper to achieve a breathtaking visual illusion:

he appears to stab himself in the back, climb through the rupture in his body, and emerge whole on the other side. In the second exercise, Campus uses the effect of chroma-key to achieve a potent metaphorical effect. He wipes his face with his hand and, in doing so, "erases" its surface -- only to reveal another image of his face underneath. Finally, in a dynamic conclusion, he appears to burn the living image of his face (as if it were a photograph), leaving only blackness (Campus, 2004, online).

Nam June Paik also worked extensively with video processing techniques, working with Shuya Abe on a video synthesiser (Youngblood, 1970:303-4) that allowed a manipulation with the video signal. Eric Seigel, too, made image-processed work with a colour video synthesiser (ibid: 314) and other engineers like Bill Etra collaborated with Woody and Steina Vasulka. In England, Chris Meigh-Andrews made experimental image processed video using a hybrid synthesiser called the *VideoKalos* designed by Peter Donebauer and Richard Monkhouse (Meigh-Andrews, 2004).

Live Process

In the performances made with the group Ticklish I wanted to use image processing to extend the audiovisual counterpoint, developed in *Fyr*, between image and sound. I hoped that collaborative and spontaneous use might develop the potential of image processing beyond special effects and filters to develop a clear relationship to the time and place of the work. The structure of flow in music is maintained by a social interaction that is active, particularly in improvisation. Ticklish are a trio of musicians from a variety of musical forms encompassing free improvisation, techno, and pop. They use software-based granular sound synthesis, samplers and amplified objects. The sound moves between very strict mechanical structures into a kind of sonic collapse as the polyrhythmic arrangements are developed and abandoned. I wanted to find a way of working as spontaneously as the music was spontaneous – from prepared structures, but allowing instant decisions to alter the image. The intention was to bring an ethic of improvisation to sample-based electronic music, which was characterised at the time by repetition and quotation.

Ticklish combined software-generated sound with electronic samplers and amplified objects, and I began by using a video mixing desk (Panasonic AJ-MX50 – see VJCentral, 2003) which incorporated the processing technology of earlier video synthesizers in a device built for studio editing. An excerpt from a performance at the *Impakt* festival in Utrecht shows the use of feedback and transition windows mixed in response to rhythm (**DVD One: Chapter One: Ticklish: Ticklish live in Utrecht**). Initially I used a range of video input sources as a live edit, inter-cut and remixed in response to the sound. Increasingly I began to use interference and feedback from within the desk as means of generating images that were not dependant on video clips or samples. This reflected the interests of the group as a whole, who were becoming less and less

interested in the ubiquitous use of found samples and sonic *bricolage*, and more interested in real time composition using auto-generated material. In sonic art, granular synthesis refers to development of music from very small samples or sources. The excerpt from a performance in 2000 at the Spitz in London shows the combination of image-processed work using empty transitions, and montage still images with machine feedback as expressive means for sound interaction. Distortion and rapid frame freezes are also used to follow rhythm and sound volume and intensity (**DVD One: Chapter One: Ticklish: Ticklish live in London**). Although I was also working with montaged audiovisual samples and clips from existing sources, as in **blip kino (DVD One: Chapter Four: blip kino)** I wanted to generate meaningful sound and image relations from reduced means that would be integral to the performance, rather than visual accompaniment. In free improvisation the practice known as 'extended technique' refers to the use of an instrument in ways that go beyond or against its intended use, like David Tudor's prepared pianos or Keith Rowe's table top guitar played with electric fans. I attempted 'extended technique' with video apparatus. Since the mixing desk is designed for studio editing, the main activity it enables is A-B roll editing. This is simply editing from two sources – A and B – into a third. The mixing desk effectively manages the transitions between those source channels, which it does by means of a small digital memory that grabs a single frame of full-size video. This allows quite complex combinations of wipes, dissolves, colour adjustment, and sound synchronized image processing, such as anti-aliasing and colour reversal, all effected in real time onto the video inputs. In an untitled live performance in Cork, in Ireland (**DVD One: Chapter One: Ticklish: Cork**), I used a sound-synchronised image reversal and the manual operation of empty picture-in-picture window transitions applied on a rapid image sequence of black and white rectangular forms, to respond the rhythm and its alterations in a way that resembles the early contrast-based animations of Richter and Ruttmann (see Chapter Three p69-74), though achieved by very different means. While the rapid monochrome colour reversals responded to the beat, a white keyed image – a looped sequence of panned ceiling lights – created a counter-rhythm and a horizontal motion. The resemblance of these automated picture-window transitions to early abstract cinema is likely to be owed to their derivation from earlier optical form in film. The work of people like optical printing pioneer Linwood Dunn (1904-1999) given the Californian location, and the proximity of experimental animation and 'visual music' cinema and Hollywood were undoubtedly influenced by non-narrative experimental film. John, Michael, and James Whitney, for example were using a slit-scan technique long before Douglas Trumbull's famous 'Stargate' sequence in Stanley Kubrick's *2001 A Space Odyssey* (Kubrick, 1968). Youngblood points this out in relation to the work of Jordan Belson after an extended description of Trumbull's technique (Youngblood, 1970: 150-5, and 235).

But the meaning of processed image techniques is altered by their ubiquity as software 'filters'. The Ticklish performances were a way in which I tried to find a balance between analytic and intuitive ways of working with sound and image.

Despite a lot of comparisons between early 20th century montage and new sampler-based sonic culture (i.e. Poschardt, 1995:162), there is a contrast in aims between the interventionist model and the deployment of media effects. As Maureen Turim writes in 1983, reviewing a decade of experimental video art in the United States:

The artist must get past the seductive lure of simply “exploring the capabilities of the technology”, because the result is to produce a mere catalogue of possible imaging techniques (Turim, in Kaplan, 1983:133).

I wanted to avoid this pitfall, but not by simply using video as an unmediated image-creating tool. The research in the following chapter develops an analysis of the video medium as an electronically generated form while trying to avoid the production of a “mere catalogue” in favour of linking the electronic image to electronic sound through the shared characteristic of feedback. This is then linked to the performed and processed image work introduced in this chapter.

Chapter Two:

Foregrounding Video as Form

The history of self-consciously modernist art practice is based on the notion that an art form can be used self-analytically. Having its roots in the Kantian idea of philosophy as a critical activity, these modernist criteria are most clearly exemplified in visual art in the writing of Clement Greenberg. Greenberg's famous description of Modernist art as: "...the use of the characteristic methods of a discipline to criticize the discipline itself" (Greenberg 1964:193-4), defines it as the use of a medium to reveal its own specific properties. "Emphasize the medium and its difficulties, and at once the purely plastic, the proper, values of visual art come to the fore," he had written earlier, in 1940 (Greenberg, 1940: 558). In Greenberg's developed model, Modernist painting is increasingly constructed as "painterly painting"- its task the process of expunging from the combination of pigment, canvas and supporting frame all that detracts from their inherent characteristics, in a historical trajectory that culminates in the abandonment of the goal of figurative painting itself. Greenberg's modernism addresses painting at the end of a history during which the handmade image was the dominant medium for reflexive analysis of visual truth and meaning. The painterly critique - in keeping with Greenberg's Kantianism - is brought about by the same technical means, and within the same perceptual orbit, as its own object.

But defining the medium in this way requires bracketing it off from the social uses, which, it could be argued, are equally part of its ontological existence. Greenberg's transatlantic version of modernism, conceived of within (and increasingly against) the emerging popular culture of mechanically reproduced forms of sound and image, needed vigorously to separate the art-image from other kinds and classes of image into a kind of paradigmatic exclusivity, in a way that earlier European forms of modernism, like synthetic cubism, or Dada appropriations, had not. And popular forms since the cinema have tended to be hybrid, combining modes and media. The question for artists working in such media, that are not so easily separated into low and high, and are 'impure' incorporations and combinations of prior forms, is whether that self-critical analysis of the structure and form of the medium can be retained, when it is so hard to define the specific single process or event that gives rise to the object itself. "[The] development of electronic and digital media..." film and video artist Malcolm LeGrice argues:

"...video [and] particularly the computer – challenges the more fundamental concept of medium as material as a result of the very form of the technology itself (LeGrice, 1997, in LeGrice 2001:302).

Since it is a both technical definition, and a cultural one, it is difficult to define absolutely the characteristic material form of video. The term can refer to a spool of tape in a cartridge, a magnetic disc, or a process through which light is converted into a waveform or a series of bits and then a pattern of light and

colour on a cathode ray tube, or on a plasma or liquid crystal screen. Like celluloid film, videotape makes use of light, time, and sound, but unlike film, it has no tangible existence distinct from machine playback. When video information is recorded on tape, we cannot usefully hold the tape up to the light, or examine it with a scopinette, or similar optical tool. The term 'video' may be applicable in a context that is entirely camera less, like a video game, or conversely where a camera is present, but where nothing is recorded, like Closed-Circuit TV, or an endoscopic camera. The waveform, the pixel, the helical scan, and magnetic tape storage – these have all been a constituent component of what is called video but at the same time are not essential to it. Sean Cubitt renders the helical scan, typical of the domestic VCR, metaphorical in an essay named after it, in a collection from 1992 (Cubitt, 1992). This dual-head, angular system of writing information to tape is the main reason why magnetic analogue videotape cannot be edited as magnetic audiotape can. It introduces a non-linearity to the medium prior to the advent of random access and bit encoded data that Cubitt sees as emblematic of the process of writing about video. Its form is in the process of change, and as LeGrice points out in an essay from 1997, it is still a hybrid combination of analogue and digital forms (LeGrice, 1997, in LeGrice 2001:303).

Both the technical and cultural definitions of video have adapted to new uses. Once inseparable from the institution of television, the video screen is now essential to the interface by which a computer is operated, in all the various forms that can take, from the Internet to a cash-dispensing machine. Increasingly, too, it is a name given to something that is stored in bit-encoded form to be realized or accessed in varied software types. What we describe as 'video' can be projected, appear on a cathode ray tube or group of tubes, or on a flat plasma, or LCD screen. Bit-encoded or 'digital' video movies can playback as QuickTime, Real Movie, or other branded media compression formats, alongside other information, onto a screen, which is itself, a 'video' monitor displaying a static desktop image.

The camera too, has developed in divergent ways, and is not the outcome of a linear development. Even before its incorporation into what LeGrice has calls "hydramedia" (ibid: 297), video was an accumulation of prior audiovisual modes and techniques, many inherited from the sound cinema, and, like the moving film camera, the video camera retains some features, actual and representational, of those media that precede it. Although the visual (and sonic) information is processed and replayed in an entirely different way, in both analogue and digital video cameras, the charge-coupled device (CCD) that interprets and separates information from the light patterns and colour ranges of the physical world before the lens, still resembles in some ways the indexical form of the light sensitive plate at the rear of the optical camera. The light falls through the lens, and is imprinted on the light-sensitive semiconductor array, which will transform the information into the video signal, either as electrical energy, or as a translation of that energy into a series of 'bits'.

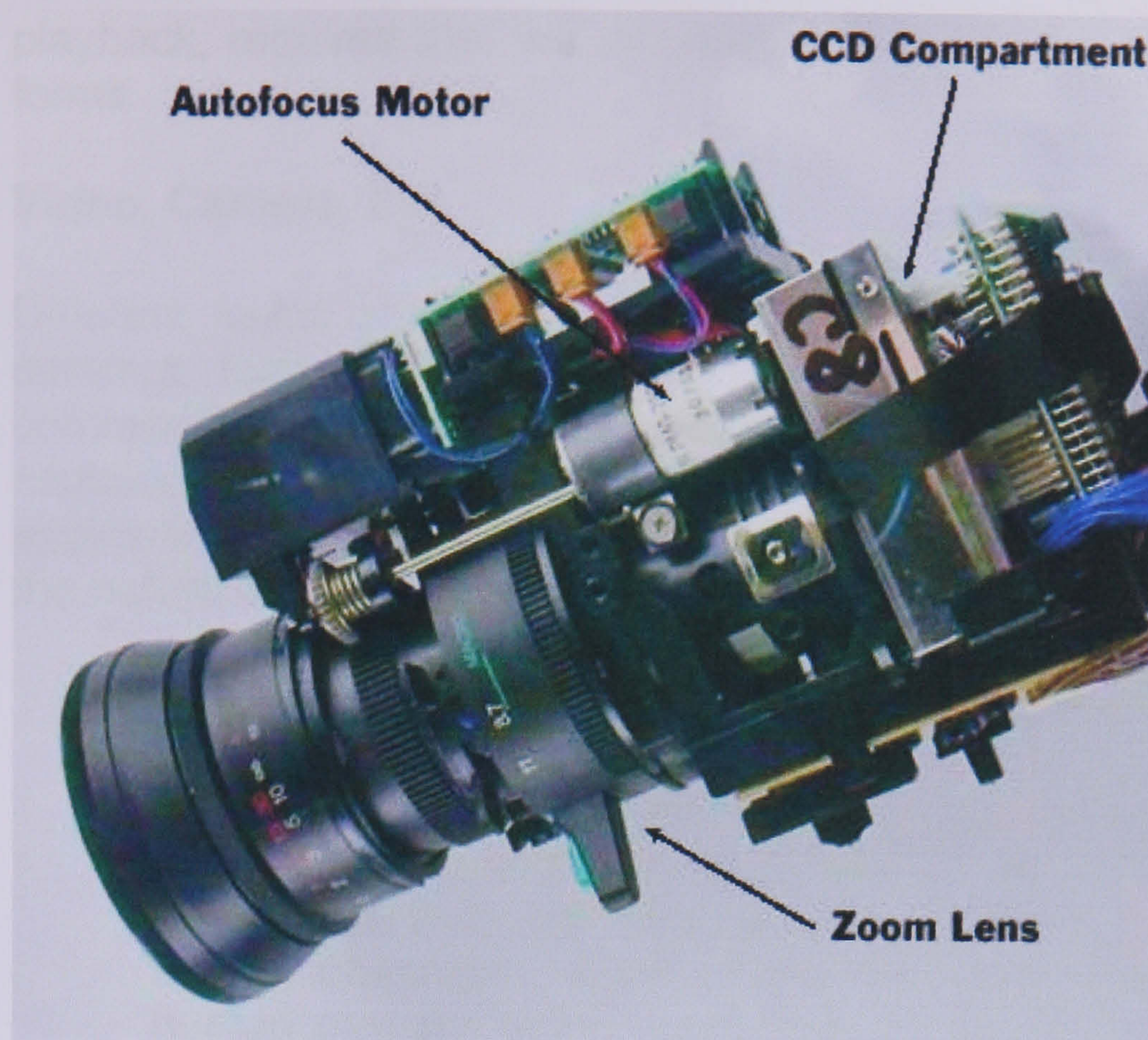


Figure 4: CCD location in video camcorder

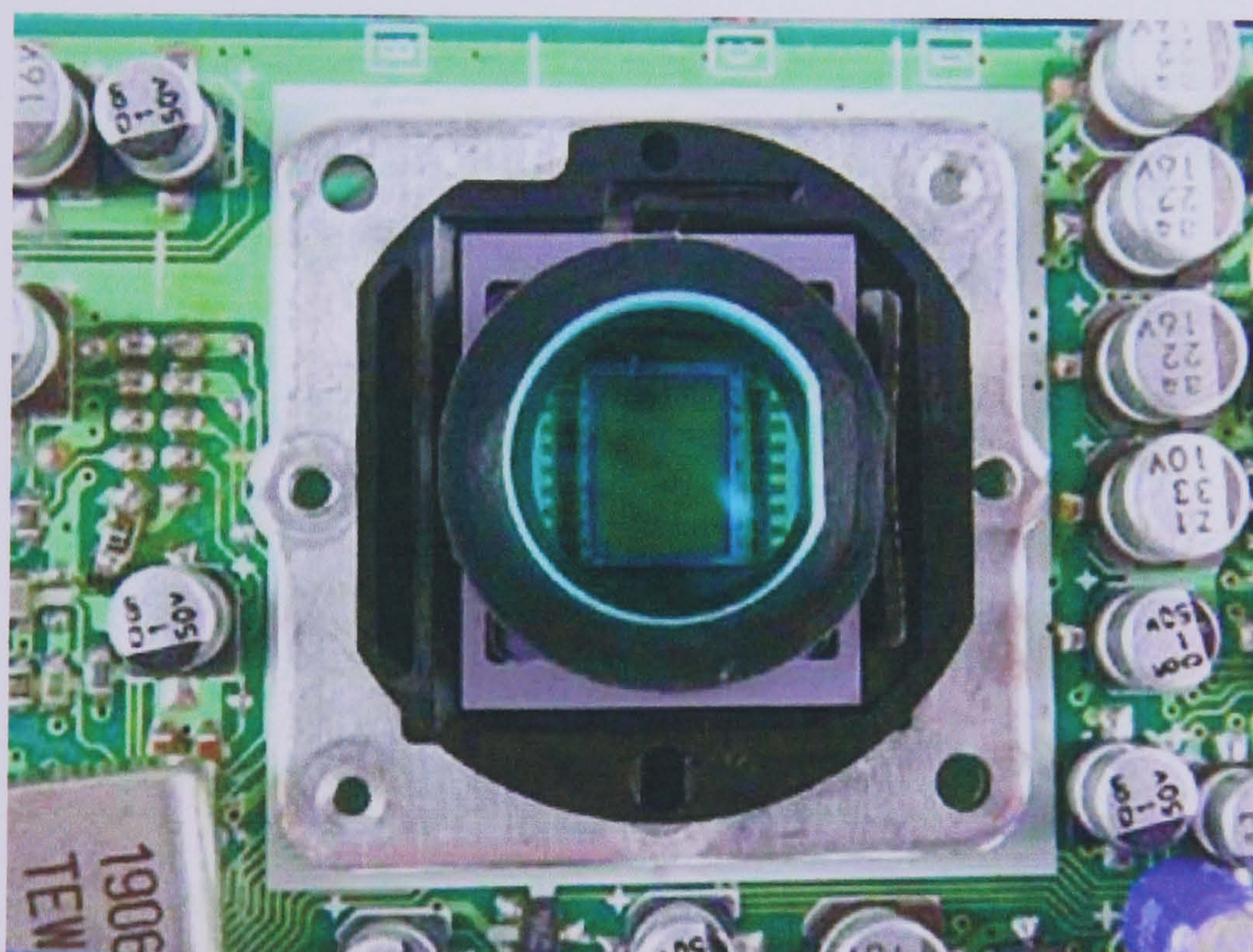


Figure 5: CCD and lens mounted on circuit board

Video cameras combine digital and analogue forms of data storage and process. The domestic necessity of playback on domestic television equipment, itself in transition between analogue and digital forms of image

playback, requires that the camera, in process and in output, combines both forms.

Video, Camera, Eye

Different forms of image reproduction and transmission processes relate to different forms of physical and optical experience. While it has been commonplace in histories of cinema to see the development of photographic camera technology as an extension of the human eye, this analogy has limited application. Jonathan Crary has summarised this current “transformation of the nature of visibility” in the introduction to a study of earlier optical forms:

“Computer aided design, synthetic holography, flight simulators, computer animation, robotic image recognition, ray tracing, texture mapping, motion control, virtual environment helmets, magnetic resonance imaging, and multi-spectral sensors are only a few of the techniques that are relocating vision to a plane severed from the human observer... Most of the historically important functions of the human eye are being supplanted by practices in which visual images no longer have any reference to the position of an observer in a “real,” optically perceived world” (Crary, 1992:2).

Instead, the images’ reference is toward:

...millions of bits of electronic mathematical data. Increasingly visibility will be situated on a cybernetic and electromagnetic terrain where visual and linguistic elements coincide and are consumed circulated and exchanged globally (ibid: 2).

This entails a changing organisation of the body in relation to the image seen, and Crary asks:

How is the... observing body, becoming a component of new machines, economies, apparatuses, whether social, libidinal, or technical? In what way is subjectivity becoming a precarious condition of interface between rationalised systems of exchange and networks of information? (Ibid: 2)

After the manner of Martin Jay, an acknowledged influence (Jay, 1994), Crary questions the dominant anti-ocularcentric discourse of French and French influenced critical theory. This discourse, claims Crary, reproduces a normative (and inaccurate) story of the hegemonic Renaissance perspectival view and its modernist overturning. This viewpoint constructs its narrative as both coherent and inevitable, and defines modernism as the first cultural recognition of the contingency of vision. André Bazin’s theory of cinematic realism as the culmination of a concentrated quest for verisimilitude, for example (Bazin, 1967), assumes a consistent path along which technologies of vision have been developed. The camera is therefore the essentially modern object that first reveals the image to be a process, rather than a “given”. To challenge this notion, Crary’s study examines a range of earlier

optical technologies and conceptual constructs, through Kepler and Descartes, Zootropes, Phenakistascopes, and stereoscopes to argue that the idea of an abstract “machine vision” was a concept available long before photographic modernity and non-objective painterly modernism. He uses the discontinued failure of the stereoscope as an example to demonstrate that the visual regimes of modernity were not a single linear pathway towards accumulative detailed realism *à la* Bazin, but a more improvisational and exploratory process affecting also a changing notion of the observer as a crucial component. “It would be completely misleading”, Crary argues:

...to pose the camera obscura as an early stage in the ongoing automation and specialization of vision that continues into the nineteenth and twentieth centuries Vision can be privileged at particular historical moments in ways that simply are not continuous with one another. Situating subjectivity within a monolithic Western tradition of scopic or specular power effaces and subsumes the singular and incommensurable procedures and regimes through which an observer has been constituted (op.cit: 57).

Where the camera-as-eye construction has most power is in those instances where it dislocation is acknowledged, as in Dziga Vertov's *Kino Eye*, a powerful motivating metaphor for the roving camera that goes beyond the body into the physical world. But here the eye is an acknowledged metaphor, not a literal substitution, since, as William Wees argues, it would be truer to describe the camera-eye as synecdoche – a part standing in for the whole (Wees, 1992). And, since synecdoche functions as a condensation of meaning, emphasis on eye-as-camera requires a bracketing off of the corporeal body that occupies physical space.

In fact, as Wees points out, the human eye resembles the camera in only a few limited characteristics, human vision being infinitely more complex in its function. Although certain of the chemical processes that permit images to be formed in the retina echo the processes of chemical paper photography, like the chemical rhodopsin found in the eyeball, whose light sensitivity causes it temporarily to darken, those processes are a tiny part of the active practice of seeing. Wees goes on to show the incompleteness of the photochemical extension of this metaphor. Yes, rods, cones and rhodopsin replicate the effect of the photosensitive chemical paper (or vice versa) but these only represent the light sensitive component – ‘neither image duplicates actual vision’ (Wees, 1992: 23). Instead his study of avant-garde cinema sees the eye-camera metaphor as crucial to what he refers to as the “dialectic of eye and camera”:

...avant-garde filmmakers have turned that dialectical relationship into a positive creative force; individually they have tended to favor either the camera and the mechanical nature of the apparatus, or the eye and the range of human perceptions capable of being represented by the cinematic apparatus. Towards one end of the spectrum are Belson, Whitney, and Anger, whose films avoid direct reference to cinematic processes and machinery...Snow and Sharits, on the other hand,

expose the mechanicalness [sic] of the medium, and openly impose on it their cinematic images (Wees, 1992:22).

Thus film and the camera operate as tools for the description and analysis of vision, rather than a mere extension and substitution of it. It is perhaps in this sense that experimental art with moving images and sound can be self-critical. The self-critical activity that Greenberg identifies with the avant-garde, is not in fact an isolation of the technical characteristics, of paint and its adherence to the canvas support, or of recording, storage and playback equipment, but of the visual practices into which they are inserted, and by which they are formed and re-formed. Perhaps “[The] medium and its difficulties...” (Greenberg, 1940: 558), might be expanded to include the time-based medium of visual experience in the eye, its optical and its social, processes. This is Wees’ defence of what P. Adams Sitney dubbed “visionary film” (Sitney, 1973). This “inner vision” is occupied with the contingencies and characteristics of the human visual apparatus.

Video as Signal and Time

So film (and video) can be critically analysed in terms of its relation to the processes of perception. Crucial to any understanding of the video image is that it is temporal in nature. For analogue video and the cathode tube, even a static image displayed on a video screen is constructed across time:

On the level of electronics, the very construction of the video image, its generation as well as its display, is time dependant. The composition of the signal, then, defines the visual nature of the image, as it exists in time; it dictates both the appearance of the single ‘still’ image, which exists within a specific length of time, and its behaviour through time (Miller Hocking, Brewster, 1986:1).

Also central to video then, is its dependence on an electronic signal to take the form of an image. This implies the light that enters the lens being broken up to become information. From the very start, its existence as a signal prior to its becoming an image permits very specific kinds of intervention different from those possible in film. For this reason, the history of experimental art using video is close to the history of other electronically generated signals such as magnetic tape audio recording. This close relationship has influenced the wider development and meaning of the medium itself, and the kinds of tools used to produce, reproduce and synthesize it. In this respect video differs radically from the film image, which though constructed sequentially in time as motion, retains the transparent celluloid photographic frame, which is, as film-maker Peter Kubelka insisted, itself a single finite image (Sitney, 1974:334). Although this may now be further complicated in the instance of the commercial feature film, where the contents of that frame will almost certainly be the product of digital processes, the distinction between video as electronically generated and film as an optical light form remains.

A semiotic distinction is helpful. The film/photographic image combines sign relationships that are, in Peircean terms, both indexical and iconic. In Charles

Sanders Peirce's original formulation, indexes are able to "...become such by virtue of being really connected with their objects..." and icons are defined as a "... sign [that] may serve as a sign simply because it happens to resemble its object" (Peirce, 1887: 8.119: 92). The simplest form of the index is the imprint, where the causality of the mark and the object are unified by a static historical moment of their being joined. In film the act of an imprint – whether of light falling on a chemical reactive agent, or a Norman McLaren or Len Lye attacking leader tape with a blade – determines the film image. In this same causal way, video has an indexical form too, but it is unrelated to its iconic form, since it does not directly index the visible world, but the invisible world of electrical charge and current. This necessarily determines the differing forms that each takes when subjected to a critical and formal analysis by artists.

The aesthetic discovery, by artists like Woody and Steina Vasulka, or Nam June Paik and Shuya Abe in video, or Donald Buchla, Robert Moog, or Peter Zinovieff in sound, that electronics could be used to *produce* as well as to reproduce sonic and optical information, lends itself to more complex forms of possible intervention in the output. Jonathan Sterne describes at length the conceptual and epistemic development that leads from the measurement, capture and transcription of sound, to the understanding that a reversal of this process leads also to the generation of sound (Sterne, 2003:31-87). At a simple level of analogue electronics, this reversibility is at the core of electronic sound reproduction. A microphone and a loudspeaker are fundamentally the same vibrating cone-and-coil construction refined for their specific task.

But a further discovery lies at the heart of processed electronic sound and image. Once the source material is transposed into a signal that can be stored and passed through a circuit, then manipulating that circuit can manipulate the fabric of the sound or image itself, or even synthesise it independent of any recorded source. The development of the synthesiser is first and foremost a product of experimentation with electronic signal processing, before it is understood as either sound or an image. It is as a cut in the flow of electric current that processes of recording, replay and synthesis are developed.

Though this characteristic, of electronic synthesis, "processability" and the possibility of signal simulation, undermines any quest for an intrinsic character, artists in electronic media have nonetheless pursued its analysis not only through the reductive disassembly or de-construction of existing forms, but through the creation of new tools for processing electronic information. Through this the line between the analytical-creative practice of art, and the analytical-creative practice of science becomes blurred. While avant-garde film artists like those of the 'Structural/Materialist' cinema experimented with, and subverted a form that had already been articulated historically (see Gidal, 1975), the experimentation of the electronic artists cited above was part of the technical development of an emerging form. It is an unaccustomed position for the avant-garde, questioning perhaps the usefulness of that very definition. The aesthetic research of electronic artists becomes quickly integrated into the everyday uses of technology. Lev Manovich has argued recently that the formal experimentation of early

modernism has been absorbed into the technical processes of post-modernity, so that the “...*avant-garde becomes materialised in a computer*” (Manovich, 2001:301 – author’s italics). Latterly Greenberg, too saw avant-garde formal experimentation as closer to scientific process in its resistance to “literary” forms of content (Greenberg 1961, in 1965:194-5). In electronic arts this process is accelerated, or concurrent. The proximity of artistic experimentation and technical development is particularly close in early work in electronic sound and image, Shuya Abe’s development of video synthesis tools with Nam June Paik, for example, or the team of engineers working in development with Woody and Steina Vasulka, and the computer imaging research of John Whitney. Nothing illustrates this connection more clearly than the *9 Evenings – Theatre and Engineering* events in 1966 at The Armory in New York, organised by Billy Kluver, and the subsequent *Cybernetic Serendipity* show at London’s ICA and elsewhere, curated by Jasia Reichardt in 1968, in which early computer imaging by the Boeing Corporation, plus that of Whitney, Kenneth Knowlton, and others was displayed alongside auto-destructive public art project proposals by Gustav Metzger (see Reichardt, 1968). Avant-garde practice and cutting-edge technical research were suddenly sharing a studio.

Feedback: Noise, or Pattern?

Any system that has amplification, and has a positive coupling between its input and output is unstable, and when either the amplification or the degree of coupling reaches a critical level, it will go into oscillation (Capel, 1991:1).

One important phenomenon investigated by artists exploring and developing new electronic media is feedback. A key attribute of electronic hardware, linked to the characteristic ‘flow’ of electrons analysed earlier, feedback, like the theories of flow, operates at a literal and a metaphorical level in the surrounding discussions. Despite – or perhaps because of – the technical status of feedback as an undesirable form of noise interrupting the amplifying process, many artists working with electronic sound and image have used it as an intuitive means of investigating the properties of a particular medium, and it is perhaps a defining formal characteristic of experimental television and video art in the electronic era. Jimi Hendrix’s improvisation on ‘The Star Spangled Banner’ at Woodstock in 1969 exemplifies the balance of mastery and surrender to machinic interruption typical to the use of guitar feedback in popular music, as to well as its iconic significance as rebellious counterculture. Although sonic electronic feedback had already been explored as a musical technique in works by artists like Robert Ashley – *The Wolfman*, 1964 – or Max Neuhaus – *Fontana Mix-Feed* of 1964/5 (see Holmes, 2002:27-9) – Hendrix’s usage popularised this means of extending the range of the electric guitar to emphasize the expressive action of the performer in a manner that has since become standardized within rock music. Nicolas Collins, composer, student of Alvin Lucier, and former artistic director at STEIM research institute in Amsterdam, reminisces that:

In 1964 feedback was more than just a cool sound, it was a sign that

things were not going entirely according to plan. By the standards of a comfortable middle-class American kid, it was a revolutionary sound, a harbinger of more radical things to come: Hendrix and The Who, Psychedelia and Punk, Reich and Ashley. Forty years later, feedback's rebel stance may seem anachronistic in pop music, but thanks to the laws of physics it remains a provocatively unstable and haunting musical material (Collins, 2002:7).

Michael Chanan, too, has written of the symbolism of Hendrix's expressive technique, seeing the *Stars and Stripes* 1969 performance at Woodstock as a blurring of the boundary between composition and performance unique in popular music history (Chanan, 1999:316-317), but feedback also identified the amplified guitar as specifically an *electronic* instrument, rather than merely an amplified acoustic one, thus entering it into the world of electronic flow and the image of the artist as a vector or portal for existing phenomena to manifest itself, rather than to be constructed autonomously from scratch. This coincidence of effect between electronic sound and video signal is well illustrated by a short early Portapak video sequence shot by the Vasulkas in 1970 in which Hendrix plays onstage at the Fillmore East in New York while the light trails of the high-contrast early electronic image briefly correspond to the sonic trails of notes extended by electronic feedback.

Figure 6: Electronic sound, Electronic image: Jimi Hendrix at Fillmore East in New York, 1971

From:

Raw Tapes 1970, Steina & Woody Vasulka, (Cathcart, 1978: 35)

Also on: Steina & Woody Vasulka, *Participation* 1971.



That particular Vasulkas videotape is entirely unprocessed, (other than by standard camera function) but conjunction of image and sound as electronic signal is clear. In mainstream popular culture video feedback is now similarly associated with psychedelic distortion and hallucinatory effects, via studio techniques once commonly used to embellish live music in the era of analogue television studios, best known perhaps being the promotional video for the song 'Bohemian Rhapsody' by Queen from 1975 (Gowers, 1975), where feedback and prismatic lenses are used to multiply the image of the band in a manner that mimics the choral layering of voices.



Figure 7: Feedback in pop video: Bruce Gowers' 1975 video for Queen's *Bohemian Rhapsody*

In 1975 video feedback was still a very experimental process. As video technology became more widely available, its experimental, or abstract use tended, as in electronic music, to focus on noise and distortion, turning the camera onto itself. Ronald Pellegrino's description, outlined for the construction of a creative video graphics studio gives a clear outline of the process:

Perhaps the most accessible introductory path to the field of videographics is the game of video feedback – focusing a video camera on the blank white raster of its own monitor. Video feedback is an electro-optical loop created by a camera looking at itself and transforming its electrical nature into vibrant visual forms. Camera noise, the inevitable random movements of electrons in any circuit, is transferred to the monitor, where it appears as an area of relatively more intense light. The camera picks up its own noise-turned-light and amplifies it as the feedback loop perpetuates itself. Depending upon the interactive states of all the variables in the loop – focus, f-stop, camera and monitor raster registrations, the monitor brightness and contrast settings – the noise-turned-light becomes purely electronic images that dance, pulse, swirl and move in myriad fascinating ways (Pellegrino, 1983:160-1).

Undoubtedly part of the appeal of video feedback was this auto-generative quality. Using a medium which is product of a temporal signal, rather than a succession of static image frame objects, here was a “purely electronic” means of generating visible motion in time, without the necessity of a pictorial representation of the world. Feedback as a technique has traveled now, from the studio-generated form in Pellegrino’s description, to be a frequently in-built synthesized camera-less feature of the special effects pallet. Its concentric organization suggests depth and traveling motion in a way that is now simulated by the “infinity tunnel” clichés of video software transitional effects. Both too, have become visual shorthand for the “cosmic” imagery of the psychedelic era. And not surprisingly, given its widespread use: “Almost every artist went through a period of doing feedback...” Johanna Branson Gill writes in 1976, in a survey of the preceding decade of American video for an exhibition at The Rockefeller Foundatio:

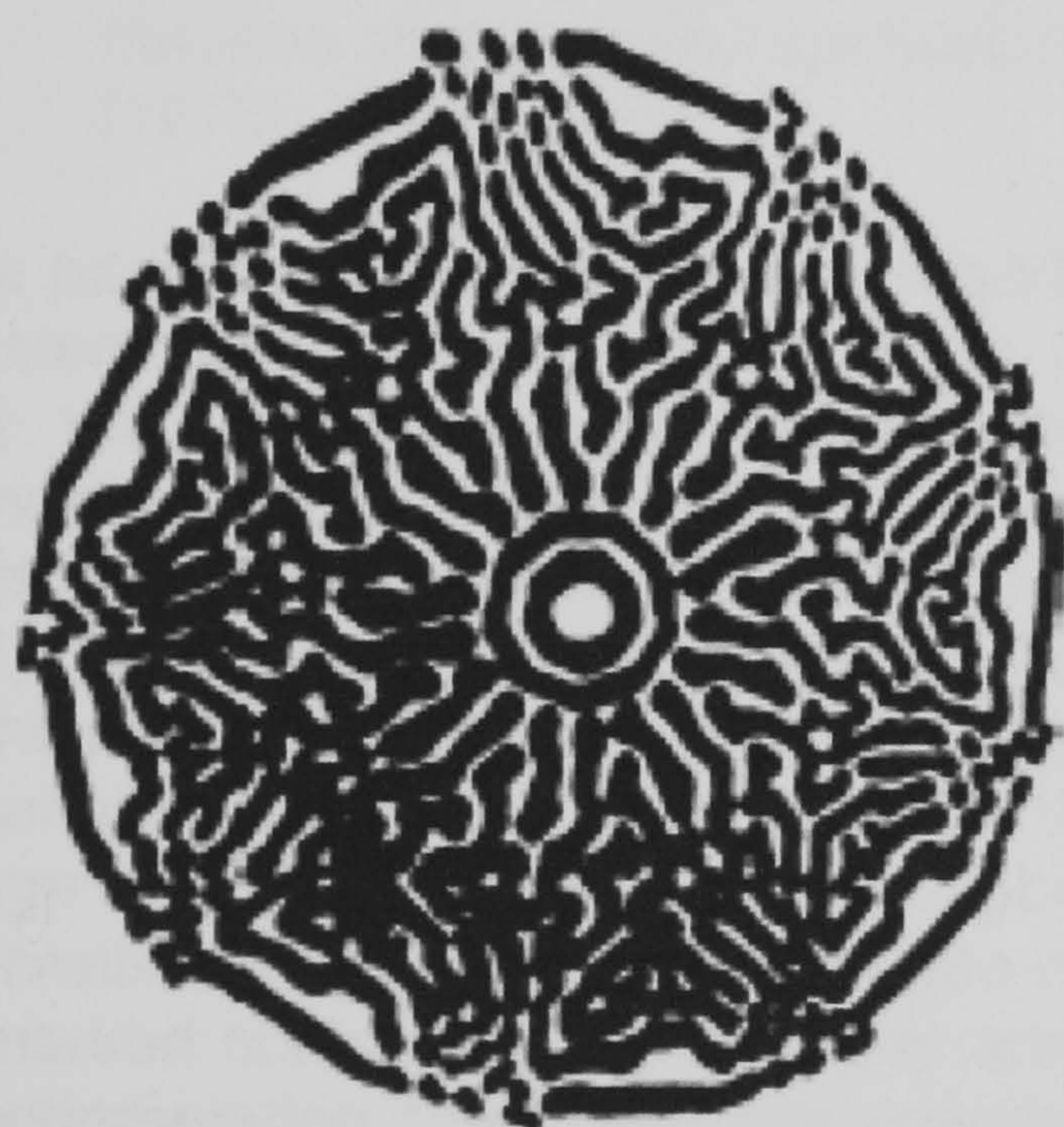
...if only because it is one of the simplest ways to create powerfully lyrical, abstract imagery given only a camera and a monitor. It is pure video: the camera is turned to pick up the image on the face of the monitor that is displaying that camera’s image. A closed circuit has been established, so what you get is an image of a monitor within a monitor, and so on, an infinitely repeating image. By tilting the camera and by altering the controls for brightness, etc., abstract patterns are formed. There are so many variables in the image that it is very difficult to control; the picture constantly “spins out.” A very characteristic feedback image is of a vortex, an electronic whirlpool. In practiced hands, such as [Skip] Sweeney’s, this can become a shimmering, interweaving mandala (Gill, 1976: 70).

Woody Vasulka, in an article on the work of Sweeny, “...acknowledged master of feedback” organizer of video festivals and founder of Video Free America in San Francisco, writes:

Video feedback is a dynamic flow of imagery created by the camera looking at its own monitor. It was often (and still is) the first phenomena that seduced users of video by its sheer beauty. Although everyone who discovered feedback was transfixed by it, feedback seemed an uncontrollable, rolling effluent byproduct of technology - one of those natural mysteries, appreciated but untamable (Vasulka, Woody 1978, online).



Skip Sweeney, ca. 1983, with feedback set up at the Exploratorium, San Francisco, California. HW: Satchell-Carlson Television. Photo by Susan Schwartzberg.



Feedback by Skip Sweeney

Figure 8: video camera feedback by Skip Sweeney

From: Woody Vasulka (Vasulka, Woody 1978, online).. Left: (Gill, 1976, online) catalogue for *Video: State Of The Art*, The Rockefeller Foundation.

While feedback was not the only idiosyncratic effect available for artists like Paik, VanDerBeek and the Vasulkas, analyzing the new electronic signal-and-tube generated image, its intuitive appeal lies in the fusion of the high-tech with the primal that supports a 'naturalistic' interpretation of the 'flow' experience of new electronic media. Here, too, for artists like Sweeney, was a fortuitously strong aesthetic parallel to the mandala form, with its significance in non-western traditions, and more recently too, its significance in the work of previous west coast abstract film pioneers the Whitney brothers, particularly James, whose *Lapis* (1963-66), brings together the shifting mandala image (comprised of thousands of separately drawn dots) with drone-and-repetition-based Indian classical music of the sitar. Jordan Belson, too, influenced by the Whitney brother's works after seeing screenings at the Art in Cinema show at the San Francisco Museum in 1946 created a scroll painting of successive images entitled *Mandala* (1953), which he later withdrew from circulation. (Moritz, 1950) Of Belson's interest in mysticism Moritz says:

During the 1950s, he had been an integral part of the Zen Buddhism of San Francisco's North Beach Beat scene (indeed, Belson still lives in North Beach) . The mature films frequently express aspects of Indian mysticism and yoga, reflected in the titles of his masterpieces *Samadhi* (1967) and *Chakra* (1972), which render the actual visual and auditory phenomena that Belson experienced in heightened states of meditative concentration. They also explore the relationship between scientific theories and human, spiritual perception (*Phenomena* [1965], *Light* [1973]) (Moritz, 1950:1).

This parity between the classical mandala, as it appears in a number of non-Western religious traditions including branches of Buddhism and Hinduism, and the video feedback image was not understood as an accidental coincidence, but emblematic of the unity between the 'wired' world of electronic media as described by McLuhan, and the paradigm of the 'wired' body, whose central nervous system corresponded to the circuits and currents of the media environment. Gene Youngblood uses the term "neuro-aesthetics" (Youngblood, 1970: 201) to describe this relationship between the electronic image and brain function. For Youngblood the mandala is an emblem of the syncretism that he aligns with a wide-ranging perceptual revolution (ibid: 84). In marked contrast to the critical or analytical Greenbergian models of artistic experimentation this combines mystical, rebellious, and playful approaches deployed by the counterculture from within which Youngblood wrote.

Optical and Cortical Mandalas

The swirling, concentric mandala form is also one of a number of optical attributes are common to hallucinatory images and closed eye vision. Some researchers see these effects, dubbed 'form constants' by the psychologist Heinrich Klüver (Klüver, 1928) as more than just delusion phenomena, but indications of the function of the optical cortex, through which light phenomena become lucid images. Klüver's theories developed out of research into commonality of visual experience in subjects experiencing mescal-induced

hallucinations, and such images are a consistent feature of psychedelic experience. Paul Deveraux's prehistory of psychedelia (Deveraux, 1997) speaks of them as 'psychedelic signatures'. He lists their various causes and attributions:

Debates over which elements of the human visual system cause the 'form constants' continues. Suggestion have been numerous and include specific firing patterns of neurons within the visual cortex, phosphenes, fibrous and folding structure of the eyeball, structures of the retina, "floaters in the liquid of the eye, and red blood cells passing through retinal capillaries. It is probable that most or all parts of the system are involved in various ways (Devereux, 1997: 147 *fn*).

Klüver's research is extended by Siegel and Jarvik (1975), and Cytowic (1989, 2002). Richard E. Cytowic writes on Klüver's findings in the context of his (Cytowic's) own work on synaesthesia (see following chapter).

Cytowic is at pains to describe synaesthesia as other than an hallucination, but sees connections with the psychedelic 'form constants' via the "...discrete nature of synaesthesia, particularly the generic and restricted nature of synthetic percepts...":

...Synaesthetes never see pictorial dreamlike scenes, or elaborate percepts, they perceive blobs, lines, spirals, lattices, and other simple configurations (Cytowic, 2002:161).

He cites Klüver's development of a consistent pattern of 'Form Constants' from the described visual experiences of varied mescaline-ingesting subjects, which enabled them to use a standard terminology for otherwise quite disparate experiences. While the collection of forms suggest a universalizing explanation of transcultural archetypes like those described by Carl Jung in *Man and his Symbols*, (Jung, 1968) Cytowic's parallel resists the metaphysical explanation, to suggest instead that:

...the novelty of hallucinations, and their vivid coloration captivated people's attention, and invited unwarranted elaboration of what were basically *elementary features that the nervous system was hardwired to perceive* (Cytowic, 1993:125).

Distinct within the various forms common to hallucinatory experience is are typically tunnels, radiant spirals strongly reminiscent of fractal geometry, and "linear configurations featuring axial and radiant symmetry:

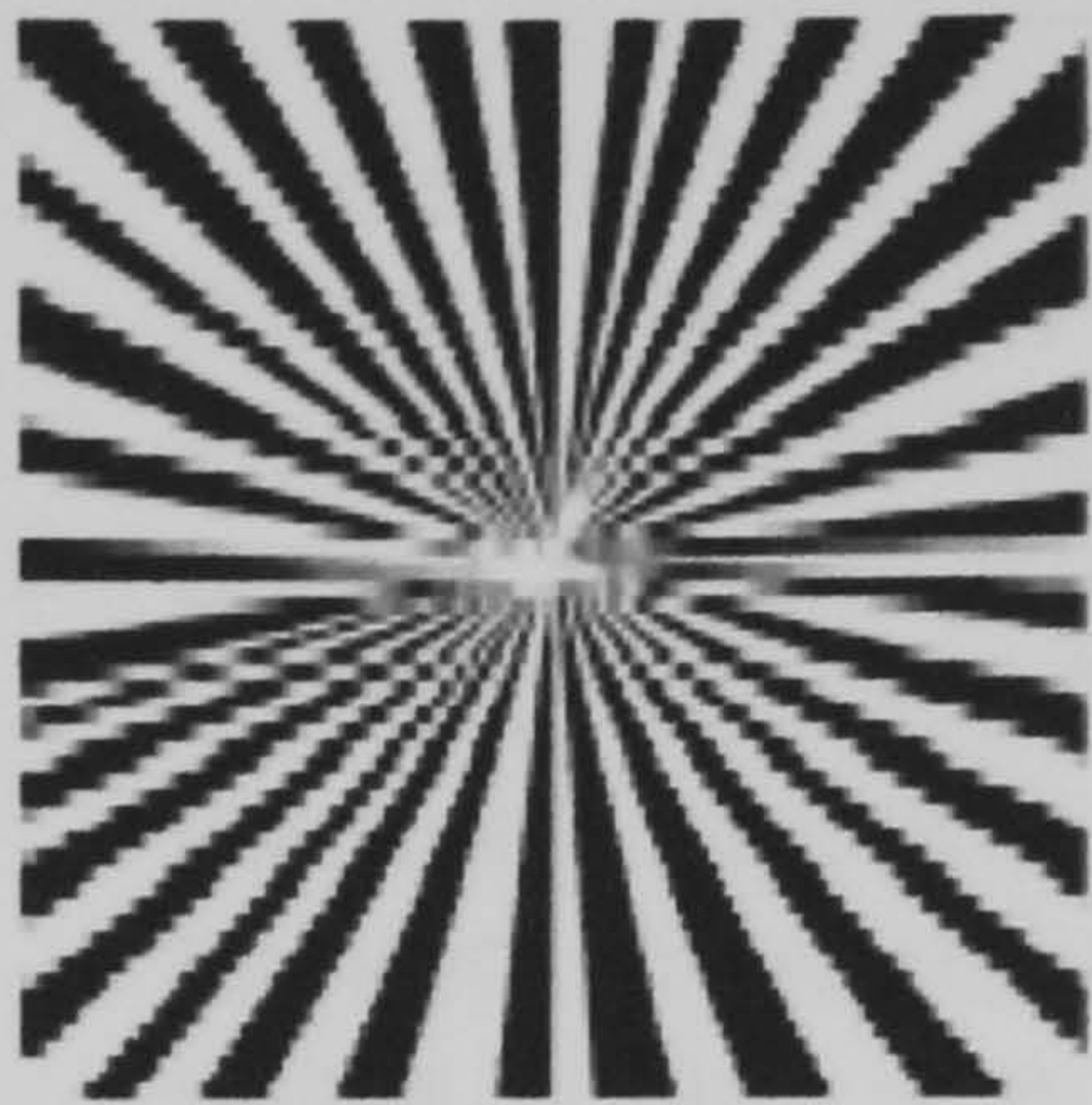
The spatial connotations of the term 'form constant' give the false impression that what is perceived is stationary and invariant, when in fact the elements are highly unstable, continually reorganizing themselves in an incessant interplay of concentric rotational, pulsating and oscillating movements through which one pattern replaces another. This kaleidoscopic transition occurs at the approximate rate of 10 movements per second (Siegel and Jarvik, 1975). These spatial and

kinetic properties are readily seen in synesthesia, number forms, and the auras that herald migraine and seizure (Cytowic, 2002:177).

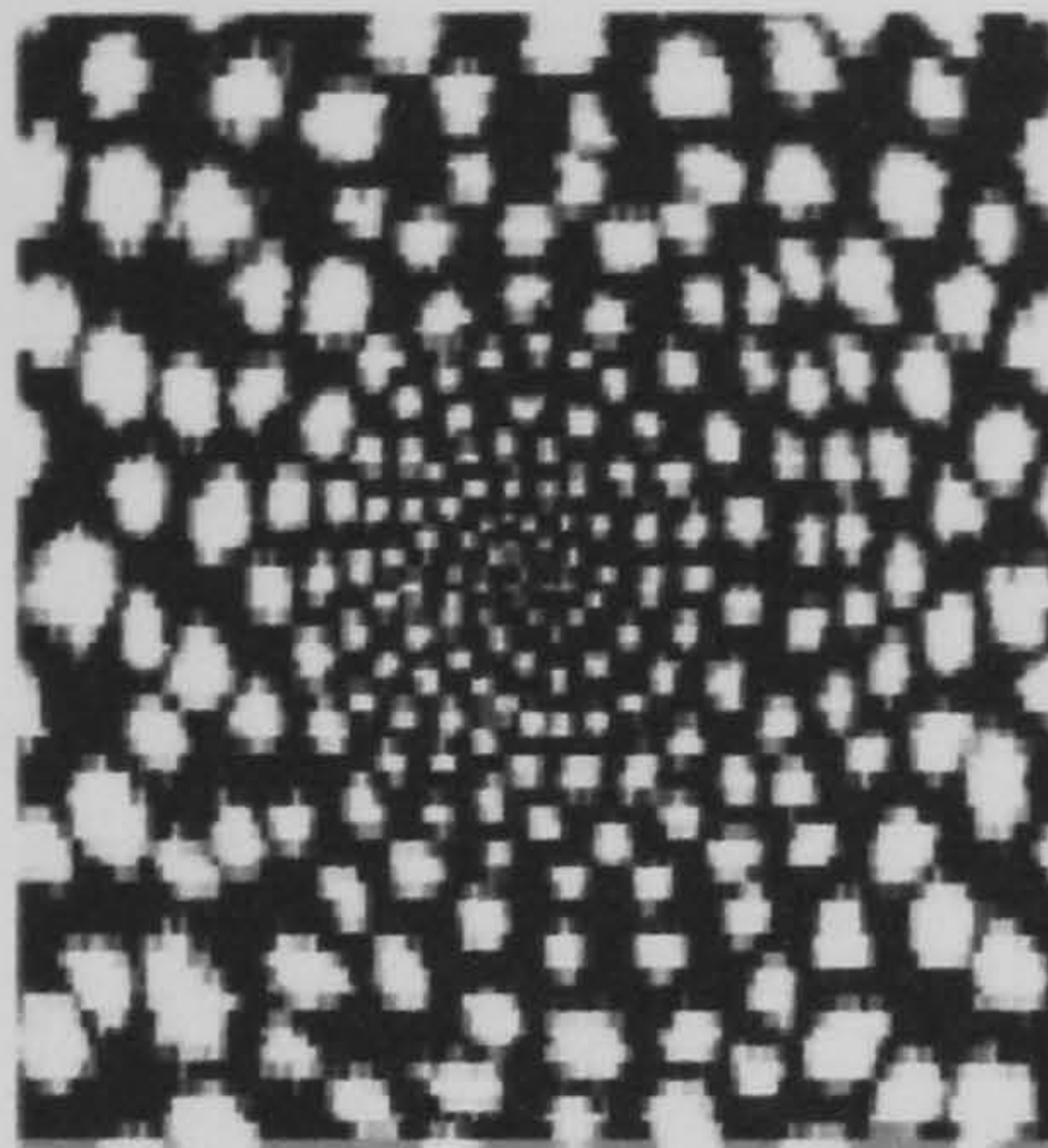
The similarity to previous accounts of video feedback is striking. That some of those forms are repeated in the noise generated by technology designed to reproduce optical phenomena suggests a degree of continuity between the structure of the optical organs and the technologies that simulate them:

Some have suggested that form constants, like spirals, result from the projection of retinal blood vessels and capillaries, but others show that the pattern and structures of retinal vessels are simply not regular and geometrical as drug-induced visual imagery. It remains possible, however, that such entoptic structures only provide the basic structural templates for cognitive elaboration in higher centres of imaginary constants (Siegel and Jarvik 1975:144).

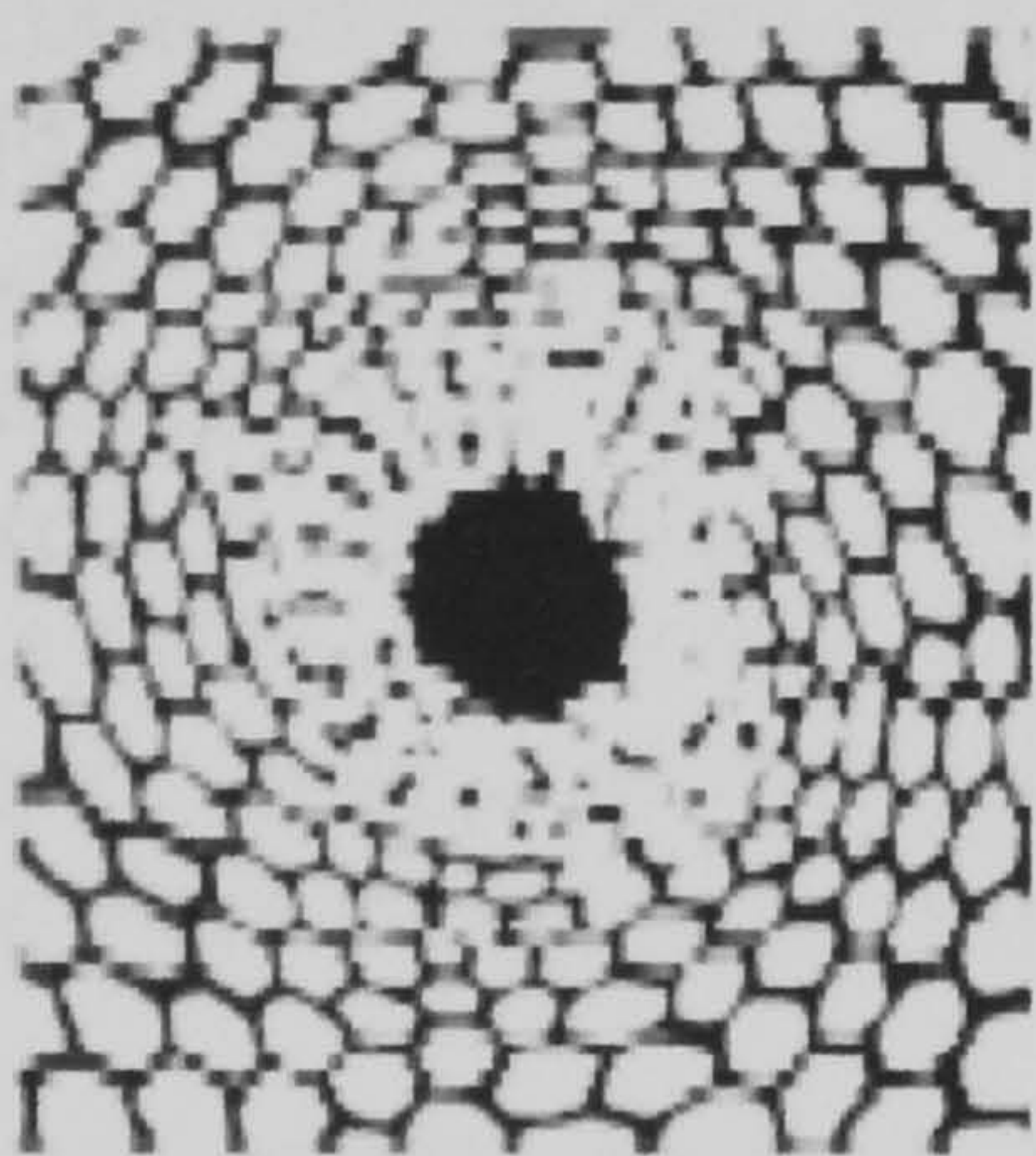
Cytowic's scientific concern with the phenomenon of synaesthesia in general, and optical perception/apperception in particular is focussed on the developing distinction between the distinct activities of the cortical and limbic areas of the brain. So fully has the cortical explanation for 'form constant' imagery become accepted, that, in 2002, a team of mathematicians argued that the geometric data present in Klüver's constants, as reproduced in Siegel and Jarvik (Siegel, Jarvik, 1975), could be used to provide information about the structure of the retino-cortical map itself, working backward from the diagrams to describe mathematically the virtual shape of the brain area known as V1. (Bressloff, et al, 2002).



(I)



(II)



(III)



(IV)

Figure 1: Hallucinatory form constants. (I) Funnel and (II) spiral images seen following ingestion of LSD (redrawn from Siegel & Jarvik, 1975), (III) honeycomb generated by marijuana (redrawn from Siegel & Jarvik, 1975), and (IV) cobweb petroglyph (redrawn from Patterson, 1992).

Figure 9: “form constants” identified by Heinrich Klüver...

...discussed by Siegel & Jarvik (1975) and redrawn for an article on the mathematical relationship of geometrical hallucinations and the visual cortex (Bressloff, et al, 2002)

These ‘Form Constants’ and the researches around them are close to the activities of some key figures in experimental film. William Wees’ chapter on “...Making Films for the Inner Eye” (Wees, 1992:123-153), draws a clear connection between Klüver’s ‘form constants’ and the Mandala form, as it appears in film through Whitney and Belson, and on into flicker films by Conrad and Sharits. He does not, however, include the early video feedback form. There seems a direct connection to be made with the electronic image as perhaps an even closer parallel to the cortical function than the optical camera and celluloid film. It is Youngblood’s much earlier book that permits that connection, through reference particularly to the work of Robert Zagone (Youngblood, 1970: 285), and Lutz Becker (ibid: 334), without detailed examination of similarities and differences. The electronic image, particularly as exemplified in camera feedback provides a clear parallel to the relatively autonomous function of the eye within the brains structure. Youngblood

states:

...science has taught that there is no purely physical reason for the disparity between apprehending and comprehending. We know, for example, that thirty-eight percent of fibers entering or leaving the central nervous system are in the optic nerve. It is estimated that as much as seventy-five percent of information entering the brain is from the eyes. Current research indicates approximately one hundred million sensors in the retina and only five million channels to the brain from the retina. There is a great deal of evidence to suggest that information processing is done in the eye before data are passed to the brain (Youngblood, 1970:46).

Consistently throughout Pellegrino and Youngblood is threaded the McLuhanesque idea of technology as a physical extension of the body into the world, firstly as a mechanical movement, then as an extension of human nerves. The mystical tradition, summarised by Moritz (Moritz, 1985), its influence cited by Wees (Wees, 1992:123-153), and the more cybernetic approach of McLuhan, rooted in de Chardin's "noosphere," (McLuhan, 1964:263), share this mental image of the interpenetration of the interior and exterior space of the body and the world, microcosm and macrocosm. Nam June Paik modifies McLuhan's position thus:

...don't confuse 'electronic' with 'electric' as McLuhan often does. Electricity deals with mass and weight; electronics deals with information: one is muscle, the other is nerve (Paik, in Youngblood: 137).

This fascination with the wired body resembles the imaginary technologising of the body that appears in European pioneer moderns like Marinetti, as quoted by Douglas Kahn in his introduction to the *Wireless Imagination* anthology, which takes its name from Marinetti's essay. (Kahn, in Kahn, Gregory, 1992:7) Recent retrospective writing by Erik Davis has defined as 'Techgnosis' this fusion of cutting edge science and religion characterised by:

...the fascination with the vitality of bodies, the desire to spiritualise material form, and the millenarian drive to transmute the energies of earth into the divine realization of human dreams (Davis, 1974: 24).

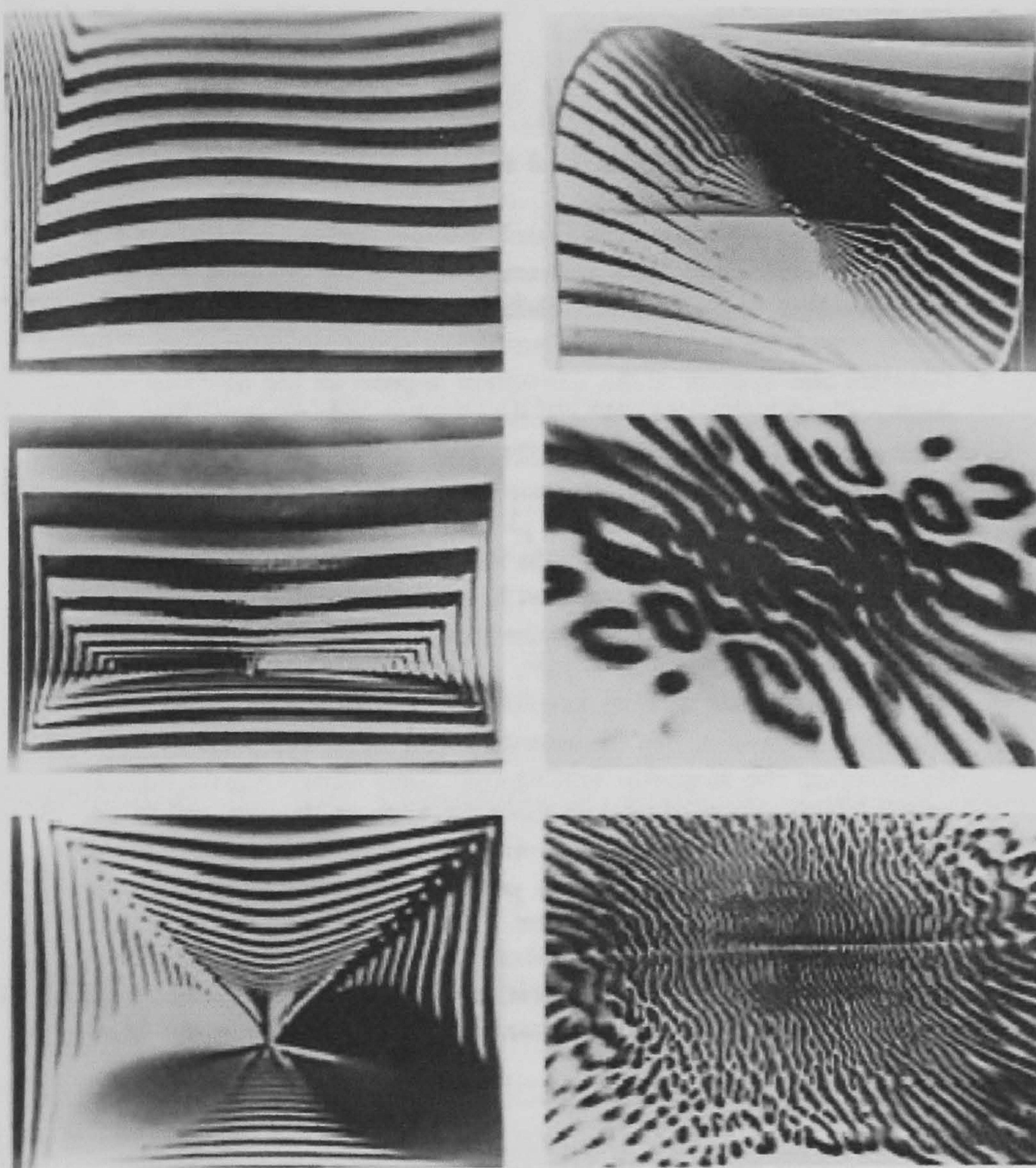
Champions of the cybernetic model of consciousness see connections between the human nervous system and the global network implicit in the development of networked television and satellite communication systems. These frequently appear as mutual metaphors for one another:

Just as the human nervous system is the analogue of the brain, television in symbiosis with the computer becomes the analogue of the total brain of world man. It extends our vision to the farthest star and the bottom of the sea. It allows us to see ourselves and, through fiber optics, to see inside ourselves. The videosphere transcends telepathy (Youngblood, 1970: 260).

In a clip in Nam June Paik's *Global Groove*, (1973-2004) John Cage describes his fascination, while inside an anechoic chamber, on hearing sounds which, the engineer informs him, are those of his blood circulating, and the functioning of his central nervous system (also in Cage, 1967:134). In a similar vein, Ronald Pellegrino writes:

Consistent with all the electronic arts, video is an extension of the nervous system... (Pellegrino, 1983: 147).

Videographic Cinema 335



Lutz Becker: *Horizon*. 1968. Video feedback. 16mm. Color. 5 min. Tightly controlled phasing between a TV camera and its own output monitor.

ARTSCLAB 2001

Figure 10: images of Lutz Becker's video camera feedback
(from Youngblood, 1970:335)

But this nervous system has a life of its own:

As an electronic surface, video has its own inherent motion, the interleaved raster scan. Any motion introduced into the video system must interact with its inherent motion. The forms involved in and/or created by that interaction enter into one or more of the dynamic states of floating, revolving, streaking, wheeling, rocketing, dancing streaming, snowing, sparkling, glowing, shimmering, showering, puddling, dappling, blooming, quivering, cracking, peeling, disintegrating, exploding merging, warping, curling, melting, and bursting; all that action, and color, too (op.cit: 147).

Invoking other forms of clinical psychology he asserts recklessly:

Visual elements on the electronic surface can create fields of ephemeral Rorschach images that reveal the psychic state of the observer as he divulges the personal meanings and feelings the images evoke... (Pellegrino, 1983:147).

Youngblood extends this metaphor internally and externally:

The direction is simultaneously toward inner and outer space, the microcosm and the macrocosm. On the one hand, intermedia environments turn the participant inward upon himself, providing a matrix for psychic exploration, perceptual, censorial [sic], and intellectual awareness; on the other hand technology has advanced to the point at which the whole earth itself becomes the "content" of aesthetic activity. The term "light show" must now be expanded virtually to include the aurora borealis, since hemispherical lumia displays are possible in the creation of artificial plasma clouds in space...the launching of rockets to generate atmospherical events, or urban environmental generators (Youngblood, 1970: 368).

Interestingly, and in contrast, John Whitney himself came to reject the cathode tube based feedback experimentation, as his own research developed increasingly precise mathematical means of generating geometric harmonic moving images, commenting disparagingly:

Little wonder the color tube was an early item of the drug faddists paraphernalia. The tube is just too fluid to control with less than a strong mechanism of order. Indeed this video reminds one of the primordial one-ness, out of which the musical scales were formed ...most video pattern today contains within its phosphor field obvious gratuitous relations that are imprecise, uncontrolled and accidental. Despite many elements moving at once in various directions...video's inexact 'impressionism' is not an equivalent to musical counterpoint, by any stretch of the imagination (Whitney, 1980:84-85).

As Whitney's work developed in precision he became more active in the developing use of computer imaging techniques, looking for the harmonic relationship common to light and sound. It is a measure of his success that much of the work now resembles the kind of complex three-dimensional mapping widely available using the shared 'OpenGL' or open graphics library that is common to standard operating systems, for mathematical graphic modelling. The distaste for disorder, evident in his comments above alienated him from the impromptu and ad hoc components in Expanded Cinema. Occupied with delineating harmonic relationships common to sound and light, his work represents a strangely anachronistic attempt to 'classicise' optical art by finding a determined pattern equivalent to the musical scale at a point when musicians had spend three quarters of a century dismantling it. By his own admission, his work was more concerned with activities of research and development than critical or models of art practice. He draws a distinction between "analytical" activity that acts on existing material, like editing, or musical improvisation, and "synthetic" activity that is about "...creating something out of the blank nothingness..." and of his own work, he says:

...I favour the synthesis approach...over the trends of experimentation around the world (Whitney, 1980:194).

Feedback, Negentropy and the Avant-Garde

For Youngblood this experimentalism was central to new expanded forms of cinema, and feedback was a vital principle through which art in new media could resist cultural entropy, relating it to the quite literal definition in the Second Law of Thermodynamics, Youngblood wrote:

Feedback exists between systems that are not closed but rather open and contingent upon other systems. In the strictest sense there are no truly "closed" systems anywhere in the universe; all processes impinge upon and are affected by other processes in some way. However, for most practical purposes, it is enough to say that a system is "closed" when entropy dominates the feedback process, that is, when the measure of energy lost is greater than the measure of energy gained. (Youngblood, 1970:63).

Youngblood's cultural adaptation of systems theory posits feedback as kind of a resistance to cliché, seeing entropy in the dominance of the profit motive:

Commercial entertainment may be considered a closed system since entropy dominates the feedback process. To satisfy the profit motive the commercial entertainer must give the audience what it expects, which is conditional on what it has been getting, which is conditional on what it previously received, ad infinitum (ibid: 63).

He quotes Norbert Weiner's definition of feedback as:

...a method of controlling a system by reinserting into it the results of its past performance... if the information which proceeds backward from

the performance is able to change the general method and pattern of performance, we have a process which may well be called learning (ibid: 63).

Thus art is necessarily distinct from entertainment, as it is concerned with innovation and change, reflexive and always experimental:

The notion of experimental art, therefore, is meaningless. All art is experimental or it isn't art. Art is research, whereas entertainment is a game or conflict. We have learned from cybernetics that, in research one's work is governed by one's strongest points, whereas in conflicts or games one's work is governed by its weakest moments. We have defined the difference between art and entertainment in scientific terms and have found entertainment to be inherently entropic, opposed to change, and art to be inherently negentropic, a catalyst to change. The artist is always an anarchist, a revolutionary, a creator of new worlds imperceptibly gaining on reality (ibid: 64).

Again the powerful contrast with the modernist model of artist as critical antagonist. Youngblood's use of the term condenses definitions from physics and systems theory to construct something like a critical theory of art practice, but never defines the social object of that critical distance. Absorbed with the variety and innovation in the development of new forms of cinema, he sees the technology as full of the potential to evade its own current misuse.

Woody Vasulka's use of feedback is analytical, particularly in those works which are systematically – "didactically" - to use the artist's own definition (Vasulka, 2004), concerned with the process through which the video signal becomes an image:

I was educated in film at a film school. I was exposed to all the narrative structures of film, but they weren't real to me and I couldn't understand what independent film was. I was totally locked into this inability to cope with the medium I was trained in. So for me, video represented being able to disregard all that and find new which had no esthetic content or context. When I first saw video feedback, I knew I had seen the cave fire. It had nothing to do with anything, just a perpetuation of some kind of energy (Vasulka, W. in Gill, 1976:83).

And the phenomenon of feedback is part, as Steina Vasulka describes it, of the realisation, central to the Vasulka's works, that audio and video sound and image signals are linked by their fundamental relation to electrical energy:

We would come in and just sit for hours and watch feedbacks – it's a self-made process. It just goes on. You just point the camera at the monitor, set it into motion, and then you can sit and watch it and talk, and after a while you look at it and it has changed. Then we started to figure out how to interfere with it, how to control it, what to do to change it – to find out the laws, if there were any – why it happened in the first place what was the reason for it, and why the hell I was staring at

it...We were interested in the absolute interference of sound and image. That's when we realised that there didn't have to be a camera – a voltage, a frequency could create an image (Vasulka, S. 1978:23).

In distinction from the intuitive or expressive use of feedback as an immediate visual or sonic effect, or a symptom of electro-human interconnectedness, there is a tradition of work in which it is used analytically, or temporally disassembled. Woody Vasulka describes these as their “didactic” tapes because of their being demonstrative of particular characteristics of electronic video imaging. Examples of didactic tapes include *Elements* (1971), *Spaces I and II* (1972), and *Distant Activities* (1973), in which specific elements of the tools used to describe an image on a cathode tube are used in isolation, creating disembodied segments of the conventional TV picture. Feedback is a part of the process in these works, so that, rather than being a continuous spiralling stream, broken up in time, they describe features of what Woody Vasulka refers to as the “energy image” shown alongside other tape works isolating characteristics like scanning, keying, and the concurrent display of sonic and visual wave forms. Few artists so systematically analyse the electronic video image. Nam June Paik, engages deeply with the process of the cathode tube as in his development with Shuya Abe, of the Paik/Abe video synthesiser, and Peter Campus, whose *Transitions* (1973) series play with the illusionistic depth of video layering also address the specific nature of the electronic signal-based sound and image, but Woody and Steina Vasulka are central to what Gill calls ‘image-processed’ video as an art form.

Exercises in feedback

More recent experiments by both artists and scientists have looked at the relationship between video camera feedback and fractal geometry. This is a particular quality of a video signal mediated through pixellated screens in which the video image is re-articulated into a particular image resolution that is not its native, or original one. Fractal geometry is created by the reintroduction of the video image into the picture. On a website dedicated to fractal geometry and video Peter King explains:

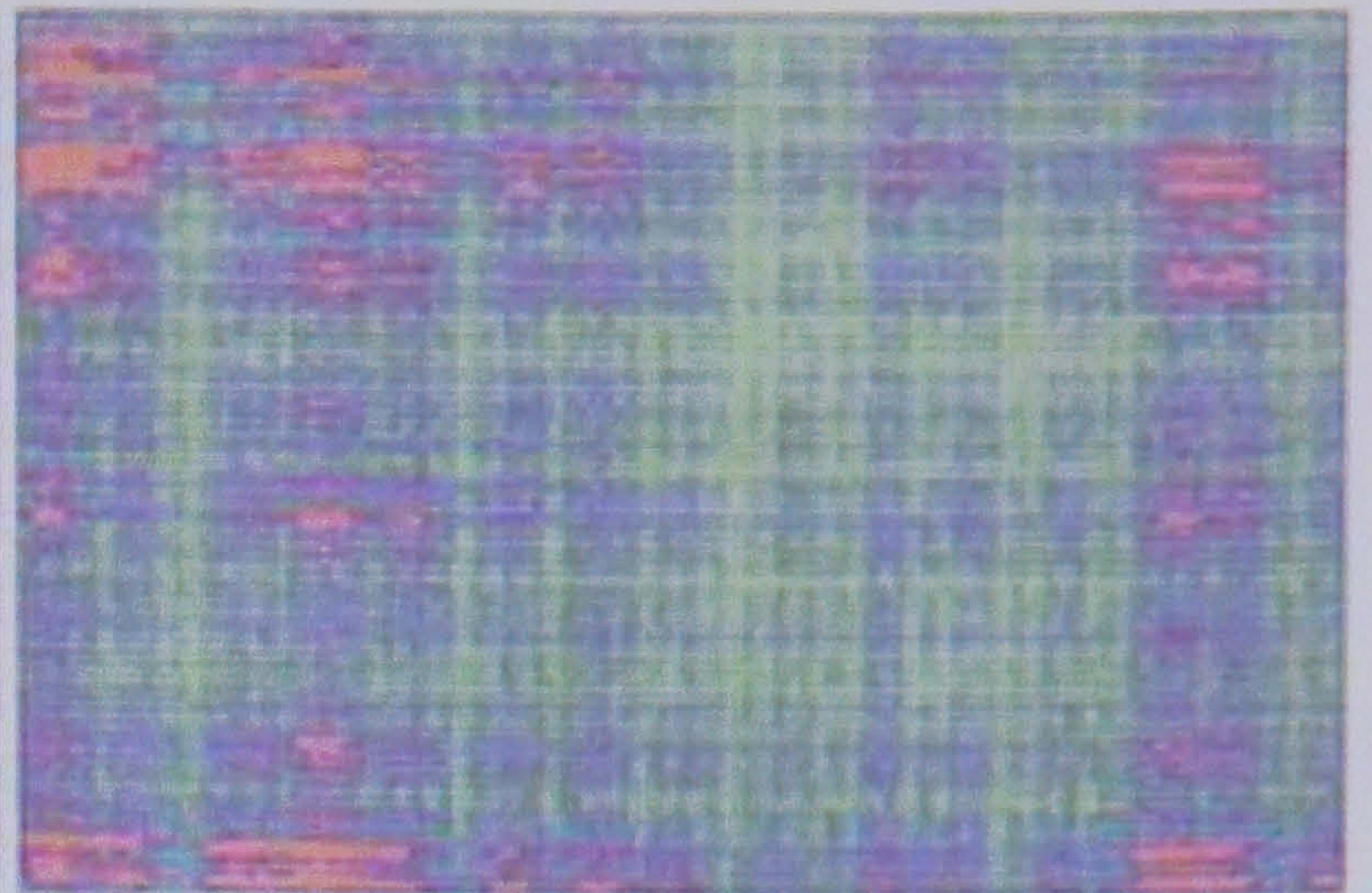
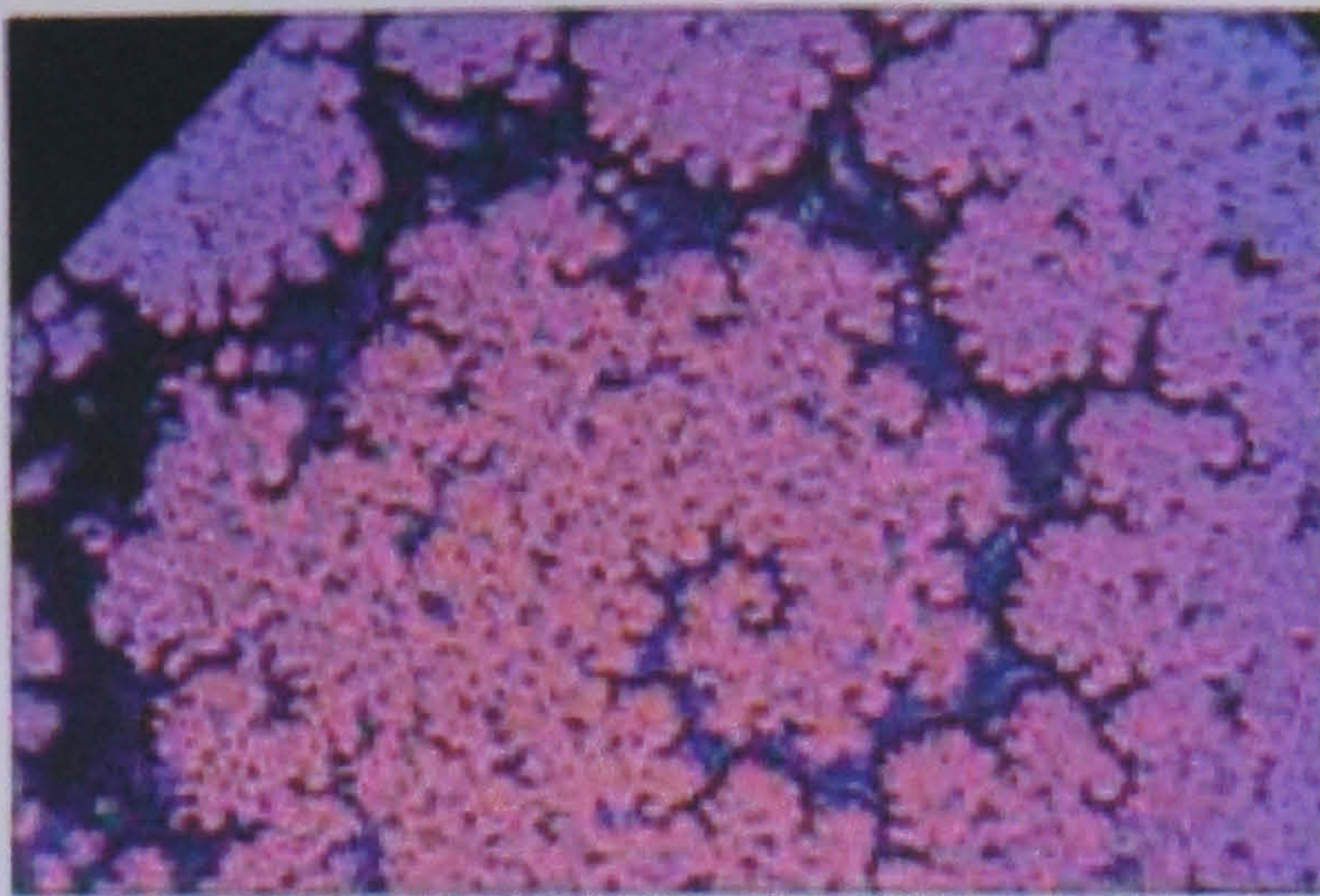
Video Feedback Fractal Genesis:

Ordinary video feedback is created when a video camera is trained on a monitor that displays the camera's live video image. The relative position and orientation of the monitor's image within the camera's field of view represents a translation of scale, rotation, and position. Each time the image recirculates, the translation is reiterated.

In order to create fractals, the camera's image needs to be multiplied and recombined so that the images may overlap freely... (King, 1997).

In direct replication of the way the video signal is made, as a breaking up of light and colour into separate components for later reassembly, so this fractal image derives from a multiple subdivision of the original image.

Fractals on video



Physicists at Glasgow University in the UK have found a novel way to generate fractal patterns like these ones using "video feedback". Johannes Courtial and co-workers saw the patterns evolve when they pointed a video camera at a monitor that displayed the image from the camera. The patterns, which take about 10 video frames (or 0.5 s) to form, arise because the image is magnified and then pixellated a number of times. Magnification stretches the image, while pixellation continuously adds small-scale structure. The result is a self-similar pattern, which depends on the shape and size of the pixels, the geometry of the pixel pattern and the magnification (*Nature* 2001 **414** 864).

Figure 11: Video fractals (from Nature 2001, 404, 864)

Electronic feedback occurs when the content of the medium is the medium itself, but itself transformed. It highlights its materiality as an electronic signal in time, rather than a static object. It is in that sense a core characteristic of electronic art, potentially fulfilling the Greenbergian criteria cited earlier, and it has been understood as such by many artists. Thom Holmes quotes Robert Ashley calling feedback "the only sound that is intrinsic to electronic music" (Holmes, 2002:27). The experimental work of Ashley, and those other musicians and composers also associated with the Sonic Arts Union – David Tudor, Gordon Mumma, and Alvin Lucier (discussed extensively below) – developed the use of sonic feedback as a generative tool in a range of different ways. Here the unpredictable auto-generative nature of feedback is central, as it part of the compositional ethic, but is frequently slowed or controlled in a way that creates a dialectic between the automatic process and the human activity of performance.

I made a number of video feedback experiments, including the series **input_output** (2002-3) (DVD One: Chapter One: **input_output**) and the live **untitled improvisation with Ryuko Kuwajima** (2004) (DVD One: Chapter One: **untitled improvisation with Ryuko Kuwajima**)

The series **input_output** were intended to revisit the visual feedback of the seventies and eighties, to which I had been introduced, not originally by experimental forms like Skip Sweeny's work or the Vasulka's, but via its absorption into the lexicon of pop video effects, like the Queen promotional video cited earlier. It was therefore already a cliché. Like Sweeny, *et al* I

turned the camera directly onto the video monitor, but also I introduced processing tools which were themselves the product of research like that of Abe, Vasulkas, and Sweeny. Using a Panasonic MX50 video mixer, I displaced one layer of video input, thus shifting the symmetry typical of the earlier 'mandala' feedback images, and by using a graduated transition between the A and B video channels, the second of which had a negative colour reversal, gave an angular linearity to contrast with the organic shimmering optical feedback. Different types of dispersed window-in-window transition, slowly executed via an automated transition, created different patterns of contrasting concentric and asymmetric lines and patterns.

The intention was to revisit the techniques of early image-processed video feedback, but also to create works whose length was determined by the fixed duration of the automated transitions in the video instrument. The results were highly decorative, colourised patterns, rendered more kaleidoscopic by the feedback layering of the transition windows, whose edges became a part of the mandala form, in addition to interrupting it with a hard linearity.

As experimental works, they offer a rich and complex variation on the earlier forms of video feedback, but it is hard to see how they engage with anything beyond the circuits of video and the cul-de-sac of 'special effects.' Despite the anti-negentropic features of feedback celebrated by Youngblood, it seemed that this was a 'closed' system, and that all it was possible to do was to further elaborate the internal relationship between the noise of the electrons and the controlling framework of the processing circuitry. Though in some ways fulfilling the medium specific criteria of modernist practice, the process pointed only toward itself – to technical processes – not toward the social processes that brought it into being. In order to use feedback in a way that has a relationship with activity outside the tube and circuits, I needed to work with other elements beyond the frame, and, since I was already using video with music and sound performance, I began to use video feedback in collaboration with sound.

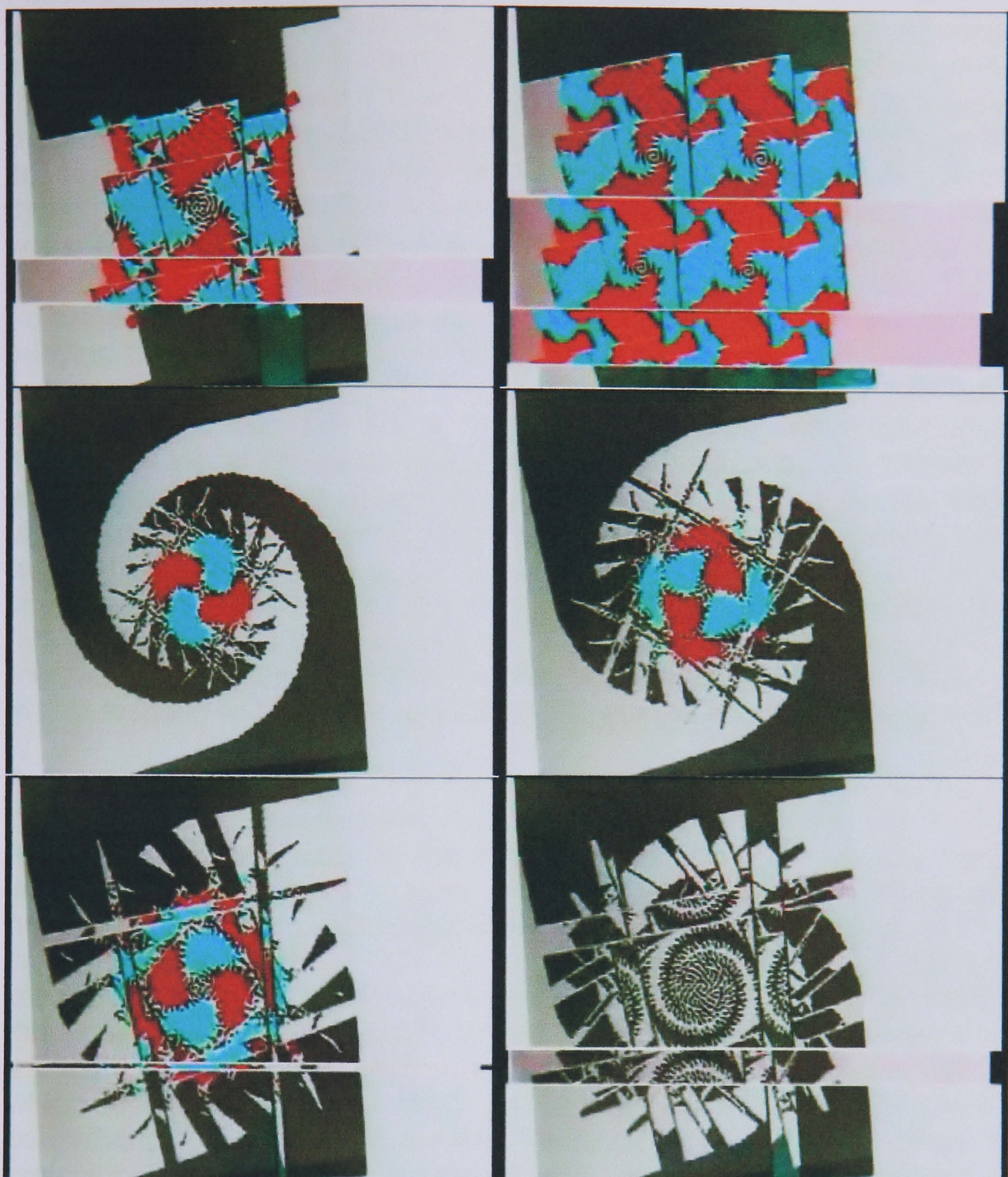


Figure 12: input_output (2004) screengrabs

I had been experimenting with feedback in performance for some time when I used feedback as a real time component in a composite work: (**Untitled improvisation with Ryuko Kuwajima**) which is cut from an eight-hour performance and webcast in 2003. (scopac.org, 2003) I wanted the use of feedback here to be closer to the musician's usage, where there is a movement outwards generated by physical activity, rather than a hypnotic centred spiral moving inwards. The work would combine the indexical sign relationship of the electronic image in its pointing toward the referent of its own current flow, with the indexicality of a soundwave measuring a sonic input. This was also a result of an interest in the sound image work of described in the following chapter, in which a concurrent visualisation of sound is presented as the content of the performance or work.

I used again the Panasonic MX50 video mixer or switcher, generating a matte layer, and automatically reducing the pixel ratio in response to the sound while lowering the output lux levels to increase the contrast and draw attention to the matte layer. The matte layer consisted of a white sound wave generated by audio analysis in Max/MSP Jitter software (see Chapter Four) from the live sound input into the computer. This matted sound wave is then processed through the aliasing, pixelisation process (a simple reduction of the pixel field which has the effect of enlarging or scaling up the visual information) on the mixing desk whose dimension is stimulated by a separate audio input feed from the same live external source. The sound source is a live microphone relaying the amplified activities of the musicians in the room, which in this sequence is Ryuko Kuwajima improvising on *SuperCollider* audio software. The camera is then pointed at the projection screen and moved manually. This direct visual feedback image loop is dominated by the matted sound wave-generated blocks, which are repeated and layered by the recessive layers of feedback image multiplication. The gain of the video signal is reduced overall to increase the visual emphasis on the white-matted audio-responsive component. Here the intent was to combine the unpredictability of the feedback signal – particularly so, when using a handheld camera – with the automatically predictable generation of the sound wave responses, which in turn respond to the overall unpredictability of the spontaneous composition.

Aware that I was transgressing the purity of the wholly auto-generated work, I wanted instead for the feedback to be influenced by the sound and to act upon it physical with the motion of the camera. Resembling the ‘cortical mandalas’ referred to the previous chapter, the work was also consciously echoing (without attempting to reproduce) the way animators like Len Lye, in *Particles in Space*, or Ruttmann, in his *Opus* series use stark white figures against a black background so that image refers to a wider space than the rectangle of the screen. This attempt to develop the visual experience of the work outside a pictorial framework is extended in the project **Foreign Correspondence** which concludes this thesis. As a part of that project I also presented a short performance in which non-camera feedback from the video mixer to the projector and audio PA combined with acoustic feedback using a live microphone creates a sound-image work determined by the shape and acoustic properties of the space. (DVD 2: **Projector One: untitled sonimage feedback performance**)

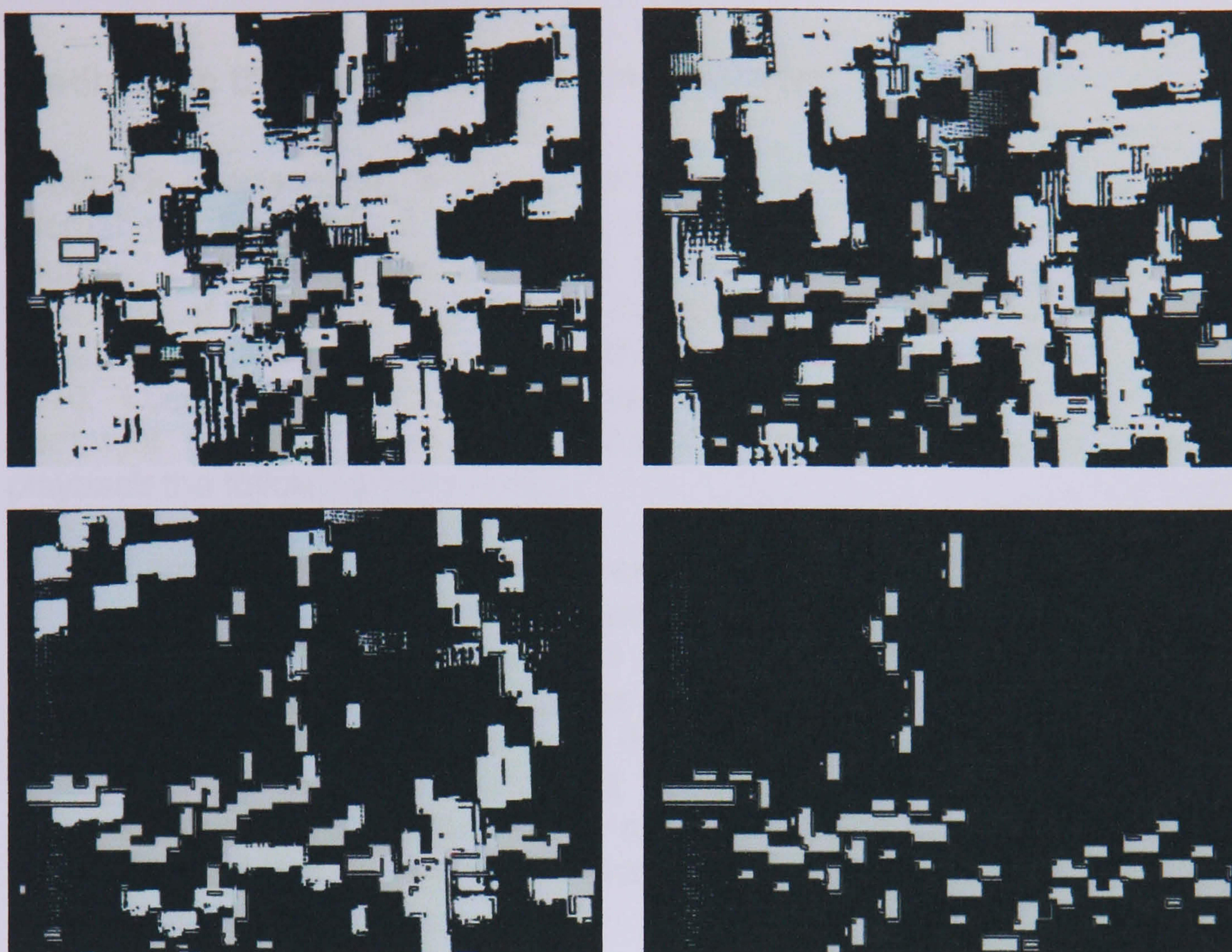


Figure 13: video stills from untitled improvisation with Ryuko Kuwajima (2004)

(DVD: Chapter One: untitled improvisation with Ryuko Kuwajima)

Feedback in the Image, Feedback in the Room

Feedback is essentially a phenomenon derived from amplification. In audio microphone feedback, it is the air in the room that provides the 'positive coupling' described in the quotation from the technical manual cited at the beginning of the chapter, and this relationship of resonance and electronic signal is explored by Alvin Lucier, in the sound-work: *I am sitting in a Room*, of 1970. Lucier takes the phenomenon of feedback and applies to it the treatment of Xeno's arrow, by recording and re-recording from ambient playback the following statement:

I am sitting in a room, different from the one you are in now. I am recording the sound of my speaking voice, and I am going to play it back into the room again and again until the resonant frequencies of the room reinforce themselves so that any semblance of my speech, with perhaps the exception of rhythm, is destroyed. What you will hear, then are the natural resonant frequencies of the room articulated by speech. I regard this activity not so much as the demonstration of a physical fact, but more as a way of smoothing out any irregularities my speech might have.

- until all that is left are the sonorous echoes of the of Lucier's voice, with its stutter an idiosyncratic addition to the musicality and rhythm of speech. This work effectively functions as an analysis of resonance, breaking its loop down into subsections and introducing a kind of cinematic time into sound, treating the characteristic howl of auditory feedback - a long-term preoccupation of Lucier (Marshall, 1976) - like a crashing car in an action movie, whose slow arc describes the temporal space of cinema itself - the core medium with which the director is working. Lucier's declared ambition is to describe the physical space of the room as literally as possible. In doing so he makes a thoughtful use of minimalist techniques: of repetition as a developmental, rather than static process; and the creation of work by other than expressive means. In much the same way visual artists of the seventies like Carl Andre and Sol Lewitt created reflexive, elegant works from impersonal parameters like mathematical equations, or the given length of store-bought timber. Although materialist in its destination, operating, as is characteristic for Lucier, through unpretentiously simple technical means, *I am sitting in a Room* describes and makes material the immateriality of the time of sound. In doing so the feedback that describes the rooms resonant frequencies gradually effaces the sound of the artists voice with its own resonance. Of course it is itself a recorded work, subject to playback like any other piece of recorded music or sound, but in isolating the phenomenon of noise as a property of both the room and the equipment, in concert with the temporal period of the process, Lucier's work emphasizes the productive properties of decay and loss inherent in the recording process, both at a technical level, and at the level of what Walter Benjamin defines as the "aura" of the work (Benjamin, 1936). Although Benjamin's definition sees the aura as something entirely lost in the practice of mechanical copying, Lucier's process of layered re-recording seems to capture a ghost image of what might be defined as "...presence in

time and space, its unique existence at the place where it happens to be” (Benjamin 1936: 222).

Delayed feedback in video differs in some important ways from Lucier's collaboration between the equipment and the room. In 1976, David Hall made a gesture with video similar to Lucier's use of audio recording for an Arena broadcast on BBC2. In a work entitled *This is a Television Receiver* (1976) he recorded, replayed and rerecorded the then-familiar face and speech of newscaster Richard Baker onto and from videotape to the point of unintelligibility, provoking an awareness of the image as material effect, rather than a transparent truth:

After an initial ‘take’ of the newsreader describing the essential paradox of the real and the imagined functions of the TV set on which he appears, a second is regenerated optically off a monitor screen (the sound by microphone) a third off that, and so on. Vision and sound progressively change, at each stage distorting the unexpected characteristics, displacing the imagined for the real - configurations of variable light intensity at the surface of the screen, each time identifying and re-identifying the implications of his recurring statement (Hall, 1976: 25).

This, as Hall says-

...was...an attempt to not only appraise the illusion convention, but more importantly to demonstrate the cognition and collation of some of the specifically indigenous properties on which is built a new and wholly videological experience (Hall, op.cit).

Hall's work, though compelling, seems to map deterioration only, rather than creating something new from the loop. Perhaps it is because of the different kind of attention afforded to sound that Lucier's work feels more than didactic, transformation rather than interference. *I am sitting in a Room* moves beyond the room itself, while Hall's work is claustrophobic, reducing the spatial illusion of television in a move toward flatness that echoes Clement Greenberg's definition of the core characteristic of modernist painting. There is of course an important distinction to be drawn between the basic materials of the two artists: Lucier's work employs the room itself as much as the recording and playback technology, whereas Hall's work takes place within the discrete circuits of the video equipment. But this in turn, reflects deeper and differing modal characteristics - sound recorded and replayed is still sound - existing as a movement of air in the same space as unrecorded sound - but the image always requires a frame, separating it from its object in everyday visual reality. Sounds are in motion, but the image stays where it is. As Michel Chion points out:

What is specific to film is that it has just one place for images - as opposed to video installations, slide shows, Sound and Light shows and other multimedia genre which can have several. This fact, and no other, accounts for why we speak of the image in the singular... what is

the corresponding case for sound? The exact opposite. For sound there is neither frame nor pre-existing container (Chion, 1994: 67).

Additionally, while Hall's work moves towards an effacement or erasure of the recorded content, Lucier's does not erase the signal, but supplements it with another, recognizably musical one. If we imagine a hypothetical encounter with the results of the two artists' feedback processes, having failed to see or hear their beginnings then the latter part of the video work makes little sense without the knowledge of the earlier part, and of the process of its development toward that state, while the sonic work the sound has a character which, while conceptually poorer without a sense of the spoken words that originated it, has an independent character as musical sound. This is, to some extent, a cultural judgment, owing much to a post-Cageian expansion of the category of music, and the lack of an equivalent context for non-pictorial video, despite the Vasulka's examples above. In terms of Chion's distinction outlined above – the sonic artist is able to transcend the container, working with sound itself, where the visual artist is limited to the confines of the medium. The video work can only be metonymically related to the wider category of vision itself. While the "visionary" (Sitney) or "inner eye" (Wees) tradition of experimental film aims to reproduce the mental process of vision itself, Halls deflationary exercise succeeds in muddying the electronic image in a destruction of its illusory coherence. Chion's own distinction does not go far enough, since even in the: "...video installations, slide shows, Sound and Light shows and other multimedia..." (ibid.) the images - however numerous - are always contained in their own frames. These modal characteristics of distinction between recorded sound and image are crucial to any analysis of the workings of combined modes and media, and will be discussed in more detail later. In live work, like the **untitled improvisation with Ryuko Kuwajima** cited above I wanted to combine the way in which visual feedback indexes internal process and electronic flow with the indexical rendering of an external sound that occurs in the physical space around the screen.

Both Hall's and Lucier's works, perhaps uniquely in their respective media, isolate the phenomenon of feedback temporally, by breaking its duration up into stages using recording and playback from storage. The works owe much to minimalist and conceptualist strategies. Woody and Steina Vasulka's works, too, are deeply analytical of the medium, though less concerned than Hall with television as an institution, and perhaps even less concerned with the definition of themselves as 'art' works in any finished conventional sense.

The use of feedback as a medium-defining attribute continues in experimental sonic culture. More recently Nicolas Collins, ex-student of Lucier, and one time artistic director of the STEIM institute in Amsterdam, has developed combinations of feedback and software-based composition that maintain the tension between the electronic signal and its bit-encoded counterpart. Japanese musician performer and composer Toshimaru Nakamura creates delicate sonic textures using "no-input mixing desk" after gradually abandoning all the instruments that were plugged into it (Nakamura, 2000). It was following a performance in Colchester with Nakamura in 2000 that I began to experiment with using video editing tools without video input. Philip

Sherburne writes in the sleeve notes for the *Leonardo Journal* LMJ13 CD *Companion: Groove, Pit And Wave*:

Toshimaru Nakamura's No-Input Mixing Board seems an even more radical – in the literal sense – act of auto-generation, "playing" a mixing desk with no inputs aside from its own output. Without recourse to any external sound source, Nakamura's strategy utilizes only the device's own internal feedback, creating a purely latent music that might be considered to be always-already present in the machine (Sherburne, 2003).

The two models of artistic practice: of flow, and of intervention, are sustained through the use of this feature of electronic media that is symbolic both of its machinic, impersonal continuous auto generative form, but also a transient highly contextual instability, determined, as Lucier shows most clearly, to its relationship with the space of the location itself. Feedback is both an interruption – in cultural terms – of the 'correct' function of electronic amplification and reproduction, but it is also a direct consequence of the 'flow' properties of electronic circuits. In video, feedback tends to represent internal features of the electronic tube and signal, but, in conjunction with sound, I have attempted to combine the tradition of 'inner-eye' experimental film making, reflecting on its relationship to electronic flow, and the connection asserted by the Expanded Cinema generation between electronic communication media, and the wiring of the body's own nervous system, as well as acknowledging its direct resemblance to the cortical and neural patterns theorized in Heinrich Klüver's 'Form Constants'. I wanted the feedback sound and image combination to form something like a "noosign" – as Gilles Deleuze describes it – "an image which goes beyond itself towards something which can only be thought" (Deleuze, 1989: *Glossary*).

In the chapter that follows, these internal properties of the electronic sound and image are linked to the external, physical means by which they are manipulated and made plastic, and introduced into the musical structure of transient and performed audio visions.

Chapter Three

It has passed generally unnoticed that this preoccupation of the last hundred years has been toward a *musicalization* of visual art

John Whitney (in Pellegrino, 1983:16).

The history of experiments in sound and moving image can be roughly divided into three distinct forms. Firstly, moving images intended to *substitute* for sound, as in the idea of visual music, where it is attempted to give images the status of, or pay similar quality of attention to, musical sound. Secondly, moving images intended to *combine* meaningfully with sound in ways that go beyond the diegetic or descriptive use of sound in narrative film. Finally, a third, perhaps more obscure category of moving images and sound that are generated from the *identical source*. Like the frequently conflicting models of flow and intervention noted in the previous chapters, sound and moving image combinations are marked by contrasting emphasis given to harmonious links and dissonant and counter-posed opposites. This chapter will look at instances and combinations of these three forms and at the concept of synaesthesia, which is intertwined with them. The condition of synaesthesia has been compared to the technology of multimedia. This comparison is critically examined through a dialogue between automated and hand made processes in my own software and video work and the hand-made films of Len Lye.

Visual Music and Sensory Harmony

The tradition of “visual music” films is linked to an early modern fascination with synaesthesia that goes back into the 19th century. As pointed out by Cytowic (1998:117), Baron-Cohen and Harrison (1997), Cook (1998:21), and Kahn (2001:188-121), Symbolist poetry, particularly Baudelaire’s *Correspondences*, and Huysmann’s polysensual figure of Des Esseintes in *A Rebours* (1884), shows a growing fascination with inter-modal metaphor. Primarily, though, the drive within symbolism was towards an exotic destabilising of the senses, in keeping with the heightened sensory environment of urban modernity, whereas the earlier scientific quest (and the later mystical one) went in search of what Lawrence Marks calls the “unity of the senses”— a harmonious inter-relationship between sensory perceptions of light and sound so that “...the several senses are interpreted as modalities of a general, perhaps more primitive sensitivity” (Marks, 1975:6). This quest was extended by the mystical Theosophist tradition continuing into the twentieth century. The above sources cite Scriabin, Kandinsky, and Schoenberg’s artistic practice and research into synaesthetic correspondences between the senses. Fred Collopy summarises the direction of the ‘visual music’ tradition:

The most persistent association of color and music has been the effort to correlate discrete hues with specific tones. Of all of the possible correspondences between the elements of color (hue, saturation and value) and those of sound (pitch, amplitude, and tone color), the most often proposed mapping is of pitch to hue. Many such mappings have

been proposed and some were built into light instruments (Collopy, 1998).

Developments in optical colour theory prompted the creation of various light organs, harpsichords, and pianos, designed to exploit perceived correspondences between the harmonic scale in sound, and the colour-spectrum of light. From the *clavecin oculaire* of Bertrand Castel, to the Clavilux of Thomas Wilfred, the colour light music of Alexander Lazlo, or Scriabin's *Prometheus*, all these made attempts to map colour onto sound in quite fixed ways. These instruments will be referred to later in the following chapter in the context of performing with light and image, where they are understood as prototypes of the manual keyboard interface of the contemporary computer. As part of the visual music tradition, though, they represent a thoroughgoing attempt to map harmonic values in sound with coherent forms of equivalence in colour. They frequently seek to establish a perfect synaesthetic relationship in which values in one mode correspond absolutely with values in another.

The history of this experimentation and its connection to early animation work has been effectively outlined elsewhere, particularly Russett and Starr (1976), Moritz (1985, 1986) and Peacock (1988). Fred Collopy's *RhythmicLight.com* website (Collopy, 1998) provides a detailed breakdown of the various light and sound correspondence and difference in the visual music tradition (Collopy, 1998) including a comparative diagram showing the mapping of assumed relationships between colours and specific musical notes. But despite some continuity between the different correspondences, particularly with the colour red, for example, there is little evidence of objective consistency in the perceptual relationship between colour and sound. Lawrence Marks points out:

Newton (1704) and Castel (1725) and others maintained that there is a real analogy between elementary colors and notes on the musical scale. Newton, for example, named seven supposedly primary colors of the spectrum—red, orange, green, blue, indigo, and violet—one to parallel each note on the musical scale. Castel imported his own scheme into his color organ: blue for do, green, for re, yellow for mi, red for sol, etc. Castel's version was in turn criticized by Field (1820) who proposed yet another organisation. And so it went. Sadly, one finds that synaesthetic associations between colors and musical notes fail to favor any particular scheme over the others... (Marks, 1975:93).

As the scientific quest for a 'Transcendental Apperception' became less convinced of the absolute continuity of the senses, the mystical tradition, particularly the syncretic religion of Theosophy, became increasingly active in the maintenance of the idea of synaesthesia as a universal phenomenon. William Moritz has shown the translation of Theosophy from Europe to the United States West Coast, and how central that pattern of influence is to the visual music tradition in early animation. However arbitrary the ultimate connection, the belief in the ultimate unity of the senses was a powerful motivation for early sound and light instrument, and animation pioneers.

Synaesthesia, Multimedia

Most of the clinical research into synaesthesia concurs with Marks' assertions above. Synaesthesia is clinically defined as the stimulation of one sense by a form usually associated with another as psychologists Simon Baron-Cohen and John Harrison define synaesthesia:

... as occurring when stimulation of one sensory modality automatically triggers a perception in a second modality, in the absence of any direct stimulation of this second modality (Baron Cohen, Harrison, 1997:3).

The dominance of behaviourism in clinical psychology during the fifties and sixties meant that synaesthesia was neglected as a subject for serious analysis, since, as it did not constitute observable behaviour, it had therefore no empirical basis for study. More recent neurological research, however, particularly regarding the interconnected function of the limbic and cortical areas of the brain, have led to a resurgence of interest in topic, as well as in the previously existing scholarship. For earlier researchers, the appeal of synaesthesia lay in the possibility of a single 'suprasensory' core unifying the separate senses. Having its roots in the Aristotelian notion of "common variables" united by *sensus communis*, or common sense, this possibility of unifying theory appealed to the positivistic will to identify an empirical world that exists independently of the capacity to describe it. But, as Lawrence Marks points out (Marks: 1978) it has also been used to reinforce a:

...mystical correlationism that interprets the interrelation between the sense as symbolizing an arcane correspondence between the psychological and the physical realms... (Marks, 1978:5).

The cultural history of synaesthesia has been dialectical between these two positions, one appropriating the authority of scientific discourse, the other emphasising the occult, subjective, and expressive facets of the synaesthesia phenomenon. Mel Gordon (1996), writing on sonic culture in early twentieth century Russia shows a continuous counterpoint between the synaesthetic mystics and materialist revolutionaries. Moritz (1985) describes the fusion of the European émigré culture, including Madam Blavatsky, into California:

...where there developed a significant school of color music artists, including James Whitney, Jordan Belson, Harry Smith, and Charles Dockum. These artists shared a broad base of spiritual and theoretical influences, encompassing such local figures as Swami Prabhvananda, Swami Paramahansa Yogananda, Krishnamurti, Arnold Schönberg, Aldous Huxley, Alan Watts, Timothy Leary, the Beats and hippies.... Large resident Asian communities practised Taoism and Buddhism as living religions...

All of these, he asserts: "...more or less promoted synaesthesia, and all were well known..." (Moritz, 1985:302).

Synaesthesia, with Feedback and Negentropy, is central to Gene Youngblood's *Expanded Cinema* (1970). For Youngblood synaesthesia and psychedelia are co-terminous, and the multi-sensory experience of the information environment that he celebrates is a model for the expanded consciousness that will, he argues, be both a consequence of, and a necessity for, future cybernetic culture:

Synaesthetic cinema is a space-time continuum. It is neither subjective, objective, nor nonobjective, but rather all of these combined: that is to say, *extra-objective*. Synaesthetic and psychedelic mean approximately the same thing. Synaesthesia is the harmony of different or opposing impulses produced by a work of art. It means the simultaneous perception of harmonic opposites. Its sensorial effect is known as *synaesthesia*, and it's as old as the ancient Greeks who coined the term. Under the influence of mind manifesting hallucinogens one experiences synaesthesia in addition to what Dr. John Lilly calls "white noise," or random signals in the control mechanism of the human bio-computer (Youngblood, 1970:81).

While *Expanded Cinema* is full of hybrid scientific models, and analogies, Youngblood is less concerned with a 'correct' clinical definition of the synaesthetic, than in defining this new form of cinema. In the new 'expanded' cinema, older techniques of narrative, realism, and illusion, are replaced by direct experience. Sometimes quite paradoxically, the wide variety of technically and conceptually experimental works to which he refers are used to support a theory of film that is anti-illusionistic as well as being anti-narrative. Despite Youngblood's inclusion of Warhol's work, which is anything but psychedelic, and characterised by the anti-narrative form of the 'long take,' his model for synaesthetic cinema as "the end of drama" has little in common with later theories of Materialist cinema, as it has been theorised by LeGrice (2001), and - more austere - Gidal (1975). This owes more to earlier, politicised, illusion-negating models from the European avant-garde, - intended to utilise arbitrariness, and the shocks of juxtaposition - like constructivist 'ostranenie', or Brechtian 'alienation'. Youngblood's form of anti-illusionism points toward what he describes (via Freud) as "oceanic consciousness":

...by creating a new kind of vision, synaesthetic cinema creates a new kind of consciousness: oceanic consciousness. Freud spoke of oceanic consciousness as that in which we feel our individual existence lost in mystic union with the universe. Nothing could be more appropriate to contemporary experience, when for the first time man has left the boundaries of this globe. The oceanic effect of synaesthetic cinema is similar to the mystical allure of the natural elements: we stare in mindless wonder at the ocean or a lake or river. We are drawn almost hypnotically to fire, gazing as though spellbound. We see cathedrals in clouds, not thinking anything in particular but feeling somehow secure and content. It is similar to the concept of *no-mindedness* in Zen, which also is the state of mantra and mandala consciousness, the widest range of consciousness (Youngblood, 1970: 92):

The incitement to "mindless wonder" contrasts starkly with the politically ascetic injunction by Gidal for film to be concerned on with "...that space of tension between materialist flatness, grain, light, movement, and the supposedly real reality that it represents" (Gidal, 1975: 189).

Youngblood's linking of synaesthesia and emerging multimedia forms is prescient for 1970, however, and the longer history of sound and light combinations and musical visuality has been outlined more recently by Nicolas Cook (Cook, 1998) who draws comparisons from recent forms of media convergence with the aforementioned history of light organs and notions of visual music. Cook is more careful with his definition, however, and a distinction is made here between the clinical or neurological definition of synaesthesia, and its loose application to artwork that unites sound and image in some kind of patterned usage, which may induce a new association between senses. For the clinical "sufferer" of synaesthesia the linking of separate aesthetic phenomena, though chronologically consistent, is ultimately arbitrary. Despite wide research there is little evidence to prove consistency in the relationship between specific colours and musical notes, across different individual subjects. The definition of synaesthesia applied to works that link more than one sensory experience with systematic consistency, is therefore a metaphorical usage Cook defines as 'cultural synaesthesia' (Cook 1998:49) the fusion of musical and visual forms that emerges from cinematic image and sound track, into contemporary music video. Cook analyses multimedia as a cultural form, rather than a specific new technology, suggesting that to evaluate it must require a kind of commitment to this concept – to its existence as something that is more than just the combination of separate parts. While the cultural history of the term is central to his analysis of the forms of multimedia, he is keen to distinguish it from synaesthesia *per se*: "Synaesthesia...", he argues:

...provides some hints as to what multimedia is; but perhaps more importantly it supplies an illuminating model of what multimedia is *not*...

...synaesthesia – which might roughly be described as a kind of short-circuiting between different sensory modes – is all about sameness, whereas I argue that multimedia is predicated on difference...it is the interaction of different media that defines multimedia (Cook, 1998:5).

He makes modest claims for the fusion of modes, favouring a contextual understanding of their function, arguing that early work on multimedia (synaesthesia) had tended to look for intrinsic, or essential connections, rather than on the connections in a given moment (op. cit: 24). The quasi-synaesthesia of multimedia, it seems, is almost directly the reverse of the clinical definition. In clinical synaesthesia the trans-modal relationship is arbitrary, but essential (involuntary), in digital multimedia the relationship is absolutely causal, but inessential (socially determined). The universality of clinical synaesthesia seems effectively disproven, just as the synthetic, cultural form becomes ubiquitous.

Douglas Kahn is particularly dismissive of the mystical synaesthiasts, saying of the ultimate subjectivity of the true synaesthetes image to sound correspondences:

This need not detract from the potential of synaesthetic perception and devices as productive means within the arts, but their arbitrariness cannot be extended to the social sphere, let alone form the rationalistic spiritual laws of the cosmos. Synaesthesia properly belongs to another class of consideration where private experience is mistaken as public, such as the schism involved in the voices one hears while speaking versus the voices that others hear, or the celestial music and cosmic vibrations heard by a person at the time of death as opposed to the gurgling death rattle heard by everyone else (Kahn, 2001:122).

Scrolls and Timelines

In addition to the light and colour harpsichords, pianos and organs, the early development of visual music provoked some proto-cinematic forms: In 1914 post cubist painter Leopold Survage planned, but never realised, a form of coloured rhythm composed of separate paintings displayed in illuminated sequence:

For a piece of three minutes duration, it is necessary to unroll from 1,000 to 2,000 images... When the plates are made, they are to be passed before the objective of a cinematographic apparatus in three colors. (Survage, 1914, in Puttnam, 1929:117).

The musical analogy is clear in his intent:

The fundamental element of my dynamic art is COLOURED MUSICAL FORM, which plays a role analogous to that of sound in music (Survage, 1914, in Russett, Starr, 1976: 36).

Survage failed to achieve his animated painting, but the collaboration of Viking Eggeling and Hans Richter was to successfully pass from handmade sequential image into plastic motion. These early scroll paintings were a bridge between the spatial form of painting and the spatio-temporal form of film. Their work differed in intent from much of the synaesthetic/harmonic tradition. Instead of seeking deep harmonic correspondences between sound and light from beyond the image, Richter and Eggeling saw the counterpoint between light and dark as a dialectic of formal contrasts continuously in play within the work. As Richter relates, Eggeling's analytical painting was the catalyst:

His approach, methodical to the degree of being scientific, led him to the analytical study of the behavior of elements of form under different conditions. He tried to discover which "expressions" a form would and could take under the various influences of "opposites": little against big, light against dark, one against many, top against bottom, and so forth. By connecting ("equilibrating") the strongest contrasts of the most

varied order intimately with their opposites through similarities which he termed “analogies,” he could control an unlimited multiplicity of relationships. Contrasting elements were used to dramatize two or more complexes of forms; “analogies” were used within the same complexes of forms to relate them again (Richter, 1952:79).

Thus the autonomy of music represented an internal, dynamic formal relationship, rather than a universal one. Richter saw a direct correlation between this activity and the work of abstract painters of the time, particularly their contemporaries (and colleagues) Kandinsky and Klee. Richter writes:

... Our research led us to make a large number of drawings as transformations of one form element or another. These were our “themes,” or, as we called them, “instruments,” by analogy with music—the art form which inspired us considerably. We felt “the music of the orchestrated form.”

... This methodical contrast-analogy, “orchestration” of a given “instrument” through different stages, forced upon us the idea of a continuity.

... When in 1919 we finally established a definite line of continuity on long scrolls, we became aware of a multiple and dynamic kind of relationship which invited the eye to “mediate” (Richter, 1952:79).

The exclusion of sound from these works was enforced – to some extent – by technological limitations, but they were also deliberately intended as a kind of visual equivalent to music. By finding a non-objective form for the moving visual image, this abstract form could be subject to non-narrative and non-pictorial kinds of formal decision (and attention) that go into the composition of an instrumental work of music, which, rather than being compared to a world it is supposed to reproduce in some way, is instead self-sufficient - judged by its own criteria. The titles given to the works clearly indicate these ambitions: Eggeling’s *Diagonal Symphony* (1921-2), for example, or Ruttman’s *Opus* series (1921) make the compositional approach clear, linking them also to the history of modern painting as the striving for an autonomous art, rather than a referential one. The musical analogy is maintained, too, in later non-narrative camera film. Ruttman’s *Berlin, Symphony of a City*, (1927) for example, despite being a concrete image-based film, aspires, as its name suggests, to the condition and attention of musical form. Ruttman had in fact used the opportunity earlier, before magnetic tape recording was available to create a sonic composition conceived as “blind film”: *Weekend* (1928) predating Shaeffer and Henry’s post-war *musique concrete* experiments. Ruttman had been inspired to do so by Dziga Vertov’s unrealised early ambitions toward a cinema of the ear, an ambition he reluctantly abandoned in favour of the cinematic image, which he then treated as temporal composition in a quasi-musical manner. As Douglas Kahn relates, of Vertov: “...he went into film in the first place because he was unable to do what we would now call audio montage” (Kahn, 2001:139). Works like *Man with a Movie Camera* (1929) or *12 Songs about Lenin* (1934), are central to the development of complex cinematic time-signatures, not mention new media combinations. It is for this reason that both Lev Manovich and Malcolm LeGrice place *Man with a Movie*

Camera as a direct precursor to the non-linearity of digital media, and the musical analogy, where it is not about absolute correspondences, seems to promote this spatial attitude to form.

Greenberg's theory of medium-specific modernism also valued the example of music as a form undistracted by illusionism (Greenberg, 1940:296). But it is not only the aesthetic self-sufficiency of music that made the image music analogy so attractive. What cinema (and latterly video) also shares with musical form is that it is a medium that organises time. The question or problem is, as John Whitney writes " ...how shall motion pattern time?" (Whitney, 1980:40) This model of composition, the arrangement of events in sequence along a time line suggests a new form of visual thought, that is continued in the time-line interface model that characterises most current audio visual software and 3Dmedia compositing tools. Bob Cotton has drawn attention to the similarity between the timeline of popular video editing software and Eisenstein's 'timeline' score for his collaboration with Prokofiev *Alexander Nevsky* (1938) (Cotton, Oliver, 1993). The organisation of time is as central to the practice of film and video editing as it is to musical composition. Richter and Eggeling were composing image series on scrolls before they worked in film, not as a kind of flick book proto animation but as a way of permitting independent development and transformation across a number of concurrently visible forms. Elsewhere Futurist composer Russolo was abstracting the timeline component from the musical stave, in compositions for his *intonarumori*:

The new instruments needed a new kind of notation. In keeping with their basic characteristics of intoning the sound, Russolo eliminated the noises with which music had traditionally been written. In his system, the constant flow of sound was indicated by continuous solid lines that moved across the staff; the lines terminated and began again, indicating the cessation and reintroduction of the sound (Kirby, Nes, 1986:37-8).

This compositional flow is echoed in other contemporary attempts to break the static, sculptural form of painting into time. In fact fellow futurists Bruno Corra and Arnold Ginna apparently made completely abstract coloured "chromatic music" films before 1910 (op.cit: 141), but Richter and Eggeling's scroll technique makes clear the relationship of animated painting to the hand-made image, as well as to the graphic scores that characterised later experiments in musical modernism. Despite the absence of soundtrack it is, to some extent trans-modal linking the visual to the auditory, as Whitehall points out in relation to the animations of Oskar Fischinger:

Music has been reduced symbolically to a visual form—the notations of a musical score—for centuries, but Fischinger was after something much more modernist and much more complex. In a sense he has done in film what Balanchine...has done in his plotless ballets, opening out as it were a graphic score in which a visual rhythm is closely related to an auditory one (Whitehall, in Russett, Starr, 1976: 59-60).

Fischinger's experiments in automating the production of sequential images included a device for photographing slices made through a block of mixed coloured wax and kaolin layers with a synchronised blade and shutter (Moritz, 1985:300), making a sensual and organic motion image that perhaps came closest to the goal of a moving painting in its absolute absence of illusionistic depth, coupled with smoothly programmed movement.

Gilles Deleuze's epochal view of the development of cinema from a motion medium to a temporal one sees the non-figurative image as part of that same movement, from "motion-image" to the "time-image". For Deleuze, this movement can be seen in the wider history of cinema, which begins with the depiction of events in physical space, but develops into the depiction of time itself as the subject of cinema. This corresponds to his assertion that cinema is – rather than merely representing – new thought:

Even abstract, or eidetic cinema shows a similar evolution. According to rough periodization, the first epoch is that of geometric figures, taken at the intersection of two axes, a vertical axis which concerns the integration and differentiation of their intelligible elements, and a horizontal axis which concerns their linkages and transformation in movement-material. A powerful organic life then sustains the figure, from one axis to the other, and sometimes gives it a linear 'tension', similar to Kandinsky (Eggeling's *Diagonal Symphony*), sometimes a punctual expansion closer to Paul Klee (Richter's *Rhythmus 23*). In a second period, line and point are freed from the figure. at the same time as life is freed from the axes of organic representation: power has passed into a non-organic life, which sometimes traces a continuous arabesque directly onto the film from which it will draw images by point-cuts, and sometimes generates the image by making the image flicker on and off on the void of a dark film. This is the cameraless cinema of McLaren, which implies a new relationship with sound, whether in *Begone Dull Care*, or Workshop experiment in *Animated Sound*, or *Blinkity Blank*. But although these elements already had an important role, a third epoch appears when the black or white screen stands for the outside of all the images, when the flickerings multiply the interstices, like irrational cuts (Deleuze, 1989:169).

The text goes on to link flicker films, by artists like Tony Conrad to the third epoch, in which rhythm becomes the sequence of frames rather than the relationship of internal elements. Deleuze's inclusion of abstract film in his structure recognises a life of the moving image that is not merely depictive Bazinian representation. His concept of the "noosign" points towards this theory of cinema as a development of mind. - "...an image which goes beyond itself towards something which can only be thought." (op. cit. *Glossary*) Thus the passage from form to line is linked to the wider cinematic passage from the external object in motion, to the internal experience of time. But by mapping the films comparatively back onto paintings as though the two forms had developed separately, Deleuze runs the risk of making the cameraless film of this kind a subset of the history of cinema, instead of which, it has at this point an arbitrary relationship to the development of cine-photography.

It represents instead a new form of painting (Eggeling's "*Generalbass der Malerei*"), using film technology, rather than a painterly attempt at filmmaking. As Standish Lawler describes Richter's *Rhythm 21*(1921):

...normally the movie screen is perceived as a kind of window...behind which an illusion of space appears; in *Rhythm 21*, by contrast, it is a planar surface, activated by the forms upon it. Thus its forms, like those of an abstract painting, seem to have no physical extension except on the screen, nor do we sense their lateral extension beyond the limits of the screen as is usually the case in images created by the camera vision. The film is a totally self-contained kinetic composition (Lawler 1975:49).

It would be erroneous, therefore, to see these works retrospectively as either cinematic or anti-cinematic –instead they are film technology adapted to the service of painting in time. The musical form is the closest pre-existing model of practice, not the camera, and the computer generated image is its most direct offspring, as is made clear in the videographic work of John Whitney.

Despite subsequent linking of sound and image with a synchronised soundtrack the idea of film as an abstract quasi-musical form continued to influence avant-garde practice, even after the use of sound became widespread. Once the visual realm is rendered independent of the depictive tradition, and time becomes a core component, the model of practice for perception, cognition and deliberate manipulation must become closer to that of music, or of other time-based movement forms like dance. Here the 'flow' metaphor might be a positive term describing the relative autonomy of internal elements, which tend to be understood as relational in the context of an internal structure, rather than referential in the context of an external frame of reference. The timeline itself is not a symptom of linearity of form, it is an imposition of a framework (in Deleuzian terms, a "cut") on a form which is essential multivalent ("rhizomatic"). Rather than enforcing linearity it permits non-linear access into the temporal form, as though choosing the angle of the cut into Fischinger's layered wax. Richter and Eggeling's 'orchestral' model referred to above, in which the elements – like separate instruments – have a relative autonomy within an internal structure, resembles the development of object-oriented programming, in which composite independent elements function as autonomous machines, yoked into multiple variant activities in co-temporal virtual space.

But even the early silent animations were frequently not silent, however pure the painterly quest for self-sufficient autonomy. As Paul Velguth testifies in 1947 these camera-less films were later frequently shown to musical accompaniment with the collusion of the artists:

This matter seems entirely arbitrary...whether the silent film should be shown silently, or accompanied by appropriately chosen music. That there should be no music to the older silent films is a rather pure and pedantic attitude since there never actually been silent films in the

sense of viewing them in a black and utterly silent void (Velguth, 1947:91-95).

As well forming a natural progression from silent film to image and soundtrack animation, the use of playback music (mechanical or otherwise) offers a potential for spontaneity and performance in the juxtaposition of sound and image, as will be examined in the next chapter in relation to screenings like those of Jordan Belson in San Francisco, and the connections between jazz and the west coast abstract film. Velguth goes on to cite Richter's musical preferences (Bach) for his own silent films and for those of Duchamp (Ravel), and Léger (African drums), and it seems clear that a purist desire to exclude the soundtrack was not an over-riding concern to these artists. But these were fortuitous juxtapositions with previously composed music. Organised collaborative work between sound and abstract moving image were perhaps inevitable, in works like Fernand Léger and George Antheil's important film and music collaboration *Ballet Mécanique* (1925), while Fischinger went on to experiment with soundtracked animation, in a way that was influential on, though ultimately not included in Disney's *Fantasia* (1940). There was also of course an existing tradition of film accompaniment, with the vamer and Foley artist having paved the way for the diegetic form of film sound.

Sound and Image

Secondly then, there is the kind of experimental film making intended to create a synergetic work from the conjunction of image and soundtrack. This is a form less easily separated from the feature film and the commercial development of the film soundtrack. Modes of practice vary between harmonious relationships of sound and image and contrapuntal ones, that resist the descriptive role sound is usually given. For a critical theory of art practice, the musical model has always presented the danger of an empty formalism, of the kind Seigfried Kracauer sees in Walter Ruttmann's *Berlin, Symphony of a City*:

Had Ruttmann been prompted by Vertov's revolutionary convictions he would have had to indict the inherent anarchy of Berlin life. He would have been forced to emphasise content rather than rhythm. His penchant for rhythmic "montage" reveals that he actually tends to avoid any critical comment on the reality with which he is faced (Kracauer, 1970:187).

And diegetic sound, too, has been attacked as uncritical, and an-aesthetic. Sergei Eisenstein, with Pudovkin and Grigori published the 'Statement on the Sound Film' making clear their wish for independence from the literal and illusionistic uses to which sound is put in conventional cinema. They demanded:

THE FIRST EXPERIMENTAL WORK WITH SOUND MUST BE
DIRECTED ALONG THE LINES OF ITS DISTINCT NON-

SYNCHRONISATION WITH VISUAL IMAGES (Eisenstein, et. al. 1928, in Taylor, Christie, 1988:235).

This was borne out in Eisenstein's work with Prokoviev on *Alexander Nevsky* (1938) which strove for a contrapuntal relationship between sound and image, in keeping with the oppositional "shock" methodology of Eisenstein's theories of montage. Both Douglas Kahn (Kahn, 2002) and Esther Leslie (Leslie, 2002) have noted the complex relationship between Eisenstein and the development of cartoon sound in the Disney films of the '20s and '30s. The striving for non-naturalism formed part of Eisenstein's resistance to the apparent catastrophic rupture in cinema with the advent of sound, and Leslie's book is in part a detailing of Eisenstein's journey from optimism to disappointment with the "eccentric" possibilities inherent in Disney's cartoon output as a resistance to the entirely mimetic synching of the new talkies.

For Leslie the tasks of Richter, Eggeling, and Eisenstein share the common goal of a dialectical relationship within the film, so that the work, as it exists for both artist and viewer is borne out of struggle, rather than a passive explanatory naturalism. In Richter and Eggeling this dialectic is internal – the development of contrasts within the spatio-temporal frame of the film (Leslie, 2002: 36-40). Like Deleuze (though from a very different – dialectical, rather than epochal – theoretical viewpoint) Leslie also notes the passage in experimental animation from a play of formal relations to the increased importance of the line, which she links to the walking line of Klee. It is this line that returns the animated moving image to its physical relationship with the hand, rather than its optical relationship to the camera. It is this line, too that makes the cuts in the dark leader tape of Norman McLaren or of Len Lye.

Hand, Line and Synch

Someone asked how my films look without sound "Terrible", I said. They don't look at all good, because they are done for sound, with sound (Lye, 1963, in Russett, Starr, 1976: 68).

I first encountered the hand made animated image through a fleeting and incomplete glimpse of a short Len Lye sequence in the very early days of Channel Four in the UK. Unable to discover which works were shown, I was only much later able to connect the experience with the artist, and see more of the work. Len Lye's films have continued to be a comparative reference point for my work, particularly in *slaptop* (DVD One: Chapter Three: *slaptop*) and other similar recent works using a software and a graphic pen pad, since Lye's rough scratching directly onto the celluloid film causes works like *Free Radicals* (revised 1979, USA), and *Particles in Space* (1979, USA) to relate very immediately to the visual experience of the hand-drawn line. Limited in his means, Lye scratched these works painstakingly onto leader tape, using tools like needles, or "arrowheads for romanticism". (Lye, 1963, in Russett, Starr, 1976:68), creating irregular, stark white lines he described as "pictographic signatures" (Lye, op. cit.) from the resulting cuts into the coating of the tape. His hand often obscured the act of cutting from his sight, and the resulting inaccuracies gave them what he described as "spastic motion" (Lye,

op. cit.), while the synchronisation tended to be made by eye, using the sprocket holes for guidance and finding musical sources that contained the required rhythmic possibilities. Sometimes works were created in accordance with a given rhythmic sound, as in *Trade Tattoo* (1937) and sometimes, as in *Free Radicals*, (1958) finding rhythmic sources that fortuitously fitted the existing visual rhythm. Because of this linear and direct method the images relate closely to the rhythmic core of the music with continuous and coherent formal themes, but without excessive dependence on repetition.

The work of course echo earlier traditions of 'visual music' animation, of which Lye was aware, but it has moved closer to Deleuze's second epochal stage of lines and "point-cuts." At times they share 'cosmic' themes with Belson, or the Whitney Brothers, but the combination of linear imprecision and rhythmic exactitude creates an energy that uses counterpoint as much as it uses harmony. Where the Whitney's work moved towards increasingly precise mathematical means of uniting sound and the moving light image, with an emphasis on symmetry and geometric form generation, Lye's work, due partly to financial constraint, and partly to its basis in the handmade image process, embraces the arbitrary and fortuitous audiovisual combination, as well as harmonic association.

In an essay for a show defining the 'The Spiritual in Art', William Moritz uses Lye's *Tusalava* (1929) as a means of incorporating him into the synaesthetic, Theosophist train of thought that passes from Europe to California via Madame Blavatsky and Krishnamurti. (Moritz, 1985). But Lye's work does not sit easily in this framework, and to some extent Moritz is stretching the point for the sake of the show's overall theme. As a New Zealander, Lye did not fit exactly into either framework, as the pioneer European modernist, or the American beat mystic. *Tusalava* is certainly influenced by combined Maori, Aboriginal and Modernist imagery, but it is an atypical work, and the visual mode of most of the films, particularly those using jazz audio tracks, like the *Hot Club*, or *Tal Farlow*, are closer to the spatial physicality of dance than to contemplative meditation. Lye was a surrealist in the 1920s, being a signatory on the International Surrealist Exhibition in London surrealism exhibition, alongside Henry Moore and Dylan Thomas (Horrocks, 2001:159), and it seems likely that the forms of arbitrary juxtaposition characteristic of Surrealism were as influential on his process as Theosophist concepts of harmony. His imaginary model of practice was microcosmic, rather than macrocosmic, material, rather than spiritual visualisations, understanding his abstract visual forms to be imagined representation of inner cellular life. Lye himself wrote:

I believe that we carry vestigial cells, and that these vestigials are brought into contact with the old brain of our primal origins in such a way that it 'reads' their genetic information. By the imperative to self-replication it transposes this information into representations, illustrations, and illuminations. I believe such genetic information about historical stages in evolution is carried simultaneously with organic information such as information about antibodies, protein structures, and cells as they exist now... Maybe the 'particle' films *Free Radicals*,

and *Particles in Space* are transpositions of such information (Lye, 1979, in Lye, 1984: 95).

William Wees links the work of Stan Brakhage to a similar attempt to map mental, rather than strictly optical processes. These might effectively claim the status of Deleuzian “noosign”. Wees cites Brakhage’s insistence that his films were processes of documentation, before they were processes of imagination, documentation of that part of sight that belongs to the mind, and is not replicated in window model of representation. This refers to the retinal images of phosphene and flux in closed eye vision, the but also to a visualisation of the physical act of movement and the way:

...the body "knows" itself through the "movement of its own tissues," to quote Charles Olson... (Wees, 1992:82).

In the instance of video feedback, the moving mandalas of Belson and the Whitneys, and the connection with optical ‘form constants’ discussed in chapter two we saw how the idea that non representational images could be understood as corresponding to an experiential reality beyond that of optical vision. This notion can be seen to move between the internal representation of of Brakhage’s closed-eye vision or Len Lye’s cellular structures that of an external non-visible objectivity, like the Pythagorean harmony of the Whitneys’ experiments.

Visualising Sound: Harmony & Dissonance

Jonathan Sterne has shown how the origins of mechanically reproduced sound derive from attempts to visualize sonic information, in particular the human voice. This *transduction* of one signal into another, as in Bell and Blake’s “ear phonograph” (see Figure 14 below) a primitive form of oscilloscope mechanism utilising the membrane from a human inner ear to produce a kind of writing, leads to the ability to reproduce the sonic phenomenon via a reproduction of its effects (Sterne, 2003:32). Earlier, in 1787, Ernst Chladni (1756-1827) initiated this practice of analysing sound by making it visible as a founding principle of modern acoustics, as Sterne describes:

It embodies [the] connection between objectification, visualisation, and the reversal of the general and the specific in theories of sound (Sterne, 2003:44).

Chladni’s method employed the vibrations of a metal plate, on which was evenly spread fine sand, being bowed with a violin bow. Pellegrino cites Chladni in his outline of audiovisual pioneers:

...Chladni discovered that, by exciting diaphragms or metal plates with vibrations, figures could be produced that change their form according to the changing vibrational variables. When powder or other substance were sprinkled on the plate or diaphragm, the vibrations caused the

material to move from the antinodes, to the nodal lines, thereby making the vibrational processes visible (Pellegrino, 1980:2).

The resulting patterns are the lodestone of extensive future research into perception in general, and acoustics in particular. Goethe was fascinated by Chladni's findings, copying them by hand, and connecting them – as Esther Leslie relates – to the contemporary research of Johann Purkinje into retinal images (Leslie, 2002: 260-1). Purkinje's *Druckfiguren* were named analogously to Chladni's *Klangfiguren*, and form the beginnings of the analysis of sight as an active practice. Purkinje, too is a key reference point for Heinrich Klüver's research into hallucinatory cortical 'form constants' discussed in Chapter Two.

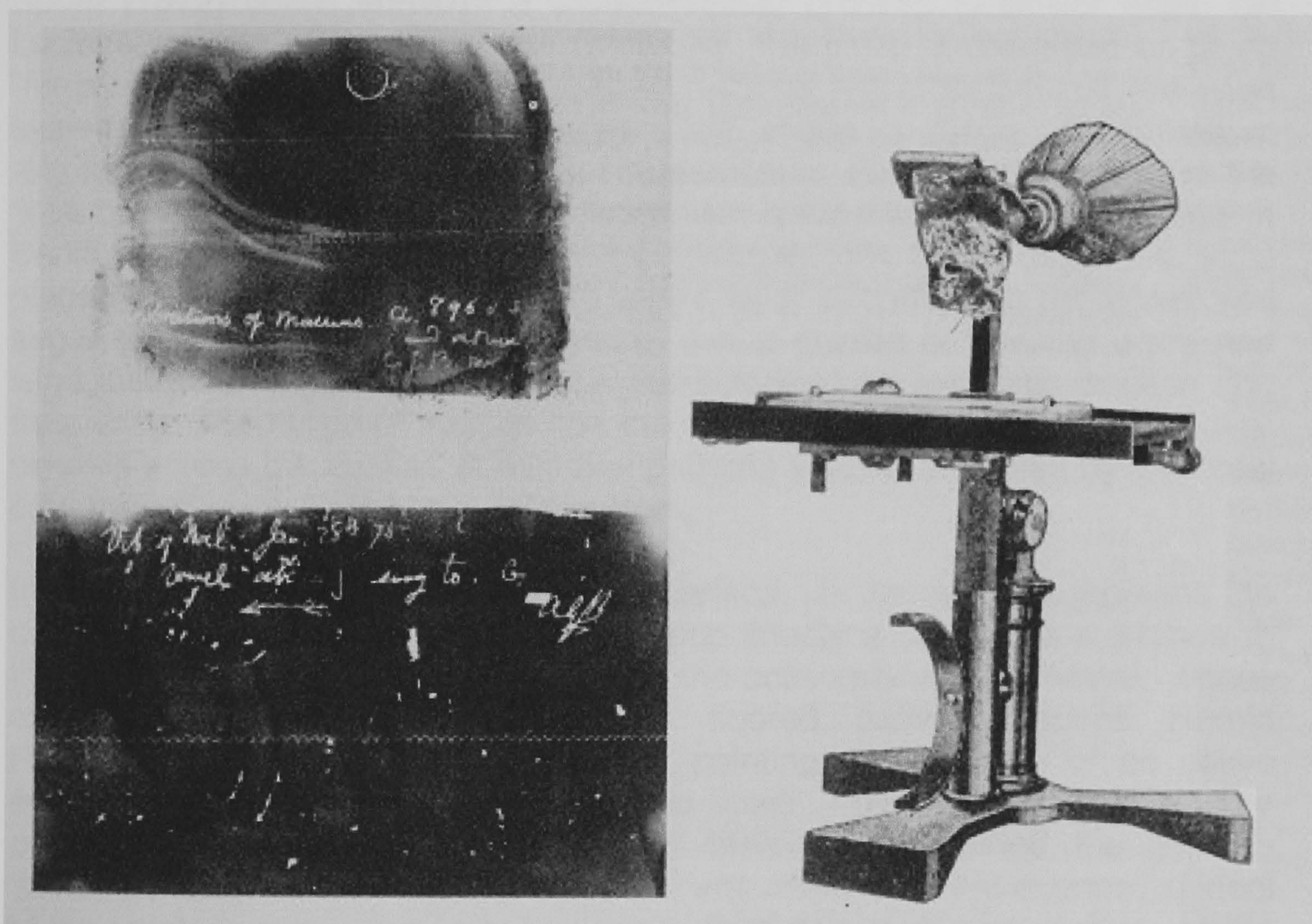


Figure 14. Bell and Blake's "ear phonautograph" of 1874

Shown alongside images written on smoked glass by the audio-responsive apparatus (image from Jones, 1999)

In the twentieth century, Chladni's results fascinated Swiss doctor Hans Jenny, who developed his theory of "Cymatics" from a reading of Chladni's experiments in the light of 20th century unified and wholistic theories of physics. Jenny's theory emphasised the universal importance of vibration in the physical world, and proposed the use of differing tones to promote healing and bodily well-being. He invented a device called the 'tonoscope,' which used crystal oscillators to vibrate surfaces, allowing a more precise control of their vibrations than Chladni's. Sterne draws attention to the link between phonetics

and the development of acoustic visualisation which, since Chladni, had been oriented towards indexing human speech. This, too, was Jenny's starting point:

The tonoscope was constructed to make the human voice visible without any electronic apparatus as an intermediate link. This yielded the amazing possibility of being able to see the physical image of the vowel, tone or song a human being produced directly. Not only could you hear a melody - you could see it (Jenny 1967).

Jenny wrote a book, *Cymatics: The Study of Wave Phenomena* (Jenny, 1967) which has been influential on New Age theories of the continuity of patterns and vibrations throughout the physical world. Inspired by Jenny's book, Alvin Lucier developed a performance/ composition work entitled *Queen of the South* (1972) which employs a Chladni-esque process to similar ends. On Lucier's website at the Wesleyan University, the piece is described as being "for players, responsive surfaces, strewn material and closed-circuit television systems" (Lucier, 2003). The score itself allows a range of interpretive readings, with different forms of instrumentation. For a performance in the 'Inventionen' series by the *Kammerensemble Neue Musik* at Sophiensaele in Berlin in June 2004, two taut, mounted canvases, one black, one white, were placed flat on the floor and covered with a layer of coffee (on the white) and sugar (on the black) in equal measure, and a quartet comprising wood and wind instruments performed a piece characterised by extremes of pitch and frequency. The range of sounds has the effects of distributing the grains and crystals across the canvas in complex patterns visually amplified by their real time reproduction on the four TV monitors.

In addition to the repetition of Chladni's method, via Jenny's development, the use of a stretcher-mounted canvas is undoubtedly a conscious reference to the tradition of painting, most specifically the action painting of Pollock, whose expressive, gestural marking of the floored canvas inspired Harold Rosenberg's existential re-siting of the painting as evidence of an active event, rather than a discrete thing in itself (Rosenberg, 1959). The comparison points up some contrasts of interpretative method, though. The 'action painting' was a kind of *reductio ad absurdum* from the expressive ideal of the painterly mark, and while Lucier's work invites exploratory activity on the part of the musicians, who are at liberty to modify their performance in response to the resulting image being formed in front of them, it is produced by an automatic, or indexical relationship to the sounds made. If the marks on the canvas are expressive, they express the vibrations of the room's air molecules in response to those of the instruments. Like the canonical Lucier work *I am Sitting in a Room* discussed earlier, it is a work dedicated to materialising the invisible, and making the process of that materialisation the object, or the work of art (or music) itself.



Figure 15: Video stills from DVD production of Alvin Lucier's Queen of the South.

Produced by Donna McCabe and Johnny Dekam (Dekam, McCabe 2004)

The Electronic Sound Image

The nature of new combined media technologies intensifies the arbitrariness of image and sound even as it draws them closer together. The division of each into discrete bits of information unlocks their direct causality. Of course it was always possible, with the sound film, to create arbitrary disjunctions of sound and image, as in works like John Smiths *Words* (1973) where onomatopoeic similarity, or punning links images, or an unreliable 'voice of god' narrator misleads, as in *The Girl Chewing Gum* (1976).

Despite this potential for disruption, film sound is linked physically to the film by its temporal partnership on the celluloid strip, and by the nature of its optical process. On the left hand side of the film strip a line dividing light and dark functions as the sound generating component by modulating the flow of light that passes through it before it strikes a photoelectric cell, which will generate a current in response to the amount of light. The sound is then achieved by a means identical with that of the image – an indexical process – imprinting light onto a screen. For some people experimenting with film and soundtrack this connection allowed the fascinating possibility of “hearing” the sound of objects, and of seeing the shape of sound. While this apes synaesthesia, it differs from the clinical definition, which occurs neurologically, not in the external world, and its function is arbitrary. In the Chladni example the relationship is not in fact arbitrary, but one is a direct causal product of the other. In the following works the sound-image is an electronically generated index of the electronic signal, just as an oscilloscope can be used to measure wavelength.

Moholy-Nagy's film *The Sound of ABC* (1933), which included “...letters of the alphabet, profiles, fingerprints, and all types of designs and symbols” (Russett, in Russett, Star, 1976: 163) used optical overprinting so that the soundtrack ‘played’ the images visible onscreen. Douglas Kahn connects this activity with earlier synaesthetic attempts to draw connections between the shape of the wave form, and other standards of visual beauty (Kahn, 2001:96-99), but prior to the instrumental organisation of electronic sound in the synthesiser, the optical soundtrack was a way in which sonic art could be generated manually, and visibly. Norman McLaren used a set of graphic patterns assembled in a card box, whose different widths produced different pitches when photographed onto the optical track (Russett, Star, 1976:165). In Vallière (1981) McLaren describes this process of “synthetic animated sound”:

..a lot of little lines on the sound-track area of 35mm film. Maybe fifty or sixty lines for every musical note. The number of strokes to the inch controls the pitch of the note: the more, the higher the pitch: the fewer, the lower the pitch. The size of the stroke equals the loudness: a big stroke will go “boom,” a smaller stroke will give a quieter sound, and the faintest stroke will just be a little “m-m-m.” A black ink is another way of making a loud sound, a mid-gray ink will make a medium sound, and a very pale ink will make a very quiet sound. The tone quality, which is the most difficult element to control, is made by the shape of the strokes. Well-rounded forms gives smooth sounds; sharper, or angular forms give harder, harsher sounds...By drawing two or more patterns

on the same bit of film I can create harmony and textual effects (McLaren 1953 cited Vallière, 1981: 40).

Russett and Starr also anticipate the development of computer-based visual sound synthesis in the work of Ken Knowlton – "...working with the problem of generating animated film images and synthetic sound from the same computer program." (Russett, Starr, 1976:166) This had in turn been prompted by the work of the Whitney brothers in their creation of an extraordinary and historically unique device involving a combination of pendula and camera shutter making a direct audiovisual connection between audio frequency, and that of pendulum motion:

Our subsonic instrument consisted of a series of pendulums linked mechanically to an optical wedge. The function of the optical wedge was the same as that of the typical light valve of standard optical motion picture recorders. No audible soundtrack was generated by the instrument. Instead, an optical soundtrack of standard dimensions was synthetically exposed onto film which after processing could be played back with a standard motion picture processor (Whitney, 1959, in Whitney, 1980:152).

Knowlton and Whitney were both represented in Jasia Reichardt's 'Cybernetic Serendipity' show (see Chapter One earlier, and Reichardt, ed. 1968). John Whitney's research provides a path of influence between the Lumia tradition of Castel, Rimington, Wilfred, and Fischinger, and the development of computer graphics.

Some of the Structural/Materialist generation of filmmakers were also drawn to image and optical soundtrack works, often in ways that combine to reveal or analyse aspects of film form and the relationship between still and moving image. Exemplary in this respect is Steve Farrer's *Drawings* (1976) in which a linear graphic pattern is imprinted over strips of film laid lengthwise to create a solid rectangle, as the artist describes in the accompanying statement:

... DRAWINGS Steve Farrer 1976 live projection for 16mm projector & slide projector b/w sound 20 m ins

A selection of 10 short films. For each film, 50 strips of clear film stock were laid side by side to make a rectangle 45 x 80 cms (50 x 16mm). A geometric shape was drawn or sprayed onto each rectangle, then the strips of acetate were joined together, starting from the top left corner (beginning) and joining the bottom of the first to the top of the following and so on until the bottom right hand corner (end) to produce the film. The sound track is created by the image carried over into the optical soundtrack area. The surface marks can manifest themselves in three ways:

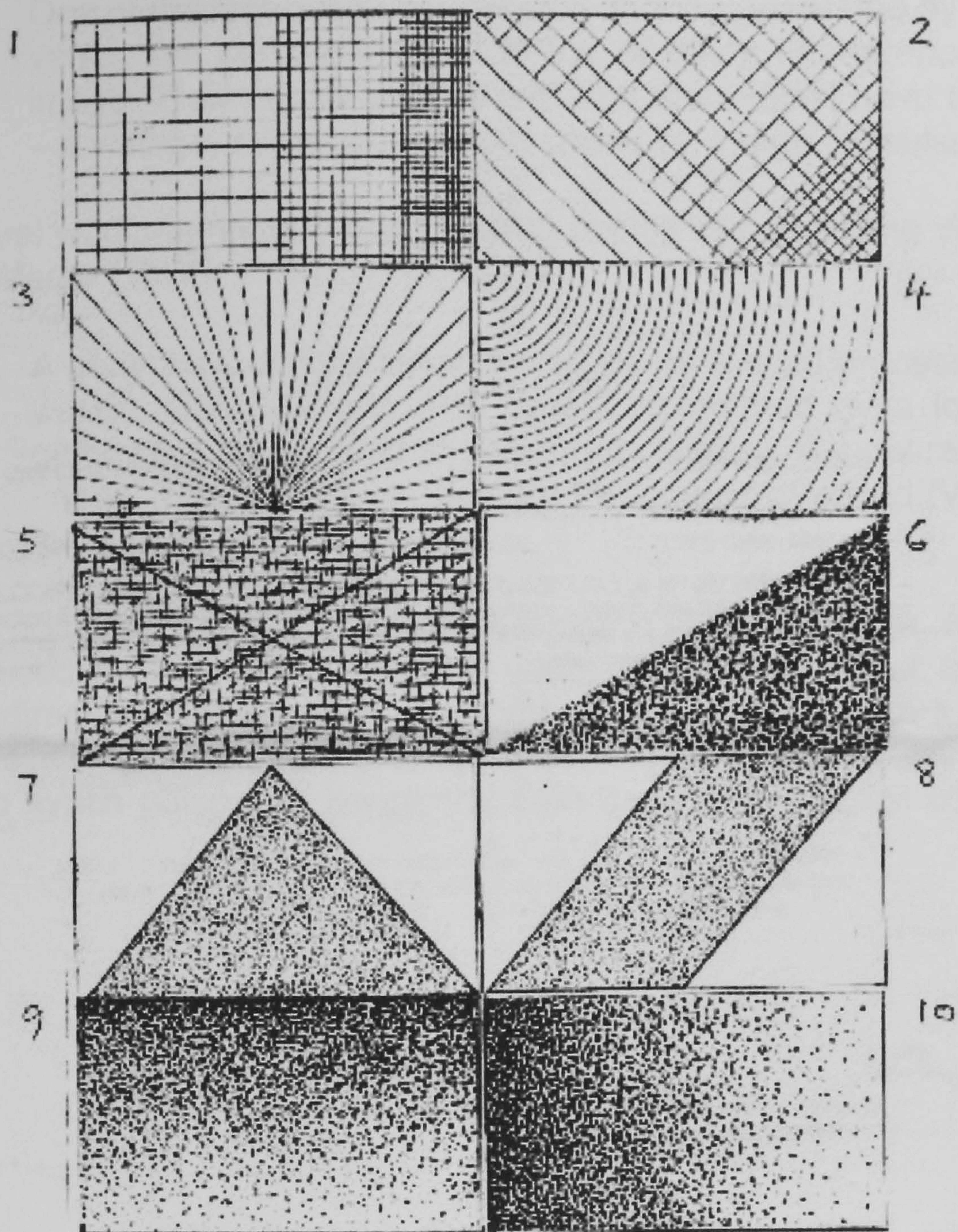
- a) a drawing (drawing of a film)
- b) a film (film of a drawing)
- c) a soundtrack (sound of a drawing) (Farrer 1976).

Effectively the projector functions as an audiovisual scan vertically up and down the still image, the linear marks across the optical track following the patterns of line repetition, width and clarity. Recreated at Camden Arts Centre in 2004, using slides of the drawings the viewing experience prompts an awareness of the film as a sequence of images, rather than a moving image, as attention is drawn explicitly to the duration of the film itself through the act of following the area of focus from the screen onto the image. Guy Sherwin's *Musical Stairs* (1977) also emphasises the combination of essential and arbitrary characteristics of this relationship. *Musical Stairs* reproduces onto the optical soundtrack fixed camera footage of a staircase which is then subjected to varied exposure settings, which in turns varies the volume and texture of the sound.

Lis Rhodes' *Light Music* (1974-7) combines optical sound track with a sculptural use of light from a film projector in a manner similar to Anthony McCall's works. Here is a description of the reconstruction of *Light Music* from the *Shoot! Shoot! Shoot!* series of screenings in 2003:

[It] employs two projectors (to be set in any configuration; in London the beams were projected across each other to the opposite sides of the room) that project simultaneously across a room filled with smoke. Here the spectator's omniscient vantage point is disrupted, and the beams dissecting the room are equally important as the images on the wall and the sound. ... the soundtrack and images are simultaneously generated, that is, the black and white horizontal and vertical lines of the images were printed onto the optical track of the film so that they literally generate the soundtrack (Clark, 2003).

Video and sound, are also united – though invisibly – in the electronic signal. For the Vasulkas this unity is central to their work, foregrounding the electronic materiality of the generative signal:



10 DRAWINGS 1976 16mm SOUND 20m
STEVE FARRER

Figure 16: Steve Farrer, Diagram for 10 Drawings Screening (Farrer, 1976)

One of the first things we did was images generated by sound and vice versa. We were interested in the absolute interference of sound and image. That's when we realised that there didn't have to be a camera – a voltage, a frequency could create an image (Vasulka, S. 1978:23).

Several works by Woody and Vasulka exploit this, including Woody Vasulka's *The Matter* (1974):

A generated dot pattern is displayed on a scan processor. Three basic waves, sine, triangle, and square, generated by a locked waveform generator, are applied to shape the display. A slow ramp controls the image. The identical waves are the source of sound (Vasulka, Woody, in Cathcart 1978: 4:7).

The soundtrack of *Orbital Obsessions* (1975-77/78), a composite work produced by Steina over several years, has image signal relayed to the soundtrack so that the mechanical view of the rotating camera is accompanied by a similarly non-human soundscape of hisses and clicks with the hum of the video synch pulse that keeps the time base of the signal correctly ordered.



Figure 17: two frames of 35mm film showing optical soundtrack
(down the left hand side)

The diagram below shows you in the simplest form how sound is transferred from the film strip to the amplifier. Light from the Exciter Lamp (A)—light transmitter—passes through the lens (B). The lens focuses light on the sound track of the film (C). This light passes through the sound track and into photo cell (D)—light receiver.

The photo cell receives sound in the form of light impulses and converts it to electrical impulses or, in other words, actual sound. These impulses, leaving photo cell, are too faint to be audible. Therefore, they pass from the cell into an amplifier which magnifies the sound to any desired audibility.

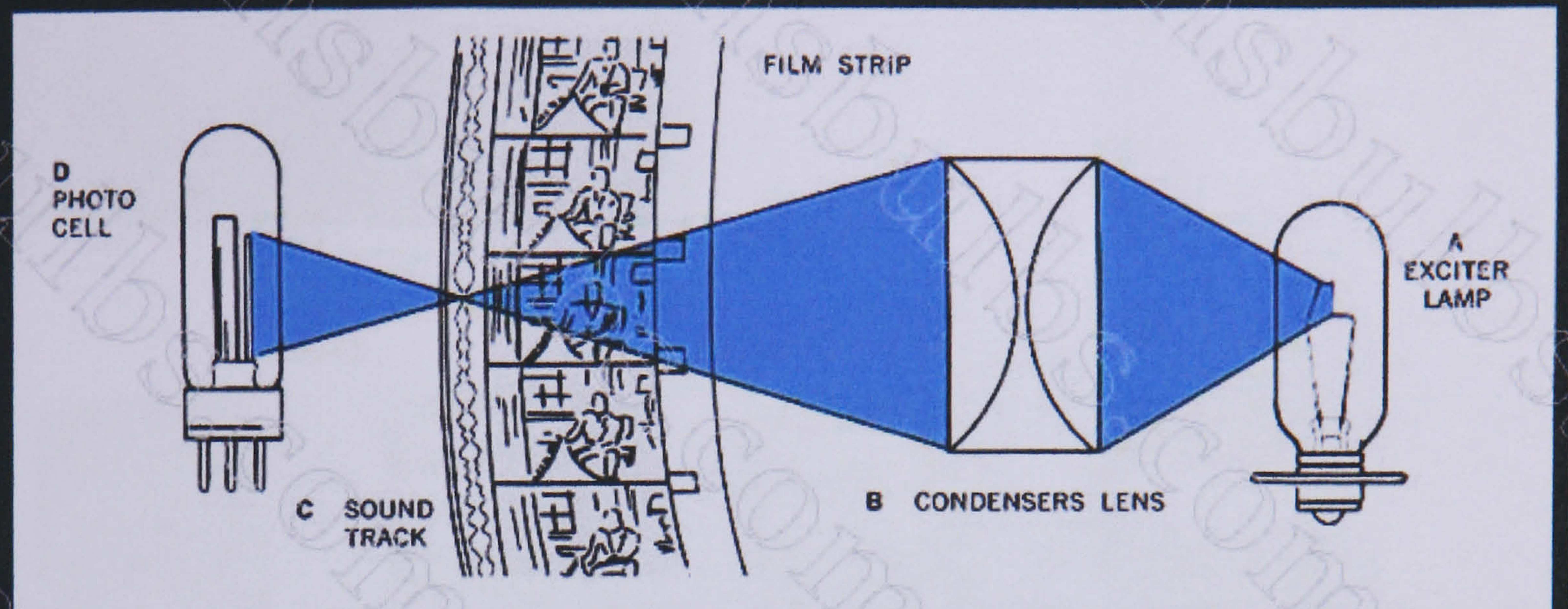


Figure 18: diagram showing optical film sound (from an industrial catalogue)

Some recent work by Carsten Nicolai (1965-) makes a link between the work of Vasulkas, John Whitney, Alvin Lucier and the techno music scene. With a background in painting in the former GDR, Nicolai has developed a parallel career as a DJ and an electronic musician in the flexible territory between club-based techno and house music, but has retained the visual preoccupations of a painter in this context. Like the work of the Vasulkas he is interested in sound and recorded sound as a signal, rather than a finite object. A series of works seek to foreground the relationship between sound heard by the ear, and sound "heard" by objects in the material world. A series of works, including *Atem* (2000) use sound and water to render the invisible sonic 'content' visible.

Nicolai's interest in modularity and the aesthetic of systems references modernist work like Bauhaus, Corbusier, but incorporates a minimalist element of contemporary popular music. Works are available in ordered series, with discreet, undecorated packaging that echoes Bauhaus functionalism, while the auditory/musical content of the CDs refers to a particularly German tradition of experimental electronic music that includes the high art electronic music of Karl-Heinz Stockhausen and the electronic pop of Kraftwerk.

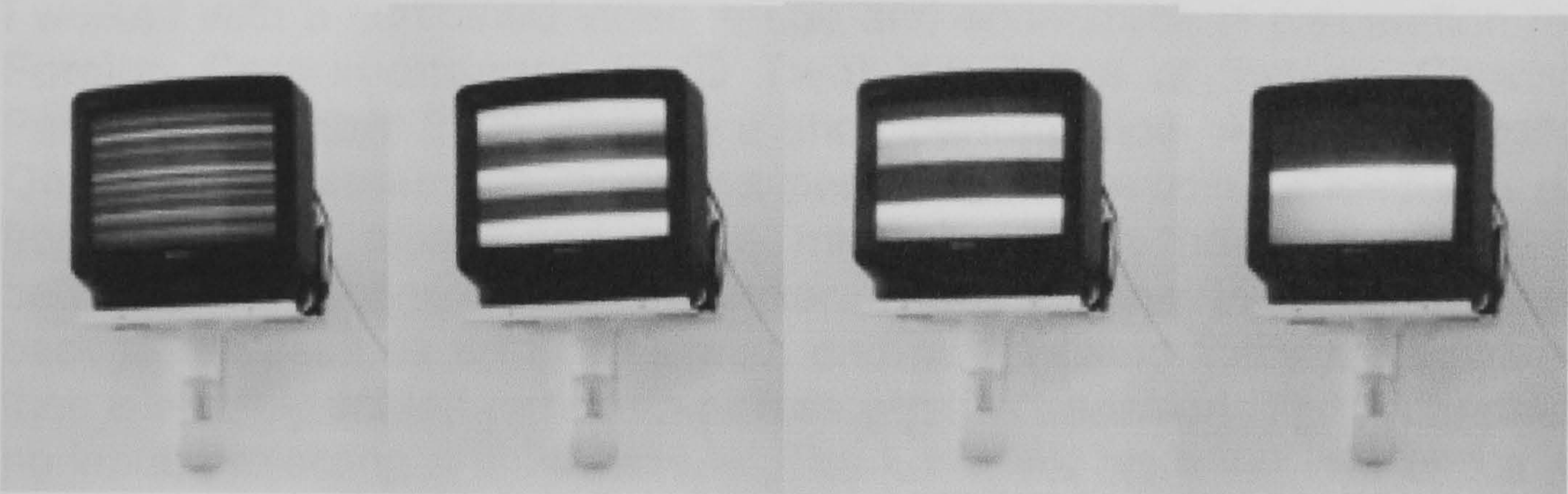


Figure 19: Telefunken: audiosignal for television set Carsten Nicolai 2000

In 2000 Carsten Nicolai marketed *Telefunken* through his record label 'noto' at the same time as showing it as a gallery exhibit through the Eigen+ Art gallery in Berlin. The work was designed as a combined audio and video CD. Tom Moody describes the process:

To activate *Telefunken*, you simply plug one of the stereo outputs of the CD player into the audio input of the television and the other into its video input. The same electronic signal that produces sound in the speakers interferes, in real time, with the horizontal scan of the TV, creating linear, minimalist patterns that move in synch with the sound. The soundtrack is a riveting procession of hums, clicks, and test-tones – the type of palette also favored by Finnish audio-sculptors Pan Sonic (one of whom, Mika Vainio, has collaborated in the past with noto). Balanced on the knife-edge between pleasure and pain, these pared-down, eerie sonorities conjure electricity in its raw, pure state (as Rob Young of *The Wire* has suggested), shorn of the synthesizer's user-friendly filters and modulators (Moody, 2000:1).

A statement on the website for Nicolai's distribution network 'raster-noton' describes *Telefunken*:

Abstrakt: telefunken is an ordinary CD production. The cd contains 30 tracks witch combine both audio pieces as well as visual tracks for television. The audio signal is fed directly into a

television from a cd player. the first 20 audio visual pieces are based on impulse frequencies which the television can interpret as linear structures. The 10 consequent pieces are test frequencies of 50-8000 hz and white noise. the telefunken audio signals utilize brightens control standards of an s-vhs video signal. the flat images "prototype telefunken" are based on the linear proportions of these audio visual tracks (Nicolae, 2000).

Nicolai's work seems consciously analytical of its position between the popular form of music distributed as cheap mass produced CD entertainment, and the "auratic" form of the gallery, in which different forms of attention can be afforded works that isolate particular characteristics of particular modes

I worked with a combined video image and soundtrack in preparation for the **Foreign Correspondence (DVD Two)** installation at Instants Chavirés in Paris in November 2004, making a short performance – **(DVD 2: Projector One: untitled sonimage feedback performance)** – using a feedback output from the video mixer, and a live microphone for "howl round" feedback between microphone and loudspeaker. The B channel in the mixer was fed back to the desk as an input signal, and mixed using firstly an additive mix, then a variably scaled picture-in-picture window transition. The A channel had no input, projecting a black screen. The lux levels were set low, and a matte layer set over the B (feedback channel). The output was monochromatic because only the grayscale signal can be clearly heard in the audio channel. Then the video output was split between projector and audio PA. The sound is generated by the constant motion of the white matte over the drifting feedback, as the controls are used to vary the transition between the unstable feedback image and the blank screen of channel A. Beneath it all is the continuous buzzing sound of the 50 hz 'synch' signal that ensures the scan will write the PAL image correctly on the output medium.

Rhythm

I did again with the screen what I had done years before with the canvas. In doing so I found a new sensation. *Rhythm*—which is, I think the chief sensation of any expression of movement... (Richter, 1952, in Russett, Starr, 1976: 53-4).

An important linking feature of time based image and sound media, whether causally or arbitrarily linked, is rhythm. Unlike the synaesthesia-seeking light organ makers, many of the pioneers of experimental animation seem to have been more pre-occupied with the relation of rhythmic image and sound. Len Lye's work in particular was absorbed in tempo and motion, as he describes:

There would be three ways of following the rhythm, besides jump-cutting, which is the ordinary way. There would be the vibration pattern of a very formal pattern like stippling, or cross-hatching, which I had very geometrically designed and which would be superimposed over the live action. You'd have the internal movement within the scene,

such as a man's hand waving, which would have a rhythm, and you could jump-cut that, make his hand wag faster or slower, and you could jump-cut the ends of the scene. You could make these visual accents synchronise with your sound accents. And this way you get a very tight tie-in of visual imagery with sounds and rhythms (Lye, 1963, in Russett, Starr, 1976: 67-8),

Popular animation gives us the term 'mickey mousing' for the expressive combination of musical sound and visual action, described by film sound composer Michel Chion as:

"... following the visual action in synchrony with musical trajectories (rising, falling and zigzagging) and instrumental punctuations of action (blows, falls, doors closing)..."

Sound, he suggests:

"...helps to imprint rapid visual sensations into memory. Indeed, it plays a more important role in this capacity of aiding the apprehension of visual movements than in focusing on its own substance and aural density" (Chion, 1994:21-2).

Improvising images to music accomplishes this conversely; visual movement can be adapted in response to sound, beat matching cuts in synchrony with tempo, pitch, and other values can, like the work of the early abstract pioneers, make complex visual counterpoint to the music. Chion's example is of course closely related to his work as a sound designer for feature film. The conjunction of sound and image relates to narrative and pictorial images, where sound is to some extent always at the service of illusion, in the sense of having a relationship to diegesis even where the sound itself is non-diegetic.

John Whitney's approach relates to formal musical structures – "...rhythm is pattern, and motion becomes pattern..."

...if objects move differentially. Secondly, a resolution to order in patterns of motion occurs at points of resonance. And thirdly, this resolution of resonant events, especially at whole number ratios characterizes the differential resonant phenomena of visual harmony (Whitney, 1980:40).

Whitney effectively outlines the possibilities of rhythmic pattern and syncopation. His musical model is one of tension and resolution. Tension in melody is related to physical tensions:

Melodic lines in music are often described in terms of a drive or forward motion... (Whitney, 1980:73).

In film this is determined by the frame-rate:

Because time is a function of the 24-frame rate of film or 30 frames of video meter and rhythm is set by a real-number value divided by the required number of integer steps (frames) of the projection media. Any motion can be set to synchronise with another that is set to complete its own action exactly within the time-span of perhaps a third action. This is a method to compose polyphony, the coincident play of two or three more actions at the same time... (ibid:81).

Whitney's is a rich and complex theory of visual harmony, undeniably productive in his research into programmed software-based image synthesis. It is at odds, though with the structuralist cinema that sought to disturb or to reveal the cinematic process, rather than to work with it, like the 'flicker' experiments of Sharits, or Conrad who were attempting to push outside the frame of the image itself.

Distinctions between vertical (harmonic) and horizontal (melodic) aspects in music correspond simply to the syntagmatic and paradigmatic axes in semiotics. The vertical axis implies concurrence, where the horizontal implies sequence. Colour, and colour harmony, tend to be identified with the vertical axis. Eugene Chevreul asserted in 1839 (see Chapter 1, also Chevreul, 1839) that optical colour relations are simultaneous effects. Colour has the clearest objective relationship to sound in terms of a comparison with harmonic subtleties in sound. Both correspond to a measurement as a wavelength. Colour is a live property of a relationship between eye and object, but it fails to generate temporal relations with objects, while even a fixed line describes a motion. The problem with the idea of harmonic unity between sound and light is that the visible and audible spectrum in both is very different. However consistent the mapping of one to another, the relationship can only be meaningful to the listener/observer if the connection is apparent. Because of this, the musicality of the moving image seems to be far more readily observed through its rhythmic deployment across time, than in correspondence of pitch and hue. Synaesthesia is neural, but kinaesthesia is physical. Flicker film pioneer Tony Conrad(1940-) relates an interesting reply made to a question about harmonic relations between sound and image. Students asked:

if there were not harmonic effects manifested visually by colours selected from different ranges of the light spectrum, in a way similar to the harmonic interactions of *sounds*....

To which Conrad replied that:

...the eye does not respond to colors continuously, as the ear does to pitch, but only to small frequency *bands* (the colour primaries). Second, the visible light frequencies fall within a range of less than an octave, to speak in harmonic terms, so that color 'harmonies' produce no visible pattern... there is a way to apply harmonic structure to light, and that is to modulate its intensity with time, leaving color momentarily out of the picture. This has to do with the stroboscopic use of light (Conrad, 1966, in Russett, Starr, 1976: 155).

Thus harmonic relations can be observed across the horizontal, temporal or sequential aspect of moving image. The flicker film radically confuses the separation between sequence and concurrence in film, in ways that LeGrice also observes in the work of Birgit and Wilhelm Hein, (*Work in Progress Reel A*, 1969) in which the continued repetition of a single image of three frames duration, intercut with an equal number of black frames, causes an illusion of unresolved movement (LeGrice, 1977, in LeGrice 2001:51-2). As LeGrice describes it, the rhythmic intercutting induces the essence of the motion illusion, even though no development takes place within the sequence. There is a perceptual urge to interpret repetition as what Lucier also shows it to be – a development in time. This is the area of Deleuze's third cinematic epoch. Conrad's linked activity as a musician shows a consistent interest across sonic and visual rhythm/pitch relationships.

The confusion of pitch and rhythm that occurs in this range gives an unexpected birth to to a sense of aural vastness and spaciousness. The pitch-rhythm ambiguity has also enabled me to treat the tones as primitive rhythms, and vice versa, so that there turns out to be a correlation here with some of the work that La Monte and I (and John Cage and Marian Zezeela) have done in harmony at slightly higher frequencies. This correlation is actually after-the-fact, since the electronic music arose in an independent context (Conrad, 1966, in Russett, Starr, 1976:155).

Later in 1996 he clarifies his intention:

When I made the film *The Flicker* in 1965-66 my principal motivation was to explore the possibilities for harmonic expression using a sensory mode other than sound. The experience of "flicker" - its peculiar entrapment of the central nervous system, by ocular driving - occurs over a frequency range of about 4 to 40 flashes per second (fps). I used film (at 24 fps) as a sort of "tonic," and devised patterns of frames which would represent combinations of frequencies - heterodyned, or rather multiplexed together. I was interested to see whether there might be combination-frequency effects that would occur with flicker, analogous to the combination-tone effects that are responsible for consonance in musical sound (Conrad, 1996).

But unlike John Whitney's call to order in his exploitation of combined visual and sonic harmonic structures, Conrad's minimalism links him to the modernist attempt to resist the Pythagorean authority of the harmonic scale, as is borne out by a much more recent statement for the exhibition '*Volume: Bed of Sound*' at PS1 Contemporary Art Center on Long Island where he speaks of -

...a hidden numerical order in music ... so effectively exploited by Pythagoras, with the consequence that we have been haunted by a patrician interpretation of the world for the duration of "Western civilization" (Conrad, 2000).

Optical soundtrack works offer a very direct image to rhythm linkage. In Guy Sherwin's *Railings* (1977) the use of overprinting causes the images of the eponymous railings, filmed horizontally, to stripe over the optical sound track, which, when played provides a sonic correspondence to the rhythmic visual experience of the rows of monochrome railings, like the haptic investigation of the child rattling them with a stick. The patterned repetition and change is automatically represented in sound and image, providing, like a minimalist composition, layers and density from a simple repeated source. In a strikingly close comparison, Ronald Pellegrino, writing of linked audiovisual compositional strategies talks about:

...“moiré patterns,” highly accessible analogs of complex mathematical phenomena that manifest in light and sound. Moiré patterns in light are a relatively common sight. When an observer in motion views the post between two sets of railings, he sees, moving along with him, bright and dark bands in terms of light intensity. These bands occur because the apparent distance between the posts of the two railings change as ones spatial orientation to them changes. It may also be the case that there is a greater distance between the posts of one railing set than another, or that they are greater distance from ones eye. As one changes position, some of the posts seem to coincide, while others assume different positions in the gaps between posts of the other railing set. The posts move in and out of phase with one another, and produce visual beats (increasing and diminishing loudness). Moiré patterns occur when there is a gradual and continuous change in the spatial and/or temporal orientation of two or more periodic structures. In everyday life one sees moiré patterns formed by screens, wire netting, latticework, fences, fences and their shadows, and similar structures (Pellegrino, 1983:211).

He goes on to draw comparisons with sonic experiments with phasing. Although he doesn't cite Steve Reich, it is in works like *Piano Phase* (1967) that Reich developed his signature use of layered and phased repetition in a way that he compares to African musical structures. Pellegrino:

Working with and observing the various manifestations of electronic wave instruments fertilises perception by providing a conceptual framework for an intuitive outlook sensitive to periodicity, a fundamental characteristic of all animate and inanimate systems. One is encouraged to consider the significance and accept the reality of synchronicity and coincidence, phenomena based on periodicity (Pellegrino, 1983:212).

Most of my own spontaneously generated animations have attempted to combine automatic responses to sound, with intuitive responses using manual interfaces with software and video mixing tools. I wanted to avoid an absolute ‘mickeymousing’ relationship to rhythm, but still show a clear meaningful relationship to the sound. Len Lye's use of handmade imagery is an important reference point, although my technical means allows more immediate results in contrast to Lye's years of painstaking handiwork. Because Lye's works are

hand made, there is no repetition, despite its intensely rhythmic structure. The work is also concerned with sound and movement more than with correspondences between sound and colour. I too, wanted to create rhythmic live animation without frame repetition, using technology on which repetition is the norm. In *slaptop*, (Ticklish, 2005) (DVD One: Chapter Three: *slaptop*) I was attempting to create an image whose movement corresponded with the rhythm, just as I was corresponding to it with the actions of the USB pen and pad, but in a way that was each time, different, and inexact, so that the length of the stroke, and the location of its endpoint altered continuously, while the beat remained constant, and its effect on the scale of the pen stroke predictably consistent. This opposition between constancy and change echoes, without illustrating, the counterpoint between metronomic rhythm and unrepeated sonic explorations and structural collapses that occur in the audio track, and in the music of Ticklish more generally. It is a point of creative agreement within the group to avoid the absolute repetition of recorded sample loops, both in the sonic and visual source material. So in the animated sequence no drawn shape is repeated exactly, although the progress of the hand drawn shape flows rather than being generated from isolated frames in sequence. This seems to me a positive engagement with programmed tools such as musical or graphic software, which however locked as code, nonetheless present a wide field of adaptation when used in combination with one another. It would be impossible for me to repeat exactly the motions that created the piece, just as the combined efforts of the three musicians could not be exactly re-enacted. Ironically it can nonetheless be watched repeatedly in exactly the same form. This is why the urge to re-use existing material (as manipulated replay) is so strong.

The work is generated and recorded in real time. This example deployed a Macintosh computer with a cheap graphic 'screen saver' software called *Pixeltoy* adapted from factory settings to emphasise the drawing function, which could be produced and erased continuously. *Pixeltoy* is written by Leon MacNeill (MacNeill, 2002), using the OpenGL graphic programming language, the same means by which the GUI (Graphic User Interface) is generated on the computer screen. This allows it great stability, and unlike most screensaver software, it is open to adaptation. The computer's output was processed as an S-video input signal, through the Panasonic MX50 mixing desk I overlaid a white 'matte' over the darker areas of the computer screen image, so that the figures are cut into a static white surface. Inside the drawn figure a shifting plane of colour is derived from an internal non-camera-based video feedback. Both video mixer and computer were audio responsive via onboard microphone or audio line inputs. In the software, the velocity of the audio signal increased the scale of the onscreen drawn line, while in the mixing desk, audio velocity or volume created an 'aliasing' alteration to the pixel ratio on the processed computer image. The extent of this 'aliasing' was manually controlled, and varied during the performance. Editing simply took the form of making a decision regarding where the recording is to be cut to define the beginning and end points. Since the destination was to be a commercially available CD-R on a small experimental music label, I cut the length to approximate a conventional musical track on a pop music album. It has generated anthropomorphic comparisons from some who have seen it, as

the constantly mutating figure can be isolated as an entity from the white 'ground' on which it moves. Although it exists as a recorded and repeatable work, the process by which it was created has been used in a range of different performances, also using writing tools developed on other software including the *Wacom* Graphic Pad as a specific function on Image/ine, and a custom written patch using Max/MSP (see next chapter). As with earlier work using software-based tools I attempted to avoid looping of any kind. Thus although the sound is structured around a metronomic beat, the production of the image by drawing with my hand on screen means that no single frame of video is identical with any other.

In the following chapter, this combination of spontaneous working method with manual interface is developed as a way of restoring an immediacy to the audiovisual work in the face of increasing automation of the manual tasks of sound and image making.

Chapter Four

Real-time access. That's important. The editing process in VTR is very clumsy, worse than in film. I wanted a piano keyboard that would allow me to edit seven different sources bang- bang-bang, like that – real-time editing (Nam June Paik, in Davis, 1973:151).

The use of recorded and electronically generated sound and image as a performance is one of the ways in which my work attempts to negate the continuous incorporation of image processes into video hardware and software, as presets and filters that deprive them of their ability to intervene in visual processes. This chapter looks at some existing historical and contemporary contexts where sound and moving image have been combined into 'real time', spontaneous and transitory events, from early 'light instruments', via different forms of film intervention and expanded cinema, to the recent combination of projected images with dance music in the activity of the 'VJ'. The importance of the interface through which the visual image is 'musicalised' is explored through an examination of MIDI technology as a prototypical instance of multimedia and the kind of immediate editing anticipated by Paik in the quotation above. I do not wish to suggest simply that the new technology enables new kinds of performance. If this is true, it is only half the truth; new technology also poses new problems for human agency which performance provides a means of overcoming. For the research model of art practice, this means developing new means of interacting with information, image and sound. For the critical model, it means finding ways of resisting the machinic alienation from human labour by reinserting physical activity as an intervention in the ceaseless flow of electrons and of information.

The modernist idea of the specific medium as the object of analytical art practice is made problematic by hybrid, software-based media forms. This chapter concludes with a description and analysis of my installation work **Foreign Correspondence**, through which I explored the idea of synaesthesia as a background to the arbitrary correspondences characteristic of the way sound, image, and text are conjoined in their new digitally-encoded forms.

Editing, Playback, and Performance

Performing with something designed for playback might seem at first a logical contradiction, but the use of recorded media replayed as part of a live event has a long history that has perhaps reached its apotheosis in current popular music. In a time of software-edited music, live sampling, scratching, remixing and bootlegging pre-recorded material into new compositions is a commonplace occurrence. Instruments like synthesisers, sequencers, samplers, and audio software blur the technical boundaries between playback and performance, and the very definition of 'live' performance as a distinct category is itself a product of recording and replay media, since prior to their existence no such distinction could of course be made. As Tristram Cary has pointed out, live electronic music performance, on instruments like Lev Termin's *Theremin* (1917) and Maurice Martenot's *Ondes Martenot* (1928)

preceded magnetic electronic recording (Cary, 1992:249). But once recording was widespread, its effect on the practice of performance was profound. Michael Chanan has written in detail of the ways in which recording technology in all its particulars – the microphone, the development of the studio environment, the storage material, and the commercial distribution of recordings – soon strongly affected the music that was being recorded (Chanan, 1995, see esp. Ch. 4,8, and 9). The development of singing styles such as crooning, based on close microphone technique, and the rise of the composite studio album are clear instances of the recorded form creating its own ‘noise’ in the cultural practice of making music, recalling Jacques Attali’s definition of the kind of noise which derives from an amplification that – while intended as a neutral reinforcement of an existing code – in an unforeseen way effects a transformation of the code itself:

...a noise that is external to the existing code can also cause its mutation. For example, even when a new technology is an external noise conceived of as a reinforcement for a code, a mutation in its distribution often profoundly transforms the code (Attali, 1985:35).

Technologies of recording and replay have also altered the subjective experience of music – Jean-Paul Thibaud has analysed the social practices of ‘Walkman’ listening as a way of negotiating urban space (Thibaud in Bull, Back eds 2003:18), and this usage feeds back into production with the emergence of ambient, environmental ‘headphone music.’ In popular music, the recorded form has come to define the performance, as songs or pieces tend to be referred to as ‘tracks’, and – since recorded albums are usually composite works constructed piecemeal from multi-tracked recording sessions – live performance is frequently an attempt to recreate the sound of the original recording.

Despite, or perhaps because of this, popular music performance provides some useful instances of negotiation between the automated process and human usage. Hendrix’s appropriation of the sound of feedback, discussed earlier in Chapter Two, was a re-inscription of the manual act of guitar playing against amplification’s tendency to equalise the expressive range of fingering and plucking. More recently the paradox of automated performance was explored by Dusseldorf-based electronic music band Kraftwerk, who, during the 1980s, used robotic dummies as *döppelgänger* stand-ins in live performance of their electronic music. Kraftwerk are an emblematic and self-conscious symbol of the confused popular definition of ‘live’-ness, and have developed their work very clearly within an art-school ironic stance toward conventions of popular music. Ralf Hütter explains the context of their performances in the early 1970s:

...at the time there were electronic music concerts, happenings, the Fluxus group, etc. ... We played on the same circuits, the galleries. When we began we didn’t have any engagements in the traditional music world, we were engaged in the artistic world, galleries, universities, etc (Hütter, in Bussy, 1993:23).

Theirs is a kind of Duchampian approach to the mechanical paradox of disinterested engagement:

The dynamism of machines, the 'soul' of the machines has always been part of our music. Trance always belongs to repetition, and everybody is looking for trance in life etc., in sex, in the emotional, in pleasure, in anything, in parties...so the machines produce an absolutely perfect trance (op cit:99).

It is for this reason that Kraftwerk's music and stage personae should have been so important to black American musicians in the 1980's when the popular image of playback-as-performance emerged in the figure of the Disc Jockey or DJ elevated from the role of 'selector' in the Jamaican sound system, via the extension of breaks in short 45 rpm records for longer playback on the disco dancefloor to the role of active performer. As Brewster and Broughton relate, the 'flow' of dance music took precedence over the verse and chorus structure of the pop song with the importance of:

...beat-mixing and the slip-cue, used to synch paired records to extend the track, or to segue tracks without interrupting dancefloor 'flow' (Brewster, Broughton, 1999:148-9).

The role of the player of records was suddenly transformed. From being a marginal and invisible background role, they became a performer in their own right, the guardian of the flow of dancefloor beats. Ulf Poshardt cites the importance of New York DJ Kool Herc in the late 1970s:

Herc had noticed that sparsely instrumented passages sounded particularly good with the sound system, and got the audience dancing. To preserve the intensity and power of these passages, or at least to extend them, Herc worked with two copies of the same record, playing the desired passage, the break, alternately on one or other turntable. Or else he would simply switch from the break passage in one piece to the break in another piece (Poshardt, 1995:162).

The connection between this practice and earlier modernist techniques of cut and paste juxtaposition, montage and collage, are clear to Poshardt, who sees it in Hegelian terms, as a dialectical transcendence of older forms through their incorporation into new ones. Here this process is at work on two levels: at the level of the music, which is soon to be replaced by records that are designed, rather than reappropriated, for the break beat mix, and at the level of the technology, soon to be commercially replaced by digital forms of non-linear storage – CD, MiniDisc, etc – but now re-valourised as a musical instrument in its own right. Although earlier forms of sonic montage had been made using turntables and discs by the composers of *musique concrète*, in works like John Cage's *Imaginary Landscapes* (1939), or Pierre Schaeffer's *Etudes Aux Chemin de Fer* (1948), the repurposing of the turntable as an instrument to be acted on in performance is new at this time. DJ Grandmaster Flash, Afrika Bambaata, and others would go on during the 1980s to extend the break beat technique by creating new sounds from the act of moving the

needle back and forth in the groove of the record (Poshardt, 1995:169-170), thereby creating the archetypical scratching sound later emulated by non linear sampler and software playback.

From DJ to VJ and Earlier Precursors

Once these processes had transformed the social role of the Disc Jockey from a functionary into a prestigious main act, some people wanted to use images as DJs were using sound, so purpose-built video and multimedia software and hardware have since been developed to allow the performer (or 'VJ') real-time cut, paste, and loop techniques that previously provided broadcast professionals with action replay for Match of the Day, or special effects and filters on Top of The Pops. The title VJ is a confusing one, since it is (logically, given its genealogy through the DJ) also used to describe the presenter who links the promotional music videos and other audiovisual items on television channels like MTV. This is the work that Chion describes as "Image-Radio" (Chion, 1990:166) He, too sees a 'musicalisation' of the image in its formal development. Now the fast paced mixing, cutting and synching that found its way into music video in response to the auditory scratching of the DJ, is being reproduced in live projection and performance. Increasingly the term 'VJ' refers to the live accompaniment of music with moving images, usually against beat-based dance music. There is an extensive international presence on the Internet, including net community sites like *VJCentral* (VJCentral, 2001) dedicated to reviewing equipment and providing related information.

The development of most recent video performance software is directed at this hybrid figure of the VJ-as-DJ. The primary origins of such tools are hard to pin down, and it is likely that several forms were being developed concurrently, as non-linear video storage was first developed for video editing, and some form of scratching or 'scrubbing' the image was available in that form from the start. In the 1980s 'scratch' video artists like George Barber and the Duvet Brothers used video editing to plunder and remix existing TV narratives (Rees, 1999:96), and The Enemy Within reached the pop charts with a promotional video that combined audio scratch editing with constructivist image montage in their remix of clashes between police and striking miners (The Enemy Within, 1986). But these were tape works, destined for replay. They combined the subversive montage of Dada or Eisenstein, with the expressive scratching and repetition of DJ 'turntablism' as it was being absorbed into the sound of recorded music, but they were not themselves performances. The sound of the scratch in a recording is a property of multiple cuts and edits, but it borrows a physical expressivity from its DJ-manipulated origins, just as the simulation of a splash or a brushstroke borrows meaning from the action simulated, while it is not the live act itself, like a pop version of the relationship Roy Lichenstein's synthetic *Brushstroke* (1965) has to the valorised brush marks of painterly painting.

Probably the first software to make this direct connection from the turntable scratching of the DJ to the *live* remixing and manipulation of video footage is the software 'VJamm' produced by Camart, in which the interaction with the digitised footage emulates both the piano keyboard – in its arrangement of

source material, or 'clips' – and the DJ's turntable – in its replication of the typical forward-and-reverse motion of needle scratching on grooved vinyl. VJamm's programmers had been inspired by an older piece of video improvising software called Arkaos. Arkaos was designed for manipulating video samples and graphic images in time to music, VJamm, exploiting the new compression formats for storing digital video data, now permitted scrubbing of the soundtrack in addition to, and concurrently with, the image. This enabled full audiovisual emulation of the DJ scratch technique. It has been used most extensively by the DJ duo Coldcut (Coldcut, 2004), for whom it was written.

'VJing' can of course be usefully compared with the earlier forms of expanded cinema, and to the long history of attempts to create 'visual music' - outlined in earlier chapters - of film works synchronising images to sound, and of attempts to perform with light. This history suggests an alternative path of optical experiment that is not always dedicated to pictorial representation, and, particularly in musical and rhythmic combinations, incorporates haptic, physically expressive, and gestural forms of comprehension and interaction. For Hans Richter, for example, or in the work of Oskar Fischinger, the musicality of the image had primarily to do with autonomous internal movement and rhythm, rather than pitch to hue correspondences. The Flicker films, too, of Tony Conrad, and Paul Sharits – while perhaps antithetical to the dance floor, nightclub projection – were concerned with the motion image and its rhythms in a directly physical way. This is a tradition that goes back to Duchamp's *Anaemic Cinema* (1926), and the *Rotoreliefs* (1925) and it is interleaved with the synaesthetic and visionary traditions of non-objective cinema. Len Lye, cited earlier, employed a particularly gestural and expressive form of image and sound combination through his technique of scratching onto black leader tape.

But it is particularly at the level of the physical interface that the VJ and MTV 'promo' video relate to that tradition, too. Experiments with 'light pianos' and 'colour organs' are an integral part of the synaesthesia tradition, as Fred Collopy's exhaustive online archive, and essays by Moritz (1997), Peacock (1988), and others have shown, but they also anticipate the manual interface with visual media that is essential to the modern computer. The combined graphic user interface (GUI) and QWERTY keyboard is a common domestic context through which the modernised human reacts to screens – another is the television. The less glamorous counterpart to club VJ's scrubbing (or 'scratching') video footage is the familiar remote control interface through which video and television are operated. While some may wish to manipulate moving images in real time for performance, the technical capacity to do so affects contemporary culture more widely. Our apprehension of news media and home entertainment images is increasingly inflected by the ability to repeat and replay sequences at will, through what Lev Manovich refers to as the "database logic" of random access data storage (Manovich, 2001:237-243). Manovich cites Dziga Vertov's *Man With a Movie Camera* as a prototype of the database form that will be realised in computing machines (Manovich op.cit, prologue: *Vertov's Dataset*). This example forms part of his wider argument that the experiments of the avant-garde are incorporated into new

software technologies. LeGrice, too cites experimental, non-narrative forms of cinema as a tradition of non-linear processes prior to the advent of Random Access Memory, (LeGrice, 1997 in LeGrice, 2001:289-296) including Vertov as central to this development, but citing also works such as Léger's *Ballet Mécanique* (1924), and Maya Deren's *Meshes of the Afternoon* (1943), as important developments in non-linear narrative form, with their use of cyclical, rhythmic structures:

Non-linearity...has precursors. Cinematic structures which break with the assumptions of single-track, single-resolution narrative can be seen to have strong roots in a number of directions explored in experimental film and video during its eighty-year history (op.cit: 289).

The non-linearity of RAM data storage becomes more ubiquitous to daily experience. 'View on demand' cable television, DVD players, hard drive video recorders, vector-based web graphics, and video games, all enable non-linear interaction with moving pictures that blur distinctions between viewing and editing. This promotes what John Whitney might have recognised as a "musicalization" (Whitney, in Pellegrino, 1983:16) of visual media as visual 'content' that becomes available for compositional rearrangement via the interface through which the audiovisual instrument is 'played.'

Early Light Instruments

The earlier discussion of synaesthetic and neo-synaesthetic art outlined the appeal of a unity of hearing and seeing. Early attempts to interact with light and colour were driven by that influence to find a commonality of sense experience, but they were also, as we saw with early scroll paintings and animation works by artists like Eggeling, Richter, and Fischinger, an attempt to treat light as a plastic form to be actively manipulated, as music manipulated sound. For Richter and Eggeling the internal forms were like the instruments in an orchestra, the motion series was the performance in which they all played an instrumental part. But there was an earlier series of much more literal attempts to make optical phenomena playable by instruments, just as musical instruments played sound. In 1730, French Jesuit monk Louis Bertrand Castel built a *clavecin oculaire* for playing coloured light by revealing and concealing tinted panes of glass using a keyboard, which, as Thomas Wilfred relates:

... had a musical keyboard of five octaves. When a key was depressed, a colored strip of paper or silk would appear above a black horizontal screen to the rear. The first octave represented the pure hues, the next the same hues "one degree lighter," and the fifth octave the highest values (Wilfred, 1947:248).

William Moritz later describes it as:

...a 6-foot square frame above a normal harpsichord; the frame contained 60 small windows each with a different colored-glass pane and a small curtain attached by pulleys to one specific key, so that each

time that key would be struck, that curtain would lift briefly to show a flash of corresponding color. Enlightenment society was dazzled and fascinated by this invention, and flocked to his Paris studio for demonstrations. The German composer Telemann traveled to France to see it, composed some pieces to be played on the Ocular Harpsichord, and wrote a German-language book about it. But a second, improved model in 1754 used some 500 candles with reflecting mirrors to provide enough light for a larger audience (Moritz, 1997).

Somewhat later Bainbridge Bishop devised a light organ, which, like Castel's matched a musical scale to a colour one:

The instrument had little windows glazed with different-colored glass, each window with a shutter, and so arranged that by pressing the keys of the organ the shutter was thrown back, letting in a colored light. This light, diffused and reflected on a white screen behind the ground glass and partly on the glass, produced a color that was softly shaded into the neutral tint of the glass... (Bishop, 1893:4).

Wallace Rimington made further developments of the 'lunia' instrument tradition, in 1915 accompanying Scriabin's Theosophy-influenced, would-be synaesthetic *Prometheus* (Moritz, 1997) on a Colour Organ. The modernist turn toward concrete, non-figurative imagery in painting reprised the synaesthetic tradition, and Futurist Bruno Corra, in 1912, imagined a 'Chromatic Music' that matched colours to the tempered scale, while Futurist experiments with performance are some of the earliest to use mechanically generated sound. In 1916 the Russian Futurist painter Vladimir Baranoff Rossiné created a 'Piano Optophonique'. The piano used painted glass discs, which rotated as light passed through them. In the United States, Thomas Wilfred's 'Clavilux' light organ of 1919 (Davis, 1973:40) was of central importance to 'visual music' tradition defined in the previous chapter. Wilfred's term 'lunia' described particularly this idea of performed light treated in a quasi-musical way.

Under the idiosyncratic patronage of Baroness Hilla Rebay von Ehnrenwiesen, curator of Guggenheim Foundation and founder of the Museum of Non-Objective Painting (now the Guggenheim Museum), the light-organ enjoyed some support, with patronage for Oskar Fischinger, and Charles Dockum, who, according to Moritz were set by her to spy on one another (Moritz, 1996). Both Dockum and Fischinger built light instruments, but were thwarted by budgetary considerations as the machines required operators that Rebay was reluctant to pay, a condition echoed in contemporary complaints from club VJs usurped by automated audio-responsive video displays.

Probably the most direct bridge from the synaesthetic lunia tradition to the manipulation of computer graphic images is provided by John Whitney, whose analogue and digital imaging instruments make the step from the analytical harmonic images produced on the sound imaging device developed with his brother, to the automated and synthesised images of contemporary computer-

aided design. Whitney founded his own computer graphics company – Motion Graphics, Inc. – having developed an computer for graphic use from a former anti-aircraft gun (Youngblood, 1970:206).

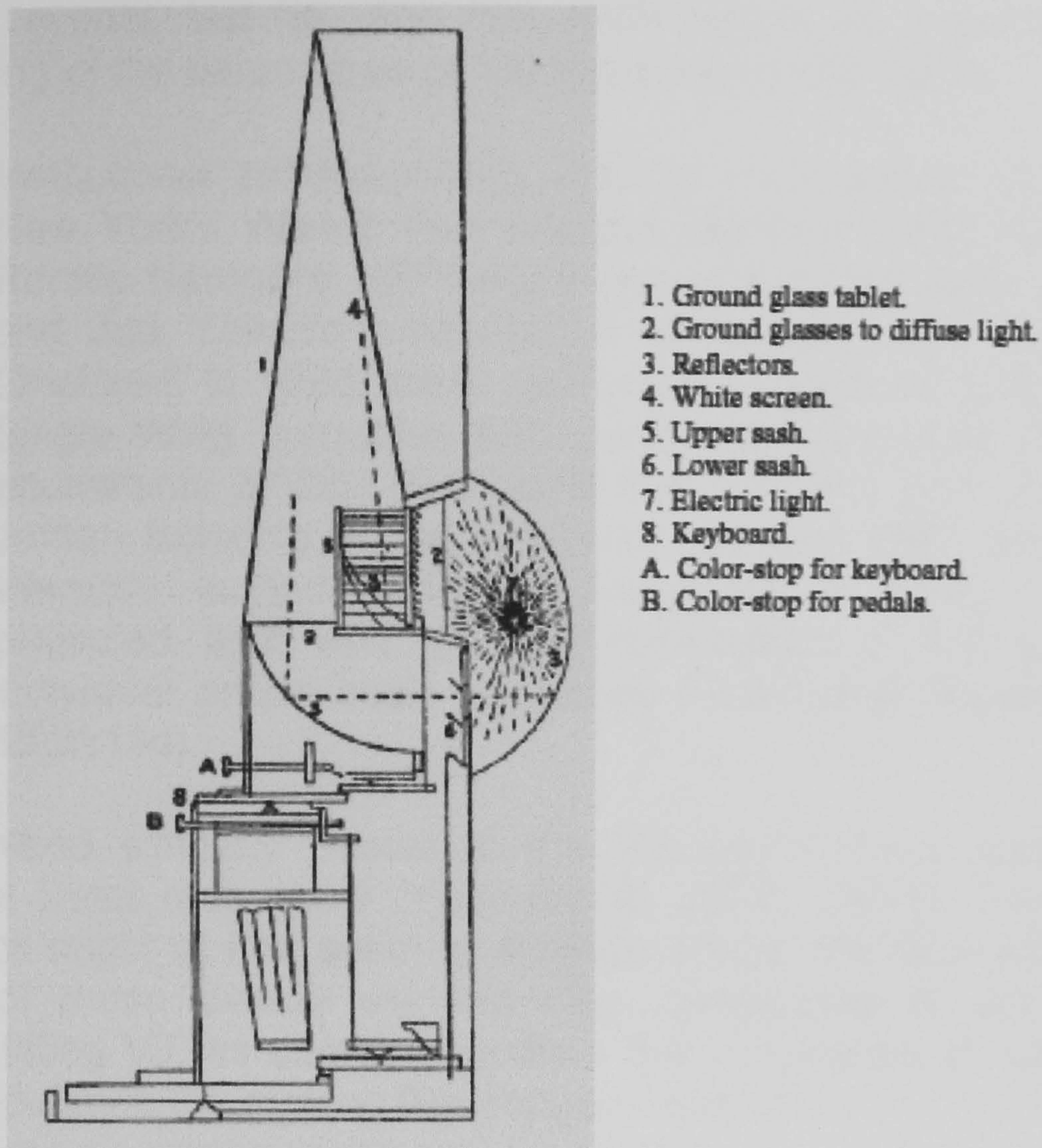


Figure 20. Bainbridge Bishop, diagram of light organ (Bishop, 1893:4)

Despite the influence of Theosophical theories of unified senses and absolute colour-light relationships, in practice these machines have a more ambiguous role, seeming to introduce or enforce new connections, rather than discovering them. The performed nature of the association between light and sound acknowledges in some way the arbitrary nature of the collaboration. It is this fact that undermines the universality of the synaesthesia phenomenon, but at the same time opens it up to performed juxtaposition. Where Eggeling, Richter, Fischinger, Ruttmann and others had explored the autonomy of forms in time and motion, these instruments anticipate the immediacy of spontaneous human interaction with, and manipulation of, synthetic forms of sound and image. In the development of new musical instrument forms new haptic interfaces with sound and image are also explored. Works by Fischinger, Richter, Eggeling, John Whitney, Harry Smith, and others were used in combined soundtrack and moving light displays (Velguth, 1947). Jordan Belson's 'Vortex' concerts showcased such works, with electronic music composer Henry Jacobs, linking image and music performance at the Morrison Planetarium in San Francisco between 1957 and 1960 (Moritz, 1985: 302).

Film, Performance, Expanded Cinema

David James' 1985 study of sixties American cinema suggests that Belson maintained an aloof distance from the mid-sixties explosion of expanded cinema events, but he cites him nonetheless as a seminal figure for the shattering of the parameters of the film context that led to:

Institutional extravaganzas like the multi-screen constructions at the New York's Worlds Fair and the Montreal Expo '67 John Cage and Ronald Nemeth's HSPCHD event at the University of Illinois in 1969, and Jud Yalkut's presentation of *Festival Mix* at the University of Cincinnati in 1968; more genuinely subcultural festivals including the Single Wing Turquoise Bird performances in Los Angeles, the many equivalents in San Francisco that followed from Henry Jacobs and Jordan Belson's Vortex Concerts between 1957 and 1960, and Andy Warhol's exploding Plastic Inevitable in New York; Ken Jacobs projected light and shadow manipulations and light sculpture by individual artists such as James Turrell and Robert Irwin... (James, 1985:134).

Youngblood similarly describes the Whitney's filmic accompaniment to a Grateful Dead rock show (Youngblood, 1970: 230-1). Celluloid film's linear playback might at first seem to exclude it from real time manipulation, but in some of these events we find clear precursors to the software image-manipulating VJ, as James describes the importance of the performative act of manipulating the moving film image in real time:

In the performances of the Single Wing Turquoise Bird... and in the Fillmore and Avalon Ballroom events, projection was constituted as collective improvisation: ...up to six people at the same time had control over several projectors of different gauges, as well as liquid projectors, banks of slide projectors, strobes and spotlights. All equipment could be spontaneously manipulated to interact with the music; projectors thus became instruments that could be played, apparatuses through which the projectionist could interact with each other, collectively composing visual events in response to the presence of projection (James, 1985:135).

James also describes the eclectic remixing of sources through what he calls "Underground Intertextuality" in, for example, the work of Stan VanDerBeek, who, in New York pioneered underground mixed media events like the 'Movie Drome' and the Vasulkas established The Kitchen (Vasulkas,2004), a site for experimental work combining the didactic examination of new media, with the playfulness of performance.

In England, the use of live projection also intermingled with psychedelic light shows and rock music. Two particular examples crossed contexts from gallery to rock performance, as well as employing non-filmic projection techniques. Gustav Metzger, in variance from his auto-destructive works, created a series

of *Liquid Crystal Projection* events, including a performance event at the Roundhouse in 1966 with music by Cream, The Who and The Move:

The principle of the liquid crystal technique is as follows: thin glass slides containing liquid crystal are heated and inserted into projectors with a polarising filter over the lens. The resulting image is projected onto a screen. As the crystals cool, they change from black at the hottest stage to grey, then gradually become awash with every colour from the spectrum, from green to yellow, purple, red, blue, and pink, transforming into endless and irrepeatable combinations (Bowron, 1998:20).

Mark Boyle and Joan Hills (throughout 1966) used projected light in their *Son Et Lumière* series, which included the projection performance *Son Et Lumière For Earth Air, Fire And Water* and *Son Et Lumière For Bodily Fluids And Functions*. These took place at London's Cochrane Theatre and UFO psychedelic club, where John 'Hoppy' Hopkins combined light shows with video activism (Rees, 1999:88). The performances involved projecting light through processed materials. In the case of *Son Et Lumière For Earth Air, Fire And Water* the materials were elemental, for *Son Et Lumière For Bodily Fluids And Functions* they projected bodily fluid samples – sperm, vomit, urine, accompanied by amplified sounds pertaining to those materials. Through these performances Boyle and Hills developed techniques with liquids and oils heating and projecting through liquids in suspension for creating unpredictable patterns of colour and motion, which were used to accompany *The Soft Machine*, in 1967 and the Jimi Hendrix Experience the following year. While the projections moved towards pop light shows, Boyle and Hills' gallery based work developed the visual amplification of minutiae and the quotidian that formed the core of the *Son et Lumière* series of performances. This was to become the huge project for which they are now better known *Journey to the Surface of the Earth* – documenting by detailed replication randomly chosen locations around the world (Boyle, 1970).

Live Film: Restoring the Aura?

Even the most perfect representation of a work of art is lacking in one element: its presence in time and space, its unique existence at the place where it happens to be (Benjamin 1936, in Zohn, 1973:222).

In addition to its occasional role in light shows, film has been used as a part of performance or real-time presentation. Prior to more widespread availability of projectors, the culture of the film club screenings was itself already almost a performance event in distinction to the repeated programme of the commercial cinema. The nature of the celluloid film itself tends to make a screening a finite event, as becomes noticeable when film works by artists are replayed as repeated video projections. Like the "live" definition of music performance, it only becomes a problem once a more automated version intervenes. Early multi-film screenings, like Fischinger's five screen films with live percussion (cited in Rees, 2004:4) were deliberately performative. This screening culture

is of crucial importance to the development of experimental or underground film, attested to by Standish Lawler in 1975:

The principal force which gave these disparate experimental films a common identity was the cine-club. Its role in forming the avant-garde film movement is comparable to that being played by the art gallery in the development of modern painting, for without a means of exhibiting their films there was no possibility of cultivating a public (Lawler, 1975:85).

And it continued to be crucial to nurturing the experimental film scene beyond the period Lawler describes. Al Rees (Rees, 1999) has also detailed the scenes and contexts that nurtured audiences for more recent forms of experimental moving image, particularly in relation to the London Film Makers' Cooperative (ibid:77), whose activities included live performative interventions into film by the 'Filmaktion' group whose core membership included LeGrice, with Annabel Nicholson, Gill Eatherly, and William Raban. Despite possible comparisons with the more psychedelic expanded cinema events 'Filmaktion' were – to some extent – the performance wing of the Structural/Materialist movement, not least because those artists involved also made films under that banner, and because much of the work is analytical in relation to the screening context and technology of film. In a recent talk at Camden Arts Centre in London (20/10/2004), LeGrice was keen to stress the playful and sensuous nature of the Filmaktion group work, but nonetheless their activities are clearly distinct from the ambient film projections used to accompany rock music or within environmental happenings. In works like Annabel Nicholson's *Reel Time* (1973), for example, there is a clear foregrounding of the processes at work in spooled film as the artist feeds celluloid through a sewing machine to punch holes in a film loop that deteriorates to destruction – "The film alludes neatly to the technology from which the film claw was derived" (Rees, 1999:81). LeGrice's own *Horrorfilm* (1970) involves physical performance as LeGrice, stands naked facing the screen on which are projected three superimposed projected film loops with colour fades. The shadow cast by his figure as he moves away from the screen and nearer to the projectors reveals the complex colour mix of the three projections (LeGrice, 1977:146).

More recently French *cellule d'intervention* 'Metamkine' (Metamkine, 2004) have developed a performed combination of 16mm projected film and *musique concrète* in which film, film sound, spooled audio tape and synthesisers are deployed to create real time composition, using manipulated, taped sources and electronic sounds, with a multiple prepared projectors in which images are overlaid, scrubbed, and melted in a contemporary form of expanded cinema.

Included in the group dubbed 'English Structuralists' by Rees (Rees, 1999:77) Guy Sherwin has made a number of live works, including 'Newsprint 2' (1972/2004) which involves a live manipulation of the film within the projector. The second of a two part series using newspaper directly glued to the filmstrip, 'Newsprint 2' is:

...a live projection event for two 16mm projectors and two

loudspeakers. In performing the work two identical prints are shown superimposed onto the same screen. I attempt to bring the two films into synchronisation with each other by alternately freezing and running the films on their way through the projectors. During these brief periods of synchronisation something unexpected happens as a result of the slight mis-registration of the two identical images and of their accompanying sounds (Sherwin, 2004).

Performed at a screening in London in 2004 (see Littmann, Hatfield, 2004), it was striking how close its sonic aesthetic came to the much more recent 'glitch' processed error-based music and sonic art. In the same series 'Man with a Mirror' (1976-present) sees Guy Sherwin interacting with footage of his younger self in a complex play of projection and reflection (see Figure 2 below).

MAN WITH MIRROR 1976

sound;10 mins.

Performance using super 8 film,
mirrored screen, and performer.

Can take place outside after dark.

The 'film is projected onto a small hand-held screen, white one side and mirrored the other. This screen is used by the performer to either 'catch' the projected image, or deflect it around the cinema space. The image on film is of the same activity taking place in a sunlit landscape. Visual echoes are set up between the live event and the recorded one.

This performance can incorporate directional sound aimed at the screen, the movements of which bounce the sound around the space.

Figure 21: Guy Sherwin, plan for *Man with a Mirror* 1976

Several other Sherwin films – 'Musical Stairs' (1977) 'Railings' (1977) (cited earlier in Ch.3) and a two screen performance version of 'Night Train' (2004) – use direct printing over the optical soundtrack to generate sound and image concurrently (see Chapter 3). This causal connection achieves a direct link between sonic and visual experience. By contrast, while bit-encoded video permits non-linear audiovisual manipulation in a way that spooled film did not, the image/sound relationship of club visuals and VJ culture tends to be less direct, usually performed as a mutual accompaniment. The intuited synchronisation of sound and image by the performer *is* the performance, making it closer to the improvisational culture of music, than to the more rigorously counter-intuitive tendency of structuralist and minimalist experimental art. This raises again the conflicting models of practice of flow and interruption. The goal of the experimental filmmaker and the VJ are in this sense radically at odds with one another. For this reason Manovich (2001:144), and Poshardt (1998:163-4), both argue that – despite the comparison with montage – the DJ is not a montageist since s/he is more concerned flow than with interruption.

This highlights a contradiction of the mixed context created by new experimental media. The culture of screenings ensured that the work articulated itself to an audience who were for the most part literate in the conventions of that context, as Lawler's 1975 comparison to the gallery makes clear. New 'expanded' contexts are pluralistic, but that very pluralism makes articulation more difficult, as the conflicting models of flow and intervention are both hard at work in a context that frequently presents itself as entertainment. On the other hand, while the distinct culture of the screening makes more specific investigation, like the sometimes radically un-commercial activity of Structural, or Structural/Materialist filmmakers, possible, this seems to undermine the modernist quest for medium specificity. It is the social context of the screening, rather than the purely internal relationships of the technological material that allows it an oppositional meaning. My own work has had to address the issues presented by this opposition, since it takes place in situations that are often ambiguously 'between' music and visual art. But in the very diverse forms of popular music performance, as well as in expanded forms of cinema, the negotiation between automated playback and human immediacy can be seen. Walter Benjamin's concept of the aura could be expanded here, perhaps in contradiction of Benjamin himself, to define something that instead of being lost permanently with the advent of multiple copies, is instead caught up in a continuous process of loss and restoration. The use of combined sound and image playback tools in performance is on the one hand wresting them away from the rituals and traditions (in Benjamin's sense) that give them meaning, but on the other hand restoring to them a new set of rituals derived from performance and music. For Benjamin new representational forms like film "...subjected the human sensorium to a new kind of training..." in preparation for the repetition of mechanised labour (Benjamin, 1939). But in expanded forms of performed film, and the DJs adaptation of the record player turntable we can see the process diagnosed by Benjamin's analysis of the photograph overturned, as human rhythm and intervention allows the aura of presence to be temporarily and transiently restored.

MIDI, Music, and Multimedia

Perhaps a connection between the synaesthetic lumia tradition and the contemporary manipulation of computer graphic images is provided by John Whitney, whose experiments in motion graphics make the step from the analytical harmonic images produced on the instrument developed with his brother James, to the automated and synthesised images of contemporary computer-aided design. But there is another parallel path of influence less directly connected to the visual and cinematic developments that predate the video image: the electronic music tradition. Instruments such as the Leon Termin's *Theremin* (1917) and Maurice Martenot's *Ondes Martenot* (1928) provided new means by which the player or performer could interact with electronics. It was a model of signal intervention, rather than reception, and the Theremin in particular inaugurated a highly physical form of haptic control that was also remote, and wireless. Part of the "musicalisation" of the image that Whitney himself identifies, has been sustained as a result of the way in which post-mechanical musical instruments have become the vanguard of

technical development in other media. But, rather than developing from a synaesthetic correspondence of integral sonic and luminant properties, it grows from the convergence of the means by which they are rendered plastic. The Theremin, and the photoelectric cell at the heart of optical film sound, both allowed a wireless haptic interaction with sound long before remote control applications like automatic doors or TV channel changers. From the 1960s onward, the technical development of electronic sound and image and its artistic usage are closely linked.

As a parallel development to the image-scrubbing VJ, Steina Vasulka's "Violin Power" (1992-) uses the action of a bowed violin to control the forward and reverse motion and the process of a video image:

In 1991, after having experimentally interfaced my acoustic violin with a variable speed video cassette player, I bought a MIDI violin and a Pioneer Disk Player. Interfacing these instruments with a computer gave me an instant access to any frame of video on the disk as well as access to fast/slow and forward/backward movements...(Vasulkas, 2004).

The resulting fusion of analogue instrumental performance, and digital moving image manipulation, is a concert hall counterpart of dance floor oriented VJ 'scratching'. Steina is an accomplished violinist, developing a dialogue between musical flow and the scrubbed images. The content of the projection itself varies from one performance to another, using material from the extensive archive of Vasulkas' video-recordings.

It is a fundamental characteristic of multimedia tools that modal values – volume, tone, colour – can become interchangeable through transduction to bit encoded data. For musicians this exchange of one mode with another has been achievable since 1983 by means of MIDI (Musical Instrument Digital Interface). MIDI enables diverse electronic instruments to communicate instructions between each other. Playing piano notes with a guitar, for example, or triggering recorded samples depending on the loudness or pitch of the singing voice. Potentially, this extends quasi-synaesthesia beyond the interplay of audiovisual modes – colour equals pitch, etc – into haptic territory. Physical actions can accurately trigger a colour, or a sequence of notes. It is based on arbitrary juxtaposition: MIDI is the practical enactment of the defining characteristic of digital multimedia, which is less a material property than an attribute defined by use. Entirely distinct forms of information, sonic, visual, or alphanumeric, can be made to respond in patterned accordance with one another. The differing modal characteristics are fused together by being given a kind of scaled virtual equivalence. Malcolm LeGrice describes:

...The condition of digital abstraction, where all data fundamentally loses its identity, allows the possibility of selective transformation into output which is different but in the same category (LeGrice, 1998 in LeGrice, 2001:305).

LeGrice, influenced by the computer experiments of John and James Whitney, and Stan VanDerBeek developed a series of graphic works in the 1980s, including a performance with improvisers Keith Rowe and AMM using a MIDI piano keyboard to interface with programmed visual content (ibid:306).

The STEIM Institute in Amsterdam (STEIM,2004) has been experimenting with MIDI, and developing media controllers and interfaces for electronic performance since the seventies. It began as a cooperative in 1967, reacting against the formal and studio-based direction of electronic composition. Michel Waisvisz, head of the Institute since 1973, inaugurated the productive direction of STEIM with the invention of the 'Cracklebox,' a MIDI instrument designed to provide a small handheld and intuitive way of controlling electronic instruments. Roland Sprekle, concert programmer at STEIM, writes:

With Waisvisz' Cracklebox', the essence of STEIM became clear: advancing an instrumental approach to the practice of electronic music. Here, instrumental implies that in STEIM's view, electronic music would only assume its definitive form on the stage, and that it's ultimately the performing musician who creates the sounds via direct and physical actions in front of an audience... At last, ecstasy and sweat on the electronic music stage! What STEIM added here was that the composer would also take on the performing role himself: a set of instruments was developed that allowed the composer to compose on stage, and to let the work be heard at the same time (Sprekle, 2001).

Waisvisz developed a range of applications that used MIDI to create "gestural controllers" including his 'Hands' instrument – a pair of manual devices that allow a physically expressive operation of switches sensitive to touch as well as motion (see Figure 22 below). Also at STEIM, programmer Tom Demeyer, collaborating with Steina Vasulka, then an artistic co-director of the Institute, developed 'Image/ine' - software designed to accomplish the tasks of 'Violin Power' more directly, by manipulating video digitally stored on the computer. Image/ine condenses much image-processed analogue work of the seventies and eighties into a digital form, with the expansion of connective possibilities that computer-based tools allow, and the potential to improvise with these processes.



Figure 22. Expressive Gestural Interface: Michel Waisvisz' MIDI *Hands*

Michel Waisvisz, (Director of STEIM, Amsterdam 1978 –), performs with the *Hands* MIDI controller, which:

...consisted of a pair of metal plates shaped so that they could be worn comfortably on each hand. The hands contain touch-sensitive keys that can be played by the fingertips as well as sensors that respond to tilt and the changing distance between two Hands. They send control signals to sound modules to generate sound in real time (Holmes, 2002:23).

Performance and Multimedia

MIDI-based gestural interfaces and software like Image/line make sound and image processing in real time much easier, though not automatically more interesting. Making tasks easier changes what performing those tasks, or watching others perform them, means. Automating an action alters its status. Similarly, complex processes triggering video and sound with touch-sensitive gloves, or intricate image tracking on the motions of a dancer, are not inherently different from using a remote control to operate a television or other electronic device. Developing more arcane interfaces doesn't necessarily reflect on the nature of the interface itself in its social form. The problem lies in finding ways of using the tools that goes beyond the mere demonstration of their technical capabilities into analysis or awareness of their form. This represents a problem for art that is also pioneering technical research.

In a series of works I attempted to create real time montage effects for performance, introducing spontaneity into the re-organisation of recorded or salvaged material. Developing from the work at the time of the **Foyer/Fyr** pieces (**DVD One: Chapter One: Foyer**) I had become interested in the way in which a cut, however arbitrary, introduced a rhythmic musical correspondence between the motion of the image and the abrupt conclusion of sound, using Johnny Dekam's *Vidvox* video sampling software (Vidvox, 2004, see Figure 23 below). This allowed experimentation with different loops, just as electronic musicians were increasingly using found loops and samples to compose sonic collage material from the huge archive of popular music. I was interested in the context of club VJing, in which much of the video material reflects the dancefloor through repeated actions synchronised to the beat, but influenced too, by experimental traditions in improvised music which reject the direct 'mickey-mousing' correspondence between image and sound.

In the performance project **blip kino** (**DVD One: Chapter Four: blip kino**), performed in cinema spaces in Nottingham and Cork in collaboration with electronic sound artist Phil Durrant, I tried to create a work that used cutting in real-time as a rhythmic device, referring responsively to dance and gesture without directly reproducing the beat-matching VJ's dance-image synchronisation. I wanted to use the sound from the found film clips directly to create the musical sound. I had noticed a common thread running through a series of British movies of the 1940-60s, particularly in crime thrillers, in which the films denouement was frequently located at the racetrack, most notably in the case of John Boulting's *Brighton Rock* (1947) and Stanley Kubrick's *The Killing* (1956). The symbolism of the racetrack in British cultural life - as a meeting of extremes of the class system in an arcane zone with occult rituals of risk and strategy - is often metonymically condensed into the figure of the tic-tac-toe man, whose private language of hand signals describe the ethnicity of the gambling tribe at the intersection of wealth and poverty, like the 'hidden hands' supposed to govern the speculative market place. I saw a parallel - at first literally, then more metaphorically - between the physical actions of these men, and those of the dancing crowds at raves, themselves also signalling with their hypnotic semaphore in a place where cultural and social boundaries

are temporarily crossed. In the performance, sampled audiovisual clips of these figures performed dances, while the soundtrack was constructed as live improvisation derived from the audio portions of the video clips.

These were assembled in the computer and using an external MIDI controller – a keyboard – I shuffled through the selection of clips, changing their speed and scrubbing/scratching on the timeline to create a rhythmic dance from the filmic figures. The sound output – deriving from the diegetic film sound and music, was concurrently captured, processed, and replayed by Phil Durrant.

While the new juxtaposition of the clips effectively created new and quite disturbing meanings for their content, the ‘liveness’ of the interaction with the clips was inarticulate. The scale of the rear screen in darkness effectively hid the action of the performers onstage, although it is exaggerated by poor contrast in the documentation. I realised that there was very little, despite the keyboard, communicating anything other than two men standing in front of a projected montage. The visual problem lies with the interface, where the action of ‘playing’ the images from the keyboard is so minimal that it needs to be exaggerated, in order to be made visible. Hence the ‘gestural interface’ research of Waisvisz’s ‘Hands’, Steina Vasulka’s ‘Violin Power’, and the developers of VJamm.

In my performance work I tried to address this problem through further foregrounding of the act of making the image in the same place that it is being projected. For a collaborative performance at the Royal Festival Hall in London in 2003, I used hand drawn images as a roving light source for Steve Beresford’s manipulation of amplified toys and other objects (**DVD One: Chapter Four: Soap Bubble Set: light pool**). In the same performance I used a graphic pen and pad combined with a “Visualiser” (a kind of rostrum camera used as an overhead projector) to combine software ‘drawing’ with a projected musical score, in imitation of the experimental graphic scores. In a reversal of this process, I created the score while the musicians frenetically improvised (**DVD One: Chapter Four: Soap Bubble Set: ensemble**). In these works the relationship between sound and image was provided by my own actions. In **scopac versus the No Orchestra** in May 2003 (**DVD One: Chapter Four: scopac versus the No Orchestra**), I used automated responses between computers and live audio inputs to develop a visual relationship between image and performed musical action. Using Jitter and Max/MSP software I worked with musician Dominic Murcott to research a means by which live sound from a microphone input would trigger specific frames from a digital video sequence. Thus the sound acted as a direct control on the image. Then, reversing this, we devised a way in which scrubbing along a video timeline could double as a controller to change audio pitch or volume. Two Macintosh Powerbook computers are linked onstage using an Ethernet network cable, both running Max/MSP software, one with audio output to a PA, the other – using ‘Jitter’ – with a video output to a video projector. These form part of a musical ensemble. (In the video documentation, the first computer is on the left, and the second (video) computer on the right).

Digital video information is stored on the RAM memory of the computer by Quicktime software as separate frames, which can be accessed in a non-hierarchical way. In the first clip – ‘**rhythm image**’ – the volume, or ‘velocity’ (to use the MIDI term for the force of a sound input) of the drum triggers on the first computer, a processed audio response which, depending on level of sound, scrubs through a set number of frames in a Quicktime video clip. Performance activity involves continually resetting the location of the first frame, to vary the frame sequence. The frame-sequence video clips were collections of monochrome still images of white geometric shapes against a dark background, partly in a conscious reference to early modernist animations like Richter’s *Rhythm* series, partly because a simplified image sequence enables a clearer set of relationships to be made to the sound.

In the second clip – ‘**hand image controller**’ – a video sequence of my hand, with the index finger pointing, is scrubbed, using the Powerbook mouse pad. Through the customised software link, the action of moving through the virtual timeline of the video clip doubles as a manual controller for the pitch of a designated synthesiser sound on the first computer. The image then becomes an exaggerated virtual controller for the software-based musical action.

The actions of the hand have an ironic relationship to the “original” act of modulating a synthesiser sound by means of using a slider or button, in addition to resembling the mouse pad activity, which is being exaggerated in the image. In multimedia, action becomes data rather than being translated into another kind of equivalent energy. Most experimental MIDI performance tools and software are in some way about recovering that lost connection between action and equivalent motion by creating a gestural interface. When improvising with video, the problem becomes how to foreground its live-ness, so that the viewer experiences something distinct from film or video playback.

VJs, DJs, and Performance

It is in order to emphasise the physical gesture signifying performance that VJ culture, and VJ-dedicated software, like Camart’s ‘VJamm’ (VJamm 2004) exploits a concept of ‘scratching’ that derives from the DJ’s manual manipulation of vinyl LP discs on turntables. The name ‘VJ’ itself suggests this connection. The pioneering work of DJs like Kool Herc, Grandmaster Flash, and others in the seventies is still a vital cultural paradigm for expressive combinations of automated and human processes. Scratching and sampling in sonic culture are often seen as entirely synonymous, but the non-linearity of the original method – ‘scratching’ the needle on the disk permits reverse as well as forward motion in the groove – precedes the entirely different means by which non-linear data access is achieved in bit-encoded “digital” media. This could be an accelerated instance of Manovich’s example of avant-garde experiment anticipating mainstream technical change. In the performance of DJ duo Coldcut (Coldcut 2004), the foremost proponents of the VJamm software, the VJ/DJ correlation comes a full circle as video images of manual ‘scratching’ by DJs are themselves rhythmically (and virtually) scratched as part of the show, which includes other recorded musical instruments similarly audio-visually sampled and replayed into the live mix. Performance footage re

establishes the causal connection between the electronic, digital, and acoustic musical forms, although the sounds could be connected to any action at all, as in the prototypical MIDI example.

Audiovisual Interfaces

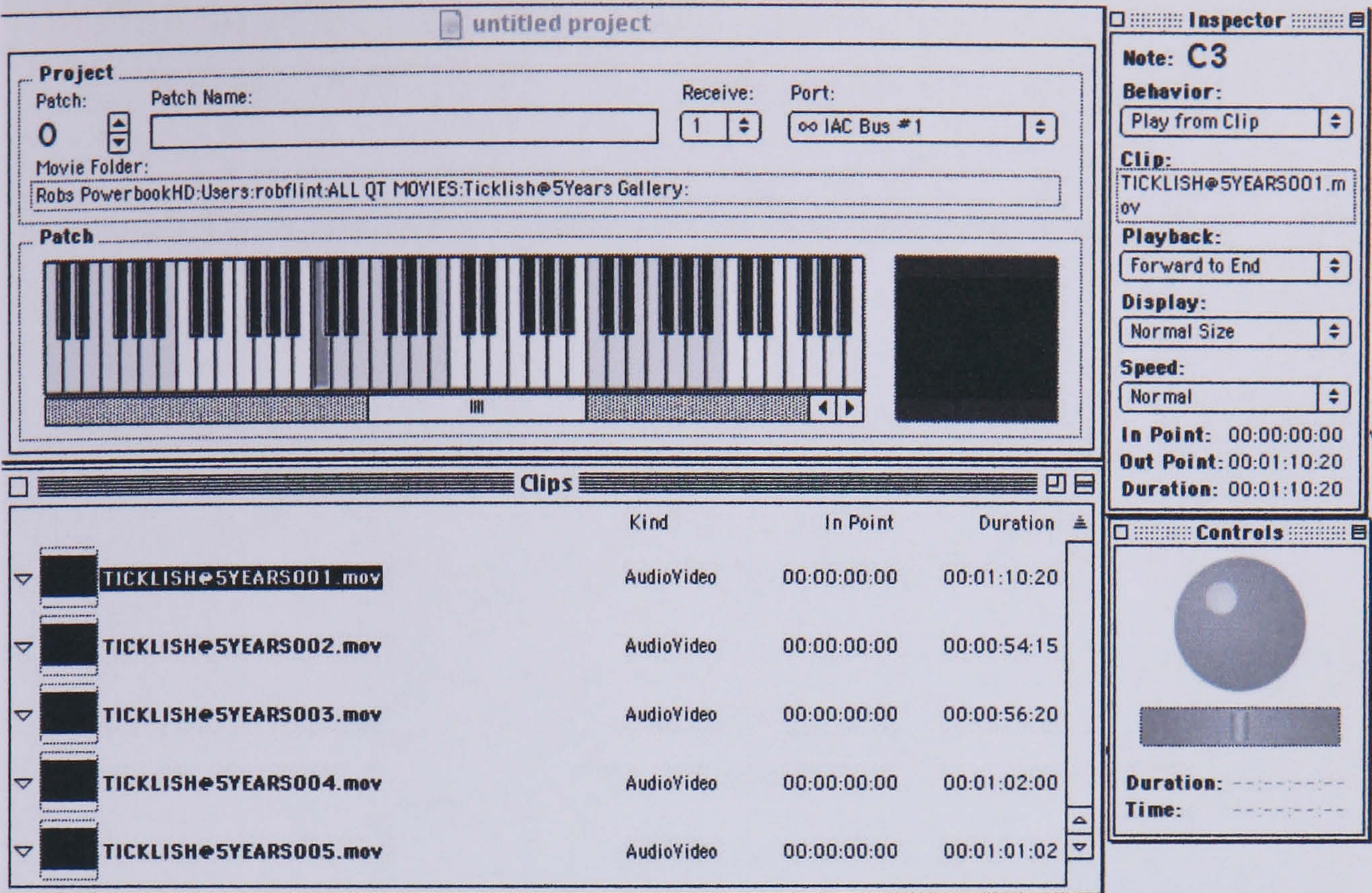


Figure 23: Desktop shot for ‘Vidvox Prophet’, video performance software.

– shows keyboard interface (Dekam, 2004)



Figure 24:Steina Vasulka performs *Violin Power*.

Screen image behind Steina shows video image, manipulated by violin actions with sonic output. Originally a MIDI violin controlled a video disc, but is now controlled using *Image/line*

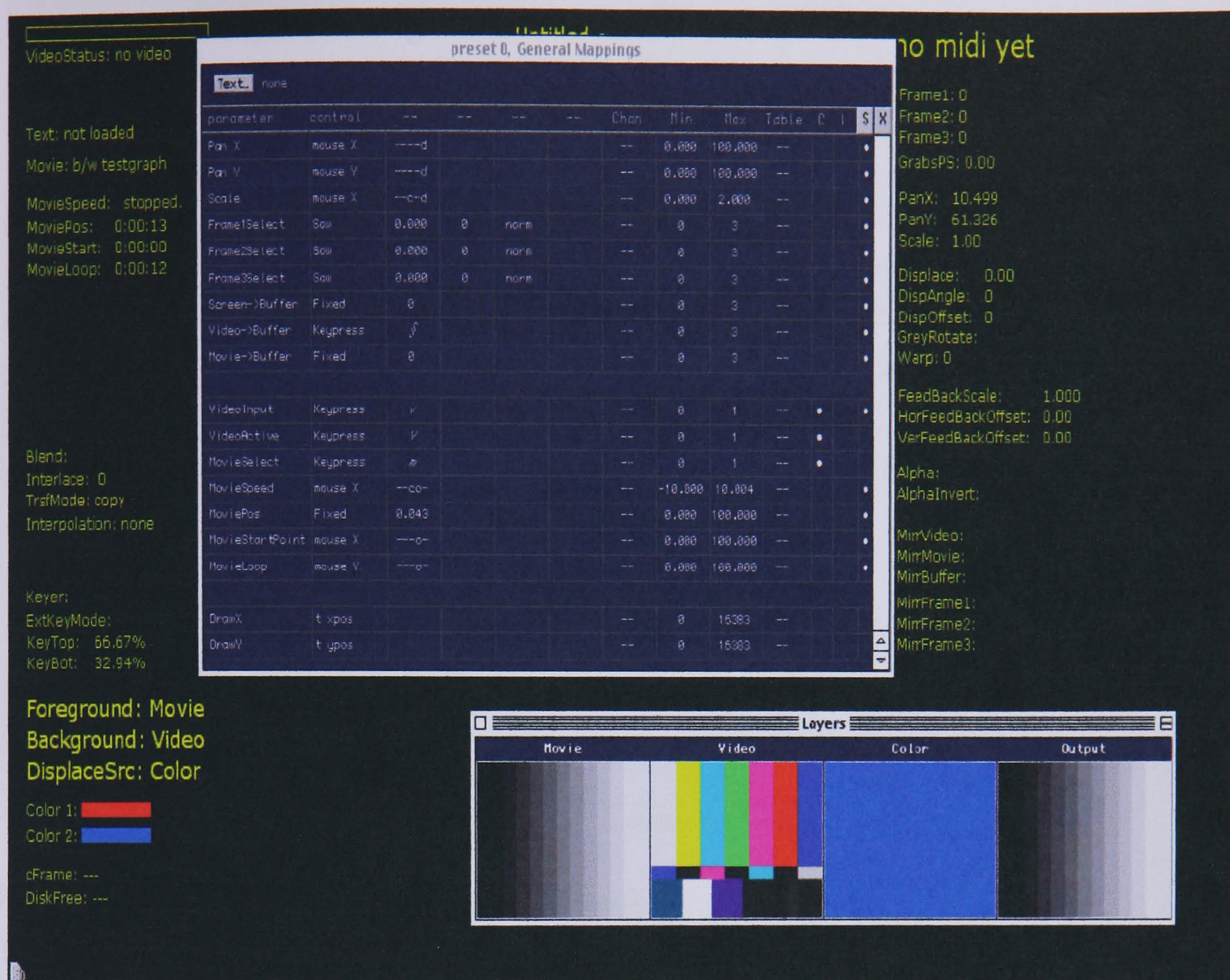


Figure 25: Tom Demeyer's *Image/ine* software.

Image/ine is a program that allows a user to manipulate visual source material in a live digital video environment: Video (live and sampled), QuickTime movies, text, scanned images, pict files with alpha channels and more (Demeyer 2002)

This screen grab shows the user interface, to be set-up for performance using the preset and mappings window, and the layers window showing three input sources ('input' may refer to an external source, like a camera, or an internal source, such as a QuickTime movie clip, or JPEG image, etc. In performance the set-up windows are hidden, and the yellow text against a black background gives information regarding the settings, the frame rate, etc, while the output is displayed external to the computer.

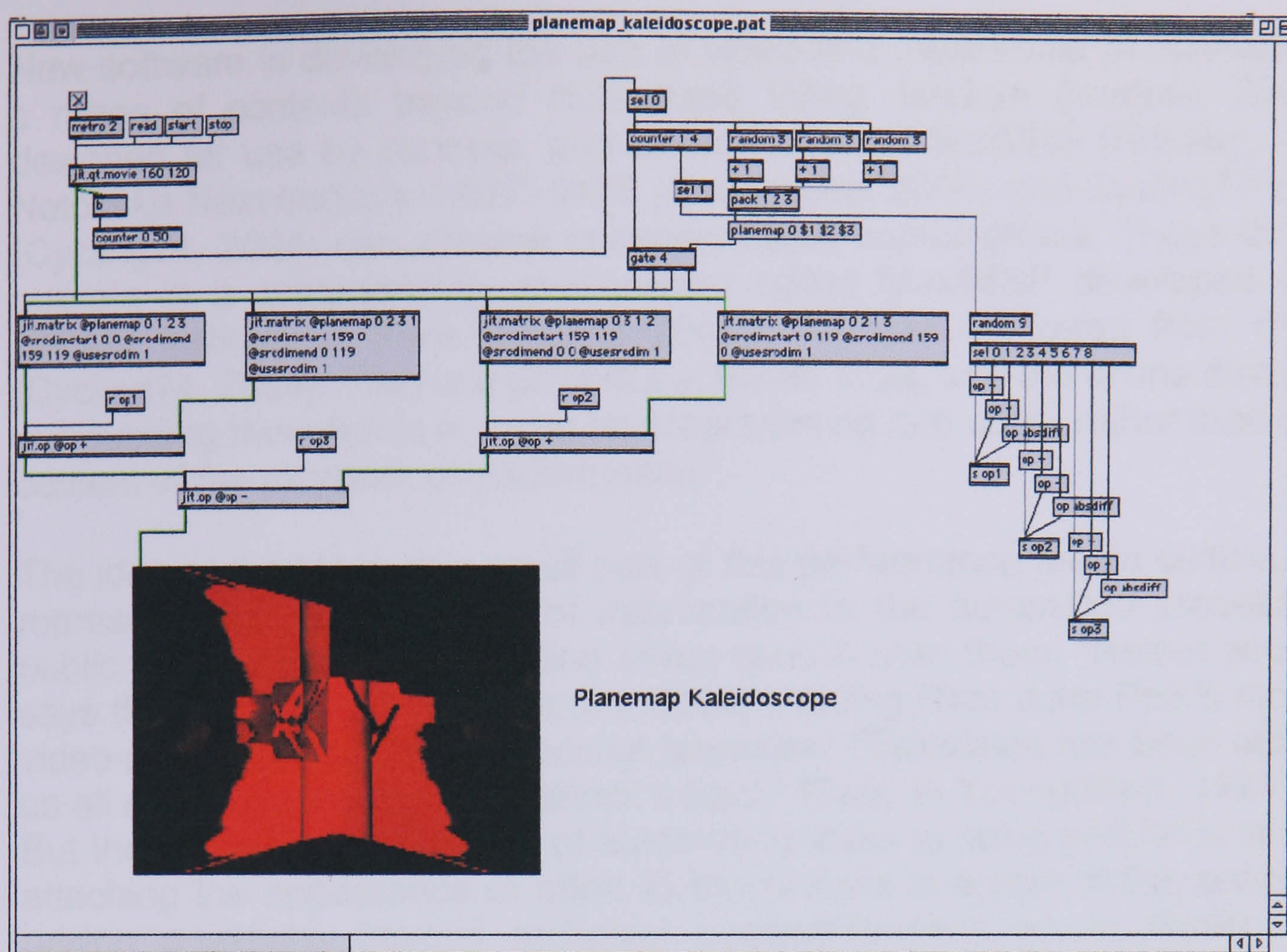


Figure 26:Max/MSP Jitter software from Cycling74.

This screen grab shows the 'patch' format, through which the user accesses the programming environment of Max/MSP. This interface is an example of an existing patch, and is highly adaptable. In spite of its origins in IRCAM and *musique concrete*, it is effectively a programming environment for multimedia of all kinds (Cycling74, 2004).

New software is developing the use of video and multimedia performance for a range of contexts beyond club-based VJing. Isadora (Isadora, 2004) is designed for use by dancers, and David Rokeby's SoftVNS (Rokeby, 2004), Netochka Nezvanova's NATO 0+55 (Nezvanova, 2004) and Cycling74's Jitter (Cycling74, 2004) can achieve complex media combinations. These three all operate in a programming environment called Max/MSP developed at the IRCAM institute in Paris (IRCAM 2004), but now marketed from the US (Cycling74, 2004). They are powerful software tools, and the online discussion surrounding them tends to focus on programming and code, rather than on the content of the playback or performance.

The idea of the VJ is only small part of this performance media culture, but it represents the popular form of intervention in the automated processes of public image culture by enacting some control over them. "Remix your TV!" says the VJamm website (VJamm, 2004) echoing Nam June Paik's model of video art as resistance to broadcast television: "Television has been attacking us all our lives...now we can attack it back" (Paik, in Youngblood, 1970: 302). But the contradictory dialectic of automating tasks to solve problems and then attaching the appearance of effort to those tasks is a part of this enactment, raising questions beyond technical accomplishment, as in music, where technique is only one part of a performed work. Why is it more interesting to watch someone wrestle with an instrument, instead of turning a dial, when the output might be sonically or visually identical? Art using combined media forms necessarily recognises and reflects on that dislocation.

The Specific Medium

While Sean Cubitt may assert, in his introduction to Malcolm LeGrice's collection of essays that: "...few, if any significant works of digital media art have been made using off-the-shelf software" (Cubitt, in LeGrice, 2001:x). the artist is also rarely the programmer of the entire work. The field of software as an art-form is a very new and tentative one, and the model of intervention in digital media is usually one of modification or of combination, rather than reduction. Even full-time expert programmers rarely create their tools from the ground up. Software is a hybrid form, borrowing code as well as concept from pre-existing forms. Even in an instance where a single piece of software is constructed by a solitary individual using a programming language, like LeGrice's own painstaking early work from 1969-1970 with Fortran 4 and a cathode-screen mounted camera (LeGrice, 1998, in LeGrice, 2001: 04), or Tom Demeyer's developments at STEIM in Amsterdam in the 1990s (see above), the running of the software itself relies on an computer operating system which is the work of others. The software itself, too is ultimately created as an "off the shelf" tool, albeit a non-mainstream shelf, with the idea that it is open enough to permit the creation of work not anticipated by the software designer. Re-purposing replaces outright subversion. Cubitt's response carries echoes of a critical culture in which the examination and exposure of the limits of a medium were a form of resistance to incorporation into the dominant ideology In film the most heightened form of this negation can be found in the activities of the Structuralist/Materialist group of

filmmakers, whose theoretical form is perhaps most austere argued in the films and writing of Peter Gidal.

Gidal's definition of materialist cinema lies entirely in its opposition to what he characterises as the "dominant cinema". Its structures - of character identification and narrative - are defined as: "...an illusionistic procedure, manipulatory, mystificatory, repressive..." (Gidal, in O'Pray, 1995: 146). In Gidal's manifesto, a fusion of Greenbergian medium-specificity with Derridean deconstruction is asserted against the distanced idealism of the structures of illusion, time suspension and the other artifices of the moving image. Practically this entailed a refusal to depict that was at the same time an examination of the form of the film medium through an exercise in deconstruction in the proper sense of the term, not meaning disassemblage, but a way of making that exposes the material structure of medium itself. Thus the sprocket holes, leader tape, claw mechanism, and other significant technical features were frequently foregrounded, while the conventions of mainstream narration and editing were either abandoned or radically inverted.

Expanded and Structuralist forms of cinema are historically close, but the ideological gulf between Youngblood and Gidal is huge. David James' analysis of Gidal places this in the transitional context of the sixties, with conflicting paradigms arising out of developing communications media and the diverse countercultural forms that concurrently resisted and embraced modernity, alongside a dominant theory of art practice that had developed from a displaced European Marxism (Greenberg via Adorno) gradually deprived of its revolutionary positivism:

Though it took place in a context that included exactly the obverse project, that is the proliferation of art activity bridging several mediums [sic] or taking place between them, the quasi-scientific demonstration of the axiomatic conditions of each medium, achieved by the elimination of its inessential conventions (typically entailing the expulsion from the art object of mimetic or discursive reference) was the paradigm within which sixties art was understood (James 1985: 278-9).

For digital media, the avant-garde model of defining axiomatic conditions is problematic. Despite its political basis in Marxism it runs the risk of valorising individualism over collective effort, and digital media are collective, in the way the production of movies is collective. How far would one have to go to "master" the digital process in its entirety? Even at the level of the complex switching operation of the microchip, decisions have been made that will affect the form of the output. The measure of autonomy may differ considerably, and the 'closed' nature of the encoded software environment remains problematic, but LeGrice, whose work spans the era of 'Film-as-Film,' 'Portapak' electronic video, and the recent fusion of video with software, recognises the necessary limitation of aims, while maintaining the investigation of medium-specific language:

"One...general characteristic of digital electronic media...is its capacity to incorporate other media and language systems while not being

incorporated by them... Faced with this level of incorporation, the artist may abandon media coherence acting as a post-modernist eclectic agent at the mercy of the prevailing context, or select a combination of media properties within which to develop a specific, if not intrinsic, basis of language (LeGrice, 1998, in LeGrice 2001:307).

Or, as Manovich puts it, defining 'Generation Flash' in 2002:

This generation is no longer is interested in "media critique" which preoccupied media artists of the last two decades; instead it is engaged in software critique... (Manovich, 2002: 1).

Where a piece of software is credited to a particular programmer, as in the case of Johnny Dekam, or Tom Demeyer, their role is often like that of an *auteur* director, who is conceptually driving the production, but does not operate all – if any – of the equipment. The degree of resistance or autonomy lies in the dialectic between tools and use, and when Steina Vasulka uses a piece of software developed at STEIM (*Violin Power* 1992-ongoing), just as when Woody Vasulka uses an analogue Rutt-Etra scan processor (*Reminiscence*, 1974) the work is a collaboration with the tool(s) and their makers in the same way a musician may work with a particular instrument. In the world of software art the goal of resistance to mainstream forms can quickly become heroic and techno-fetishistic celebration of technical, as opposed to technical skill.

My own use of sound and image media is not expert at the level of technological skill, so the level of technical intervention has been more concerned with repurposing existing tools or making work that reflects on some of the social conditions with which they make their meaning. The idea of flow, exemplified in the discussion of television in the first chapter, has been a consistent theme, and the use of methods of redirection, or of 'cuts' in the flow an objective. I attempted to use the problems of medium definition and liveness versus automation as productive questions in response to a commission in Paris in autumn 2004.

Chapter Five

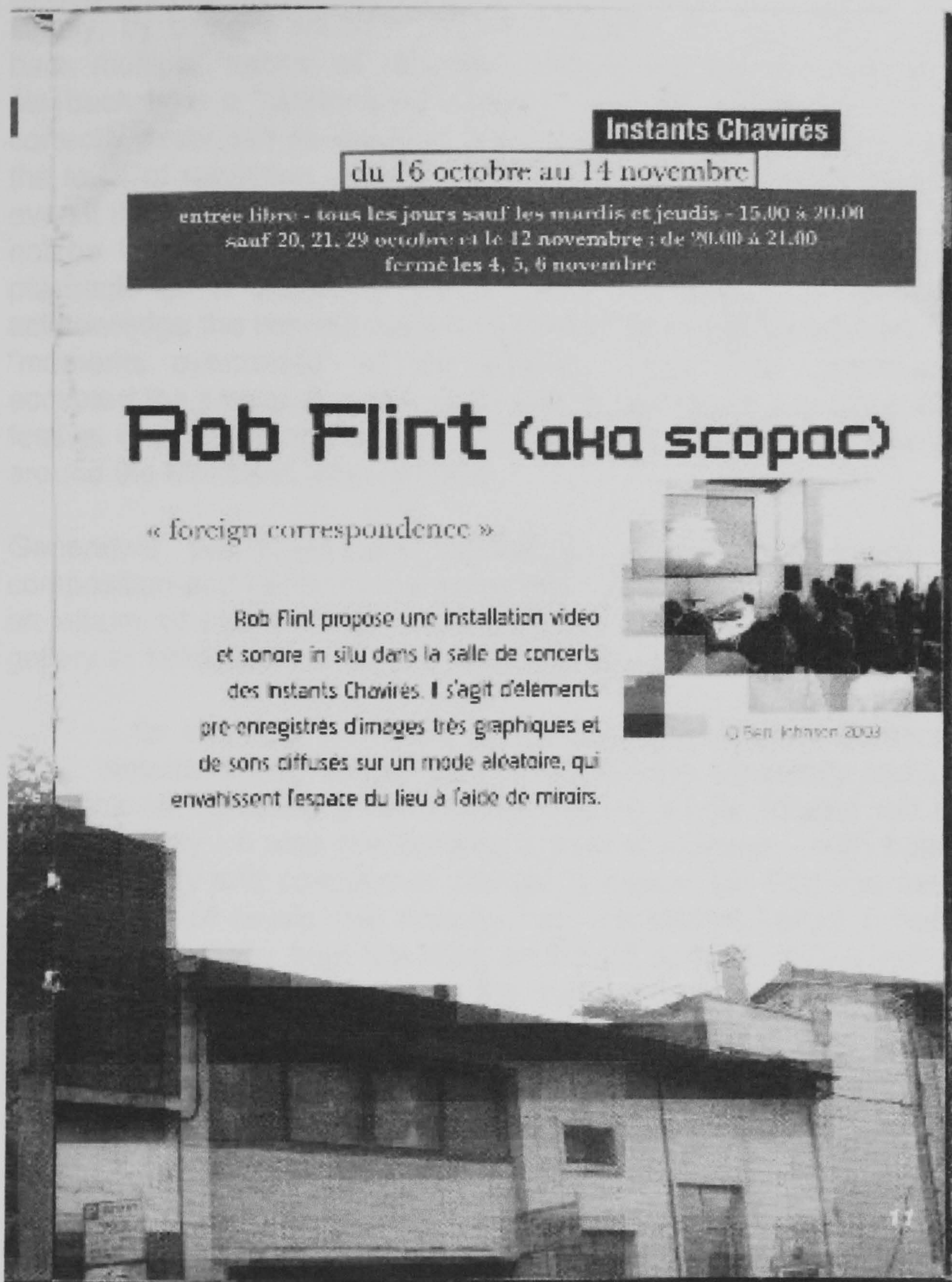


Figure 27: Instants Chavirés, Paris, 16 October – 14th November 2004

Foreign Correspondence – Project Development

Foreign Correspondence was developed as response to an invitation to screen recordings of some of my work at a venue in Paris—*Instants Chavirés*—well known for performances of improvised music and electronic sound (Instant Chavirés, 2004). Instead of screening an existing recording, I

proposed a project that would combine elements of my research into working with images in real time in response to musicians and sound performers, but present it instead as a constantly changing installation – unpredictable, despite it being a playback of recorded material. This would be achieved very simply, by using a random playback function on two DVD players, playing back multiple ‘tracks’ of recorded audiovisual source material. In fact the playback from a ‘randomised’ menu on a DVD player is not mathematically correctly described as random, but the duration of the work (one month) and the level of repetition, meant that identical patterns would not be noticeable even if they were to occur. The intention was simply that the experience would not be humanly predictable nor have a finite length, as it would with the playback of a screened piece. This unpredictability was intended to acknowledge the importance of live performance – of spontaneity, the aleatory “moments overturned” of the space’s name. The commissioning team accepted the proposal, and it was decided to include it in *Lieux Communs* – a festival of performance and *installations sonore* that would take place in and around the Montreuil area of Paris.

Generative processes are central to experimental music and sound composition and performance since the 1960s. Brian Eno, in the liner notes to an album of sounds that formed part of a show at London’s White Cube gallery in 1998 outlines the process very clearly:

...for example a number of tapeloops of different duration all playing simultaneously so that their overlays were constantly and unpredictably novel...Effectively this means that no single listener will hear it in its entirety...It was like building a natural process – with both *continuous identity* and *continuous change*. It means too that you set in motion a piece of music that nobody had ‘composed before it happened...the shift is away from the artist as the full specifier of the work and toward the idea of the artist as the instigator of the process. It also implies something else: works that are always unfinished, always in the process of forming (Eno, 1998).

Eno’s generative process is a simple playback one, and, partly owing to limitations of time and budget, so was mine. Other artists before and since have used the generative model developed through software programming to create aleatory music, as in the case of Jem Finer’s Artangel funded *Longplayer* (2000-3000) set to run for a thousand years, or Stan Douglas’ multi-stranded film and video work *Win Place or Show* (1998), in which segments of a narrative involving two men fighting and gambling in a Vancouver apartment are automatically re-edited into sequences that will not repeat themselves for 20,000 years, according to Tate publicity. Douglas’ use of randomised narrative is a kind of digital counterpart to those nineteenth century cards with images designed to join at either side to create an infinite landscape or street scene. Known as “myrioramas” these originated in Leipzig in the 1830s, and were a popular children’s pastime (Nekes, 2004:218).

For similar reasons I developed more than one set of ideas to address the “Foreign Correspondences” of the works title – the arbitrary juxtaposing of

related modes and senses in a multi-mediated world. I intended for there to be unexpected relationships thrown up between different sounds and images in the initial recording and editing process, then a second set of unexpected juxtaposition once the two sound and image sources were played back.

Sound

I was interested in the idea of transposing my actions as an image-to-sound improviser onto sounds that were not necessarily music, nor intended as performative sounds. This was to effect a re-purposing of the familiar role of visual accompanist that is part of the VJ culture described earlier in this chapter. I also wanted to address the value of the synaesthesia tradition as a motivating idea for new kinds of audiovisual thinking, without its universalising tendency.

The idea of using sounds dislocated from their source has a history as old as electronic sound itself. Douglas Kahn describes this fantasy of wirelessness appearing in a story by Guillaume Apollinaire of 1916, called 'The Moon King' in which visitors to the court of an underground king were regaled with performance on a keyboard that conjured up sounds from around the world – dawn in Japan, hot geysers in New Zealand (Kahn, in Kahn, Gregory, eds. 1992: 22-23) while Walter Ruttmann's imageless film 'Weekend' of 1928 used montaged sound on a film soundtrack to create a sound-image of a family weekend outing. Composer Pierre Shaeffer inaugurated *Musique concrete* with the use of phonographic recordings of a train station in *Etudes Aux Chemins De Fer* of 1948 and likewise Pierre Henry, and Michel Chion created formal compositions from recordings of 'acousmatic' sound:

Acousmatic: Pertaining to sound one hears without seeing its source. Radio and telephone are acousmatic media. In a film, an offscreen sound is acousmatic" (Chion, 1996, Glossary).

My use of field recording and unperformed sound was not intended as a replay of the Cagean idea of re-designating all sound as music, thus elevating their status and expanding the category or definition of what constitutes "music." Instead I wanted to adapt the "visual music" tradition of animation (described elsewhere in this thesis) that responds to or interacts synergetically with music, but to expand its scope into a wider range of sounds. A contemporary counterpart to the audiovisual animations of Ruttmann, Fischinger, Lye, McLaren, and others can be found in the music video and the real time image manipulation of the VJ, a context that I had explored, and found a very narrow field of possibility, since its basis in dance music meant that it was usually characterized by beat response and repetition. I intended to replace this with sound that – while still characterized by strong contrasts, allowing a clear discernable relationship between sound and image – tended toward a-rhythmic unpredictability. I also wanted see how it would appear to create kinetic images, in the manner of the animator and the VJ, to sounds that were not characteristically musical. Richard Murray Schafer uses the term 'schizophonia' to describe sound removed from its natural context (Schafer, 1977:88) and while his definition is ultimately a negative one, this

kind of dislocation was more important to the work than their being given a new home or status. In a wider context the concept of arbitrary juxtaposition has a history as old as modernism, from Dada & Surrealist dislocations to the Constructivist and Eisensteinian “shocks” of montage. This too, was a “making strange” of the way in which entirely separate phenomena are brought together and given equivalence in new media forms. This abstract equivalence is a central principle of bit-encoded software-based multimedia. I was also interested in developing Eisenstein’s idea of a contrapuntal relation of sound and image (Eisenstein, *et al* , 1928) along a different axis, creating a counterpoint of indexical and non-indexical signs, concrete sound and abstract image, to see how the counterpoint affects the outcome of the sum of the two parts.

I would gather sound, as field recording, choosing or creating sounds that were high in contrasts, in terms of their intensity, pitch, and duration. Then I would playback the sounds in the exhibition/performance space, and work with them in real time, as in a live performance, making video footage combined with the soundtrack, creating the correspondences between foreign elements that gives the work its title. This material would then be recorded and edited onto the DVD, having been cut into sections of differing lengths. These constituted the randomized playback ‘tracks.’

Image

Unlike the sound, the image would not be taken from the world indexically (via a lens) but be generated entirely from the electronic and encoded tools of the video mixing desk and various different forms of software, particularly *Image/line*, and *Jitter*. The image would take the form of lines, writing, and drawing, using a graphic pen and pad, and they would be white or grayscale, and would not reach the edge of the projected screen-image. The image forms would be a simplified version of the range of techniques I had devised, using combinations of hardware and software, to respond to sound as performance in, for example, the **Soap Bubble Set** (2003) (DVD: **Chapter Four: Soap Bubble Set**).

The video projectors were to be used non-cinematically – angled across two walls, or across wall and ceiling, ceiling and floor. Once positioned, they would remain fixed. Marker points would be made on wall and an anchoring video image to allow them to be repositioned. A mirror would be positioned along one wall to displace the light source further.

Works by Anthony McCall, Lis Rhodes, and Tim Head, artists of the Filmaktion group in England, have all used film projectors in ways that depart from the cinematic to draw attention to the space, or to the action of the film apparatus within it, attending to what Malcom LeGrice has called “the projection situation as material event” (Le Grice, 2001:167). McCall’s *Line Describing A Con*, for example, uses the light from the film camera spatially, as the solid forms described by the beam of light cutting through the darkened space take on an architectural form of equal importance to the temporary mark made on the wall. But the light from a video projector is far less concentrated than that of a film projector. It is essentially a slide projector whose ‘slide’ is a

translucent plasma screen, therefore the light is diffused and the appearance of the solid beam of light in the room is less strong. This too, is the reason why video projectors require such powerful and fragile light bulbs, with their noisy fan mechanisms. In contrast with the cine projector, however, it is an instrument that can be used directly for drawing with light in an entirely literal way. Its function is already diversified between a supplementation of the cinematic image, an amplifier of the television image, or a screen for representing combined information in the manner of Bolter and Grusin's "hypermedia". Image combinations can include text, moving image from diverse encoded sources, and writing and drawing. The basic concept for **Foreign Correspondence** had been the idea of drawing impermanently on the walls of the space with a kind of graffiti – *griffonages* that would be absolutely specific to the space.

Developing methods from audiovisual performances like **Soap Bubble Set** (DVD One: Chapter Four: Soap Bubble Set), using the graphic pen and pad attached to the computer I would draw in white against a black background. Since the black effectively masked the projection light, white light would be drawn on the surfaces of the room. The light writing and drawing would be used to pick out features of the room, tracing edges of walls, window frames, etc. This would be determined spontaneously in the space as part of the real-time creation of the work. At the same time, the recorded sounds would be played back, and their characteristics - in particular their intensity (volume) and pitch (frequency) - would affect the image in ways that would disturb its clarity or its shape. A line might be distorted, or its intensity depend on the intensity of a sound. The software settings that determine these changes are made as simple as possible to reduce the latency of the audiovisual response. The intention is to explore the space, and the audiovisual juxtaposition, not the software.

Audio Response

Two standard ways of visualising (measuring) sound intensity are an oscilloscopic waveform, or the movements of the needle on a dial. These are only conventional responses, but they are indexically linked to their cause. On a computer, the software performs an analysis of the input sound and generates a synthesised numeric equivalence, prompting the graphic tools to respond as programmed. These correlations are – like the pseudo-synaesthesia of all multi-media tools since the development of MIDI (see earlier discussion) – entirely arbitrary, yet causally and inextricably linked. The computer creates an abstract value common to both modes in order to generate comparable variations. In synaesthesia proper, as far as research can determine, the connection between the interlinked senses is absolutely consistent for the subject, but absolutely arbitrary as a standard for others, whether synaesthete or not. Multimedia tools create this same combination of

arbitrary but consistent links. Two disparate phenomena can now be linked to playback synchronously with unprecedented accuracy. The moving scribbles in the space would register the sounds to make illogical and uninformative equivalents to these measurements. The machine describing the sound interrupts the machine describing the space. Since the events are concurrent, these interruptions arbitrarily form a correspondence between the two.

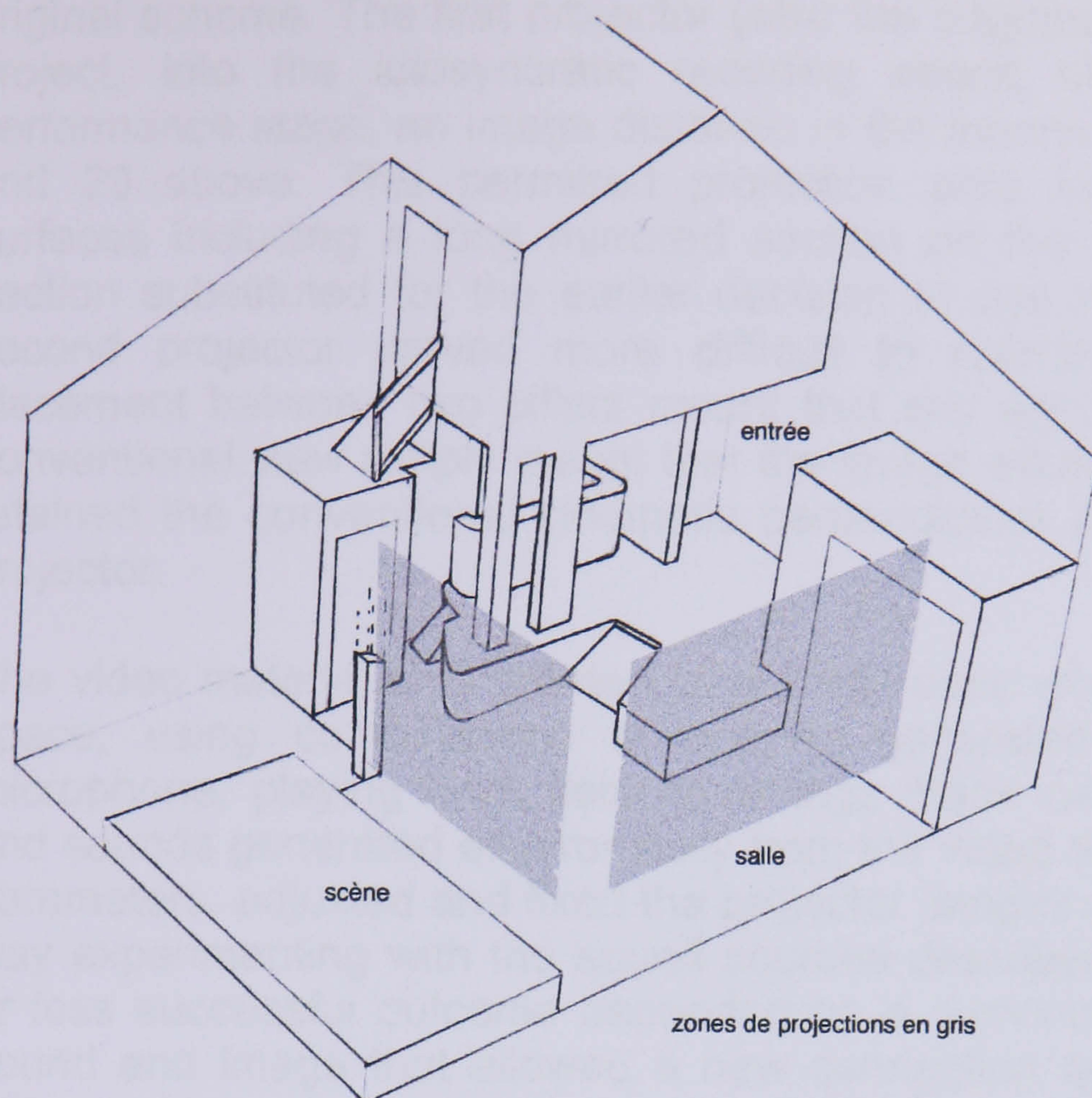


Figure 28: Instants Chavirés Floor Plan, showing usual projections in grey

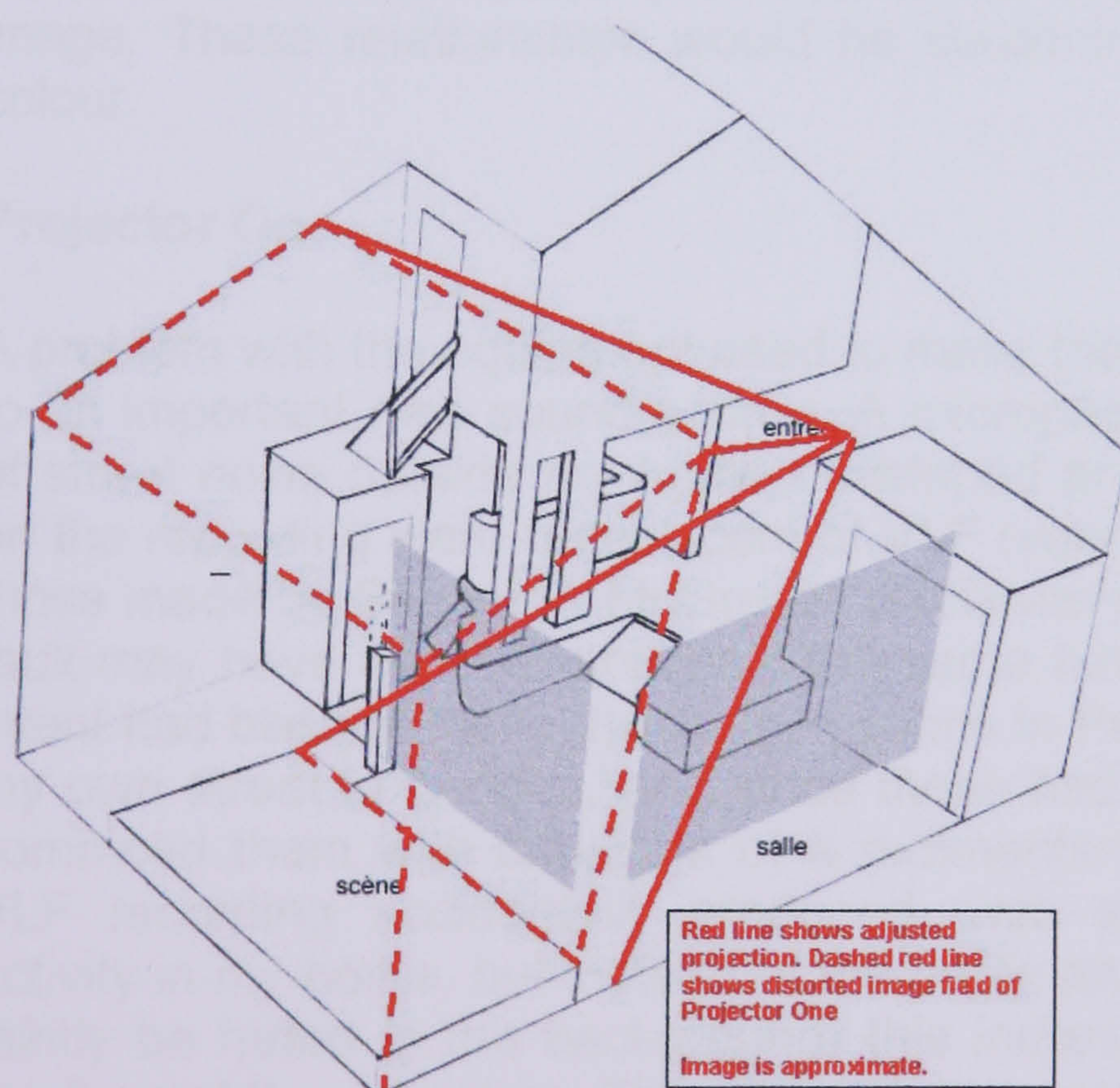


Figure 29: Instants Chavirés Floor Plan, showing *Foreign Correspondence* projection image in red.

Development

The practical development of the work necessarily involved adaptation of the original scheme. The first projector (also the brightest) was easily modified to project, into the idiosyncratic receding space of the *Instants Chavirés* performance stage, an image distorted in the manner illustrated in Figures 28 and 29 above. This permitted projection onto five distinctly demarcated surfaces including a long mirrored section on the near wall. This mirrored section substituted for the earlier decision to use freestanding mirrors. The second projector proved more difficult to rearrange, however, since its placement between two pillars meant that any significant deviation from the conventional view simply meant that the image would be blocked. Therefore I retained the conventional cinematic perpendicular projection on this second projector.

The video material was created over three days working continuously in the space, using combinations of sounds generated on the spot using a microphone, playing back field recordings made near my home in London, and sounds generated electronically from the video signal. Having defined the parameters, adjusted and fixed the projector images I then worked an intuitive way experimenting with the sound sources described. The definition of more or less successful outcome depended on a convincing relationship between sound and image that allowed a new connection or meaning from the two. This would determine which material would survive the editing process to form part of the aleatory DVD playback.

I also decided that all the video material would be primarily monochrome, in order to attend more clearly on the relationship between the sound and the image. These relationships would be determined by motion, rather than by colour.

Projector One

A problem with the equipment used to make the field recording led by accident to an important new sound source. A microphone used to create a recording of street noise outside my home developed an intermittent fault. The sounds on the recording were reminiscent of VLF (very low frequency) recordings like those made by Steven P. McGreevy (McGreevy, 1999), and it is likely that the fault may have enabled precisely the same function in the mike. The original intent had been to make the image actions in Paris correspond to the sound of my own street in London, and since these had been recorded at my home, I combined them with drawings of a rudimentary house, table and chair. The VLF recording accidentally produced, was still an indexical recording of activity in my home, but instead of the traffic and street activity (which can still faintly be heard in the background) this indexed the electrical activity during the time of the recording. The intermittent crackling would be used to redefine the image parameters by reducing the pixel ratio of the video picture, creating a violent distortion of the screen image each time the volume levels were raised above a prescribed threshold. The house drawing followed the lines of the walls ceiling and floor into a real three dimensional depth, and the flattening of the image in response to the sound caused a complex set of changes in the true depth of the space, the illusory depth of the drawing, and

the flat rectangle of the whole projection image distorted over five surfaces (See Figure 29, above).

This formed a discrete sequence on the DVD. (**DVD 2: Projector One: house drawing**)

A further set of sequences derived from experimentation with a functional microphone in the space. I wanted an additional contrast between electronic effects and images to be joined to acoustic human sounds of breath and speech. I began by using my voice to create sounds that mimicked the action of the drawn line or moving light. Initially “mickey-mousing” (Chion, 1994:21-2), I followed the passage up and down with higher or lower sounds. Then I developed the relationship away from a simple logic, so that variations in volume, some entirely arbitrary alteration of tone coincided with a change in the shape of the projected image object, giving it varieties of character, from hectic to sinister.

In addition to this a series of movements were edited to close-miked breathing sounds and edited into a sequence so that the pool of light at the rear of the stage faded and reappeared with the sounds of breathing. Using the microphone and amplification in the space in which it was to be replayed engaged directly with the rooms resonant frequencies, which are quite marked, given the unusual shape of the ceiling and stage space.

These were edited into a number of sequences of differing lengths on the DVD (**DVD 2: Projector One: vocal sounds, DVD Two: Projector One: video documentation: vocal sounds 2, DVD 2: Projector One: breath**)

A further sequence used the picture-in-picture transition window described in an earlier chapter (with an entirely black frame in the A channel, and a low-lux feedback in the second, edged in white. The motion of the transition was then effectively a series of rectangular boxes opening and closing as the empty transition windows made their way from channel A to channel B, with the feedback causing a recessive repetition of the lines in channel B. This use of ‘empty transitions’ was developed through the live performance work described in Chapter 4. The development of the transitions available in the Panasonic MX50 video mixing desk/switcher is the result of a simulation of effects previously attained through the work of special effects pioneers like Norman O. Dawn, or Linston Dunn, whose optical printer made widely available the film wipes, fades, mattes and multiple exposure images that are commonplace in the language of film editing. A recording of street sounds from my home in London was synchronised with the passage from one channel to the other, so that the volume rose and fell with the motion of the lines indicating the windows. In combination the entirely non-pictorial white lines became pseudo-causally linked to the passing traffic sounds, so that the slow movement of the transition windows echoed the lines of light that move on the ceiling at night when traffic on the street passes the window. This process developed experimentally and I had no prior conceptual intent for this associative link, but once developed I emphasised the connection in deliberate relation to the Delauney series of “Windows Open Simultaneously”

referenced in the earliest installation in Chapter One. The abstracted relationship of video transition windows to real windows also seemed to parallel the abstracted relationship of sound to image causation. Like the very early **Cave** installation (see Chapter One) it related to a simple visual experience, this time from inside of a building, with the light of traffic coming from outside via the very rudimentary projection created by passing vehicle lights to be refracted through the windows, creating long lines of light that pass across the ceiling and floor as the traffic goes by.

This formed a discrete sequence on the DVD (**DVD 2: Projector One: traffic transition windows**).

The early conception of scribbling – “*griffonages*” – in the space was developed with the vocal sounds using the live mike, so that the sound of the scribbling is amplified with the visual action (**DVD 2: Projector One: scribbled column**), and tracing the vocal “actions” in an adaption of cartoon “mickeymousing” (**DVD 2: Projector One: scribbled speech**).

Probably the most literal link between the concept of electronic flow and the liquid form that provides the analogy is made in a short sequence where video feedback is paired with the sound of waves on a pebbled beach (**DVD 2: Projector One: feedback sea**).

I used feedback again in the following sequence, which was heavily influenced by the sound image work discussed in Chapter Three earlier, particularly having seen a composite work (*Orbital Obsessions*) by Steina Vasulka, in which the sound was a direct output from the video image. It was a means of generating an image of flow unmediated by camera technology. Sending the video signal from the video mixing desk to the audio amplifier, as well as to the projector, created a sequence contrasting with the previous through its entirely causal, indexical relationship between sound and light.

We were interested in the absolute interference of sound and image. That’s when we realised that there didn’t have to be a camera – a voltage, a frequency could create an image (Vasulka, S. 1978:23).

Because both sound and image were created by the same level and pattern of voltage, the one is an index of the other, or perhaps more accurately they are both indexical signs whose referent is the electrical signal, itself an indexical sign whose referent is the movement of electrons. A white matte was set over a monochrome desk output-to-input feedback signal, and the lux levels adjusted between very slight increments to create noisy passages of change from light to dark. The monochrome video signal allowed a very clear relationship to be made between sound and image, as the increased voltage in a brighter image created sounds of greater intensity accentuated by a live microphone peaking on the edge of feedback. ‘Playing’ the sound-image involved adjustment of the lux levels, the crossfade levels between A and B channels, and the level of the white matte generated by the video feedback.

Moving a transition window onto a channel of white-matted feedback created a second sequence. The movement of the mass of white matte video feedback across the space created the illusory sense that the sound was moving with it, despite the fact that the sound signal was two-channel monophonic.

In this last pair of sequences, despite being a immediate rather than manufactured relationship between sound and image, it was dependant on entirely machinic, electronic means, referring inwardly to the automatic processes rather than the material world invoked in the imagination by traffic sounds or breathing and other vocal sounds.

I recorded a short performance in the space before it was set for the month long installation (**DVD 2: Projector One: untitled sonimage feedback performance**), and a sequence of this activity was added into the playback sequence (**DVD 2: Projector One: feedback sound image**).

Passages of blank silent frames of between ten seconds and four minutes were inserted between the sections for the installation.

Projector Two

For the second projector, I created a series of recordings of the tap pouring water into the sink behind the bar in the Instants Chavirés space. The sink was aluminium and the drop between tap and sink was about 18 inches. I made several recordings adjusting the volume of the sound and the rate of the tap. I wanted to make the fairly obvious connection between the two forms of flow – of the playback media and of the water. As I recorded the sound I adjusted the aliasing (the pixel ratio of an image of a waveform that was responding to the water sounds in the same manner as I had with the first sequence on projector one. This was edited onto an hour long DVD sequence in short sections of between half and thirty seconds, with much longer sections of blank silent frames (**DVD 2: Projector Two: projector 2 excerpt**).

There would be moments when there was no sound and image, and moments when only one projector/audio output was active. The water flow would be cut so that it would form an interruption in the automated flow of the other sound and image material on Projector One.

Conclusion

The installation **Foreign Correspondence** was proposed and commissioned as an experimental work, intended to incorporate accident, and create a 'generative' composition from the encounter between different audiovisual sources. It seemed a good opportunity to make material that drew on my experience of spontaneous improvisation with image and sound, since it was this work that had prompted the invitation.

It was also a way to bring together the strands of the various research questions relating to the flow of electronic media, addressing the difficulty of making work that defined characteristics of form in these media, with the

influential history of work that explores the relationship between sound and image combined in film and video.

The work was not a final resolution of the research questions relating to flow and interventionist models of practice, but the opposing models consciously informed the way the work was carried out. In many ways, too, **Foreign Correspondence** returned to themes raised in the much earlier work **Cave**, through its relation to a experiential model of an outside world experienced from within a defined space, particularly in the section deploying traffic sounds against an empty transition window sequence. But it made use of the range of work I had carried out since. While this was not a 'live' performance, the use of video in live improvisation had informed my use of sound and image in combination, and the installation material was created in the same direct way that my audiovisual performance is made. This was a conscious adaptation of the role of video as a collaborative accompaniment to music discussed in the third and fourth chapters, towards collaboration with other kinds of sound. As a practical model, music performance can employ both the prolongation of flow – the historic example of the DJ extending the 'breaks' – and its interruption, through the deliberate re-direction of existing tools and sources – like the extended technique of the improvising musician. 'Mickeymousing' can be clichéd and predictably literal, but in this work I wanted the automated image-to-sound response to have a more unexpected relationship.

The absolutism of mystical synaesthesia forms a strange partnership with the absolutism of modernist medium-specificity. But although digitally encoded multi-media seem to resist Greenberg's formulation or the critical foregrounding of materials, paradoxical juxtapositions of synchronized sound and image can serve to highlight this inherent arbitrary characteristic of its formless form. Through combination with other actions and elements in physical space it can also be used to resist the tendency for software art to exist simply as a demonstration of its own function. By making the work in the exhibiting space, and referring to its specific characteristics and scale in the altered projection work, I drew attention to the screen as a kind of writing with light rather than an indexical picture of the world. This was highlighted by the contrasting use of recorded sound that did refer indexically to an external world. This was a conscious diversion of the conventional use of sound in film and television, in which composite sound combinations are frequently used to supplement indexically generated camera images.

Each of the individual sections in **Foreign Correspondence's** continuous playback grew from areas investigated in the research. The use of feedback as an audio-responsive form, developed from research into examples in Youngblood and Pellegrino, was purposefully combined with the idea of the sound-image developed by the Vasulkas and linked to the history of sound visualised. The use of vocal sound as a spontaneous interplay with audio-responsive software and hardware grew out of research into the automated interfaces of video performance software dedicated to playing new machines with old gestures. The union of amplified voice with responsive image echoes the early phonautograph, but also countered the comfortably reciprocal

systems of rhythmic equivalence set up by conventional music video and VJ performance.

More critically, and perhaps as a result of the diverse strands in the research, the installation may have attempted too many different combinatory forms. Each section offers a potential for development into other more specifically focussed works, and future development of my work will develop the separate strands in more complex ways. The role of colour, too, has been set aside to concentrate on the haptic or physical interaction with the sound image, and this too, could form a future research area. The changes in commercial production during this research suggest that the real time processing of, and intervention in, image flow, will increasingly characterise the daily use of new combinations of television, Internet and other information media. The "...preoccupation of the last hundred years has been toward a *musicalization* of visual art," argued John Whitney (Whitney, cited Pellegrino, 1983:16), but this "musicalization" of the visual image is not the discovery of a hidden harmonic correspondence between light and sound, but the creation of new correspondences through the convergence of tools through which image and light, music and sound are synthesised and manipulated.

Whether or not this convergence is understood as alienated or schizoid in its cultural form, the union of audiovisual media into an all-embracing multimedia model presents challenges for anyone who wishes to develop analytical work that does not simply repeat automated processes, "...to produce a mere catalogue of possible imaging techniques" (Turim, in Kaplan, 1983:133). Critical and analytical kinds of underground, avant-garde, and experimental film making could, like the static image media that had preceded them, locate their activity within a clear set of technological and cultural forms, from the gallery to the cinema, the context enabled the work to speak, even if that speech was a refusal to speak in the way the context requested. "The role of the cine-club..." argues Lawler "...in forming the avant-garde film movement is comparable to that being played by the art gallery in the development of modern painting" (Lawler, 1975:85). By contrast, the already-superseded technology of video was absorbed into the formlessness of multimedia during the time of this research project, and the attempt to define it became a definition of the thing into which it had been absorbed: "...the condition of digital abstraction, where all data fundamentally loses its identity..." (LeGrice, 1998 in LeGrice, 2001:305). Avant-garde practices, similarly, are absorbed into technical forms, as Lev Manovich argues: "...*avant-garde becomes materialised in a computer*" (Manovich, 2001:301 – author's italics). But the human processes through which these forms are known have not changed. "In one respect the notion of medium specificity can survive the digital..." argues LeGrice, "Whatever technology is used...there must be some interface with human perception" (LeGrice, 2004:7). The physical relationship to light and sound rendered plastic by increasingly sophisticated tools of automation and repetition presents a means by which their machinic nature can be negotiated, resisted or redirected. There is a tradition in popular music, as strongly as in the artistic avant-garde, of using performance and spontaneity as ambiguous forms, which allow a transient autonomy from the machine processes of repetition and replication to restore to the work of art: "...its

unique existence at the place where it happens to be” (Benjamin 1936, in Zohn, 1973:222). The combination of intuitive and spontaneous working methods, so out of place in recent conceptual art, but so prevalent in music, can be employed without returning to a naïve expressivity. My future activity will work to bring those two different kinds of practice together.

Bibliography

- Adorno, Theodor, W. and Horkheimer, Max (1944) *Enlightenment as Mass Deception*, in Dialectic of Enlightenment. London: Verso, 1979.
- Altman, Rick, ed. (1992) Sound Theory, Sound Practice, London: Routledge.
- Arkaos (2004) *Interactive Visual Technologies* [Internet] <<http://www.arkaos.net/>> [Accessed 8/10/2004].
- Armes, Roy (1988) On Video, London: Routledge.
- Attali, Jaques (1985) Noise, The Political Economy of Music. (trans. Brian Massumi) Manchester: Manchester University Press.
- Bailey, Derek (1992) Improvisation - Its Nature and Practice in Music. London: The British Library National Sound Archive.
- Baron-Cohen, Simon and John E Harrison, eds. (1997) Synaesthesia: Classic and Contemporary Readings. Oxford: Blackwell.
- Battcock, Gregory, ed. (1978) New Artist's Video - A Critical Anthology. New York: Dutton.
- Baudelaire, Charles, (1863)*The Painter of Modern Life*, in Mayne, Jonathan (trans) 1964 The Painter of Modern Life and Other Essays. London: Phaidon.
- Bazin, André (1967) What is Cinema? (trans. Hugh Gray) Berkeley, CA: University of California Press.
- Beech, David (2000) *Video after Diderot*, Art Monthly, Vol. 227 No. 7
- Benjamin, Walter (1936) *The Work of Art in the Age of Mechanical Reproduction*, IN: Benjamin, Walter (trans. Harry Zohn,)1973 Illuminations. London: Fontana.
- Benjamin, Walter (1939) *On Some Motifs in Baudelaire*, IN: Benjamin, Walter (trans. Harry Zohn), 1973 Illuminations. London: Fontana.
- Bergson, Henri (1910) Time and Free Will: An Essay on the Immediate Data of Consciousness. (trans. F.L. Pogson), London: George Allen and Unwin.
- Bergson, Henri. (1907) Creative Evolution. (trans. Arthur Mitchell), New York: Henry Holt and Company, 1911.
- Bishop, Bainbridge (1893) [Internet] *A Souvenir of the Color Organ, with Some Suggestions in Regard to the Soul of the Rainbow and the Harmony of Light*

Available from: <<http://www.rhythmiclight.com/books/HarmonyOfLight.pdf>> [Accessed 7/9/2004].

Bolter, David J. and Richard Grusin (1999) Remediations: Understanding New Media. Cambridge, Mass: MIT Press

Boyle, Mark, (1970) Journey to Surface of the Earth. 12 July 1970 Cologne: Edition Hansjorg Mayer.

Bowron, Astrid (1998) *Gustav Metzger*, in Brougher, Kerry, and Bowron Astrid, eds. Gustav Metzger. Oxford: Museum of Modern Art.

Bull, Micheal, and Back, Les (2003) The Auditory Culture Reader. Oxford: Berg.

Braeuer, Gerhard (1980) *The Science Behind 'Old Brain' Art*, IN: Len Lye: a Personal Mythology. Auckland: Auckland City Art Gallery.

Bressloff, Paul C. Cowan, Jack D., Golubitsky, Martin, Thomas, Peter J., Weiner, Matthew C. (2002) [Internet] *What Geometric Visual Hallucinations Tell Us about the Visual Cortex*, Neural Computation 14, 473–491 (2002)
Available from: <<http://math.uh.edu/~mg/reprints/papers/6120261.pdf>> [Accessed 10/12/2002].

Brewster, Bill, and Broughton, Frank (1999) Last Night a DJ Saved My Life : The History of the Disc Jockey. London: Headline Publishing.

Bussy, Pascal (1993) Kraftwerk: Man, Machine and Music. London: SAF.

Buckberrough, Sherry (1978), 2nd ed. 1982 Robert Delauney The Discovery of Simultaneity. Essex: Bowker Publishing Company England

Cage, John (1967) A Year from Monday. Middletown, Conn: Wesleyan University Press.

Campus, Peter (2004) [Internet] anonymous caption MoMA New York,
Available from:
<http://www.moma.org/collection/depts/film_media/blowups/film_media_025.html> [Accessed 8/9/2003].

Capel, Vivian (1991) Acoustic Feedback - How to avoid it. London: Babani.

Cary, Tristram (1992) Illustrated Compendium of Musical Technology. London: Faber and Faber.

Cardew, Cornelius (1974) Scratch Music. London: Latimer New Dimensions.

Cathcart, Linda (1978) Vasulka Steina: Machine Vision, Woody: Descriptions, New York: Albright-Knox Art Gallery

- Chanan Micheal (1999) From Handel to Hendrix: the Composer in the Public Sphere. London: Verso.
- Chardin, Pierre Teilhard de, (1955) The Phenomenon of Man. (trans. Bernard Wall), 1969, New York: Harper & Row, 1975.
- Chevreur, M. E. (1839), 1854, The Principles Of Harmony And Contrasts Of Colours And Their Applications To The Arts. (trans Charles Martel), London: Van Nostrand Rheinhold Company, 1967.
- Chion, Michel (1994) Audio Vision, Sound on Screen. New York: Columbia University Press.
- Clark, George, (2004) [Internet] *An overview of Shoot Shoot Shoot – The First Decade of the London Film-Makers' Co-operative and British Avant-Garde Film 1966-1976* Available from:
<http://www.sensesofcinema.com/contents/02/21/shoot_shoot_shoot.html> [Accessed 3/7/2004].
- Coldcut (2004) *Remix Your TV!* [Internet] Available from:
<<http://www.ninjatune.net/coldcut/vjamm/>> [Accessed 10/9/2001].
- Collins, Nicolas (2002) *All this and Brains Too: 30 Years of Howling Round Resonance*, Vol. 9, Number 2, London: LMC Publications.
- Collopy, Fred (1998) [Internet] *Color, Form, and Motion Dimensions of a Musical Art of Light*, *Leonardo*, Vol. 33, No. 5, 2000, 355-360
Available from: <<http://www.rhythmiclight.com/articles/ColorFormMotion.pdf>> [Accessed 12/8/2004]
- Conrad, Tony (1996) [Internet] interview with Brian Duguid in Hyperreal online magazine. Available from:
<<http://media.hyperreal.org/zines/est/intervs/conrad.html>> [Accessed 4/3/2003].
- Conrad, Tony (2000) [Internet] statement for 'Vol.: Bed of Sound' PS1, Long Island NY Available from: <<http://www.ps1.org/cut/volume/conrad.html>> [Accessed 4/3/2003].
- Cotton, Bob and Oliver, Richard (1993) Understanding Hypermedia: From Multimedia To Virtual Reality. London: Phaidon.
- Cook, Nicholas (1998) Analysing Musical Multimedia. Oxford: Oxford University Press.
- Crary, Jonathan (1992) Techniques Of The Observer: On Vision And Modernity In The Nineteenth Century. Cambridge, Mass: MIT Press.

Csikszentmihalyi, Mihalyi, (1988) *The Flow Experience And Its Significance For Human Psychology* IN: Optimal Experience: Psychological Studies of Flow in Consciousness. (Csikszentmihalyi, Mihalyi, and Csikszentmihalyi, Isabella, eds). Cambridge: Cambridge University Press.

Cubitt, Sean (1993) Videography - Video Media as Art & Culture. London: Macmillan.

Cubitt, Sean (1998) Digital Aesthetics. London: Sage.

Cycling74, (2000) *...interactive audio processing and composition tools, including Pluggo, Max, and MSP* [Internet] Available from: <<http://www.cycling74.com>> [Accessed 7/07/2003]

Cytowic, Richard E (2002) Synaesthesia. Boston, Mass: MIT Press.

Cytowic, Richard E (1994) The Man who Tasted Shapes. London: Abacus.

Davis, Douglas (1973) Art and the Future. London: Thames and Hudson.

Davis, Erik (1998) Techgnosis, Myth, Magic And Mysticism In The Information Age. London: Serpents Tail.

de Lauretis, Heath, eds. (1980) The Cinematic Apparatus. London: Macmillan.

Dekam, Johnny, McCabe, Dianna (2004) *Queen of the South – Multiple Camera Angle DVD* [Internet] < <http://homepage.mac.com/dmccabe/qos.html>> [Accessed 9/11/2002]

Deleuze, Gilles (1971) *Capitalism, Flows, The Decoding Of Flows, Capitalism And Schizophrenia, Psychoanalysis, Spinoza* Les Cours de Gilles Deleuze [Internet] Available from: <<http://www.webdeleuze.com/php/texte.php?cle=116&groupe=Anti+Oedipe+et+Mille+Plateaux&langue=2>> [Accessed 10/10/2003].

Deleuze, Gilles (1986) Cinema 1 - The Motion Image. (trans. Hugh Tomlinson and Barbara Habberjam), London: Athlone Press.

Deleuze, Gilles (1989) Cinema 2 - The Time-Image. (trans. Hugh Tomlinson and Robert Galeta) London: Athlone Press.

Demeyer, Tom (2002) *Image/ine* [Internet] Available from: <<http://www.image-ine.org/>> [Accessed 02/03/2002].

Deveraux, Paul (1997) The Long Trip: a Prehistory of Psychedelia. London: Penguin Arkana.

Eisenstein Sergei, Pudovkin, Vsevolod and Alexandrov, Grigori Statement on Sound (1928) IN: Richard Taylor and Ian Christie (1988) eds. The Film

Factory: Russian and Soviet Cinema in Documents, 1896-1939. Cambridge, Mass: Harvard University Press.

Eisenstein, Sergei (1943) The Film Sense. (trans. Jay Leda), 4th edition, London: Harcourt, Brace and Co.

Farrer, Steve (1976) *10 Drawings*, reproduced (2004) Camden Arts Centre Artists Studio Wed 3rd Nov 2004 6.30-8.30

Feuer, Jane, (1983) *The Concept Of Live Television: Ontology As Ideology* IN: Kaplan, E. Ann, ed. (1983) Regarding Television: Critical Approaches, an Anthology. Los Angeles: University Publications of America, The American Film Institute.

Fifield, George (2000) [Internet] *The Paik/Abe Synthesiser*
Available from: <<http://www.davidsonfiles.org/PaikAbeSythesizer.html>>
[Accessed 12/09/2002].

Flint, Robert (2004) *Performance, Improvisation And Image-Processed Video*, Art in-Sight, Issue 25, Autumn 2004.

Foster, Hal, ed. (1985) Postmodern Culture, London: Pluto.

Frampton, Hollis (1983) Circles of Confusion Film, Photography Video Texts 1968-1980, New York: Visual Studies Workshop Press.

Frith, Simon (1996) Performing Rites: Evaluating Popular Music, Oxford: Oxford University Press.

Furlong, Lucinda (1983) [Internet] *Notes Towards History of Image-Processed Video: Steina and Woody Vasulka*, Afterimage, December 1983. Available from: <<http://www.vasulka.org/Kitchen/index.html>> [Accessed 2/4/2002].

Gidal, Peter (1975) *Theory and Definition of Structural/Materialist Film*, Studio International, Vol. 190, 1975, No. 978.

Gill, Johanna Branson (1976) [Internet] *Video: State Of The Art* The Rockefeller Foundation, in The Kitchen archive Available from: <http://vasulka.net.zkm.de/web/Kitchen/PDF_Eigenwelt/pdf/063-088.pdf> [Accessed 2/4/2002].

Goldberg, RoseLee (1989) Performance Art. London: Thames and Hudson.

Gordon, Mel (1994) *Songs From the Museum of the Future: Russian Sound Creation (1910-1930)* IN: Kahn, Douglas, and Whitehead, Gregory (1992) Wireless Imagination: Sound Radio And The Avant-Garde. Boston, Mass: MIT Press.

Gowers, Bruce (1975) *Bohemian Rhapsody* promotional video, for *Bohemian Rhapsody*, Mercury, Freddy: 1975, 7" London: EMI 2375

Greenberg, Clement (1965) *Modernist Painting*, Art and Literature, No. 4, Spring.

Greenberg, Clement, (1940) *Towards a Newer Laocoon* IN: Harrison, Charles and Wood, Paul eds. (1992) Art in Theory. Oxford: Blackwell.

Greenhalgh, Paul (1990) Modernism in Design. London: Reaktion Books.

Harrison, Charles and Wood, Paul, eds. (1992) Art in Theory. Oxford: Blackwell.

Huffmann, Kathy Rae, and Mignot, Dorine (1987) The Arts For Television (catalogue) Los Angeles: The Museum of Contemporary Art, and Amsterdam: The Stedelijk Museum.

Hall, David (1976) *British Video Practice*, Studio International, Vol. 191, No. 981

Hall, David (1980) A Situation Envisaged: The Rite artists notes, Available from: <<http://www.davidhallart.com/id4.html>> [Accessed 04/2/03].

Hall, David (1990) Artist Statement in Iles, Chrissie, et al, (1990) Signs of the Times - A Decade of Video, Film, and Slide-Tape Installation in Britain 1980-1990. Oxford: Museum of Modern Art.

Hanhardt, John, ed. (1986) Video Culture: A Critical Investigation. New York: Visual Studies Workshop Press.

Horrocks, Roger (2001) Len Lye, a Biography. Auckland, NZ: Auckland University Press,

Iles, Chrissie, et al (1990) Signs of the Times - A Decade of Video, Film, and Slide-Tape Installation in Britain 1980-1990. Oxford: Museum of Modern Art.

Instants Chavires [Internet] Available from: <
<http://www.instantschavires.com/>> [Accessed 10/12/2002].

IRCAM (2004) Institut de Recherche et Coordination Acoustique/Musique [Internet] Available from: <<http://forumnet.ircam.fr>> [Accessed 10/09/2004]

Isadora (2004) *A graphic programming environment for Macintosh...* [Internet] Available from: <http://www.troikatronix.com/isadora.html> [Accessed 04/203].

James, David E. (1985) Allegories of Cinema: American Film in the Sixties. Princeton NJ: Princeton University Press.

Jay, Martin (1994) Downcast Eyes: The Denigration of Vision in Twentieth Century French Thought. Berkeley, SF: University of California Press.

Jones, R. Victor (1999) [Internet] *Sound Visualization and Analysis in the Pre-Electronic Era*

Available

from:

<http://people.deas.harvard.edu/~jones/cscie129/images/snd_vis/snd_vis.html>
> [Accessed 10/10/2003].

Kahn, Douglas, (2002) [Internet] *Eisenstein and Cartoon Sound*

Available

from:

<<http://www.runet.edu/~tmckosky/thea180/SergieCarSound.htm>>
<http://www.soundculture.org/texts/kahn_eisenstein.html> [Accessed
15/10/2003].

Kahn, Douglas (1999) Noise Water Meat: A History of Sound in the Arts. Camb. Mass: MIT Press.

Kahn, Douglas, and Whitehead, Gregory (1992) Wireless Imagination: Sound Radio And The Avant-Garde. Camb. Mass: MIT Press.

Kaplan, E. Ann, ed. (1983) Regarding Television: Critical Approaches, an Anthology. Los Angeles: University Publications of America, The American Film Institute.

King, Peter Henry (1997) [Internet] *Video Feedback Fractal Genesis* Available from: <<http://www.sweetandfizzy.com/fractals/diagrams.html>> [Accessed 2/7/2002].

Kirby, Michael and Kirby, Victoria Nes (1986) Futurist Performance. New York: PAJ Publications.

Klüver, Heinrich (1928) essay – *Mescal: The 'Divine' Plant and its Psychological Effects* IN: Klüver, Heinrich (1966) Mescal and Mechanisms of Hallucinations. Chicago: University of Chicago Press.

Kracauer Seigfried (1970) From Caligari to Hitler. Princeton, NJ: Princeton University Press.

Krauss, Rosalind (1978) *Video: the Aesthetics of Narcissism*, IN: Battcock, Gregory, ed. (1978) New Artists Video - A Critical Anthology. New York: Dutton.

Kubrick, Stanley (1968) film: 2001 A Space Odyssey.

Lawler, Standish (1975) The Cubist Cinema. New Haven, Conn: Yale.

Lee (1955) trans Plato: The Republic. London: Penguin.

LeGrice, Malcolm (1997) Abstract Film and Beyond. London: Studio Vista.

LeGrice, Malcolm (2001) Experimental Cinema in the Digital Age. London: BFI.

LeGrice (2004) *Reflections on My Practice and Medium Specificity* in Littmann, S. Hatfield, J. eds. (2004) Experiments in Moving Image. London: Epigraph.

Leslie, Esther (2002) Hollywood Flatlands: Animation, Critical Theory and the Avant-Garde. Verso: London.

Littmann, S. Hatfield, J. eds. (2004) screening series and catalogue, Experiments in Moving Image. London: Epigraph.

Lucier, Alvin (2000) *Queen of the South* video Available from: <<http://homepage.mac.com/dmccabe/qosvideo.html>> [Accessed 20/1/1004].

Lye, Len (1984) Figures of Motion, Len Lye: Selected Writings. University of Auckland Press, Auckland, NZ

MacNeill, Leon (2004) Pixeltoy , software [Internet] Available from: <<http://www.lairware.com/pixeltoy/>> [Accessed 10/10/2001].

Manovich, Lev (2001) The Language of New Media. Camb. Mass: MIT Press.

Manovich, Lev (2001) [Internet] *Database as Symbolic Form* Available from: <<http://www.manovich.net>> [Accessed 10/5/2003].

Marks, Lawrence E. (1978) The Unity of the Senses: Interrelations Among the Modalities. New York: Academic Press.

Marshall, Stuart (1976) *Alvin Lucier's Music of Signs in Space* Studio International, Vol. 192 No 984 Nov/Dec 1976.

Marshall, Stuart (1990) *Video Installation in Britain - The Early Years*, in Iles, Chrissie, ed. Signs of the Times - A Decade of Video, Film, and Slide-Tape Installation in Britain 1980-1990. Oxford: Museum of Modern Art.

Mast, Gerald, and Marshall Cohen (1985) Film Theory and Criticism: Introductory Readings, Third Edition. Oxford: Oxford University Press.

McGreevy, Stephen P. (1999) *Auroral Chorus II: The Music of the Magnetosphere* DEI-SM15493-CD Canada: Experimental 017533334427

McLuhan, Marshall (1962) The Gutenberg Galaxy. London: Routledge and Kegan Paul.

McLuhan, Marshall (1962) The Medium is the Massage London: Routledge and Kegan Paul.

McLuhan, Marshall (1964) Understanding Media: Extensions of Man London: Routledge and Kegan Paul.

Meigh-Andrews, Chris (2004) website [Internet] Available from: <<http://www.meigh-andrews.com/>> [Accessed 15/7/2003]

Metamkine (2004) *cellule d'intervention Metamkine* [Internet] Available from: <<http://metamkine.free.fr/>> [Accessed 29/11/2004].

Michelson, Annette and O'Brien, Kevin, eds.(1984) Kino-Eye: The Writings of Dziga Vertov. University of California Press.

Miller Hocking, Brewster (1986) [Internet] *Image Processing*, Experimental Television Center, Available from: <<http://www.thekitchen.org>> [Accessed 15/7/2003].

Moody, Tom (2000) [Internet] *noto (Carsten Nicolai): "The Trouble Is (Not) With Your Set"* VERY No. 8, October 2000 Available from: <<http://www.digitalmediatree.com/tommoodyswriting/noto/>> [Accessed 13/10/2004].

Morgenstern, Barbara (2003) *Kleiner Auschnitt* DVD Berlin: Monika Records.

Moritz, William (1985) *Abstract Film and Color Music*, in The Spiritual In Abstract Painting 1890-1985 Los Angeles County Museum Of Art, Abbeville, NY 1985

Moritz, William (1996) *Visual Music and Film-as-Art Before 1950* IN: Karlstrom, ed. On the Edge of America: California Modernist Art, 1900-1950 Berkeley, Los Angeles: University of California Press.

Moritz, William (1996) [Internet] *Articulated Light: The Emergence of Abstract Film in America* online at: <<http://www.thekitchen.org>> [Accessed 12/7/1003]

Moritz, William (1997) *The Dream of Color Music, And Machines That Made it Possible* Animation World Magazine, Issue 2.1, April.
[Internet] <<http://www.awn.com/mag/issue2.1/articles/moritz2.1.html>> [11/7/2003].

Murch, Walter, Foreword in Chion, Michel (1994) Audio Vision. Sound on Screen. New York: Columbia University Press.

Nekes, Werner (2004) *Glossary*, in Eyes, Lies and Illusions published on the occasion of the exhibition *Eyes, Lies and Illusions* Hayward Gallery, London, 7 October 2004 – 3 January 2005, London: Lund Humphries.

Nezvanova, Netochka (2004) *NATO.0+55+3d modular* [Internet] Available from: <<http://www.eusocial.com>> [Accessed 10/10/2002].

Nakamura, Toshimaru (2000) *No-Input Mixing Board*, Zero Gravity CD ZGV-026.

Noel-Todd, Matthew, [Internet] *Histoire(s) Du Vidéo* at metamute.com, Available from:

<http://www.metamute.com/look/article.tpl?IdLanguage=1&IdPublication=1&NrIssue=24&NrSection=5&NrArticle=1371&ST_max=0> [Accessed 10/1/2004].

Nyman, Micheal, (1974), 2nd edition (1999) Experimental Music, Cage and Beyond. Cambridge: Cambridge University Press.

O'Pray, Mike ed. (1995) The British Avant-Garde Film 1926-1995. Luton: University of Luton Press.

Peacock, Kenneth (1988) [Internet] *Instruments to Perform Color-Music: Two Centuries of Technological Experimentation* LEONARDO, Vol. 21, No. 4, pp. 397-406, 1988

Online:

<<http://www.rhythmiclight.com/articles/InstrumentsToPerformColor.pdf>> [Accessed 10/7/2004].

Peirce, Charles, Sanders (1887) Collected Papers: Volume VII Science and Philosophy, and Volume VIII, Reviews, Correspondance and Bibliography (1966) Camb. Mass: Belknapp, Harvard.

Pellegrino, Ronald (1983) The Electronic Arts of Sound and Light New York: Van Nostrand.

Poschardt, Ulf (1998) DJ Culture. London: Quartet Books.

Puttnam, Samuel (1929) [Internet] *The Glistening Bridge Léopold Survace And The Spatial Problem In Painting* Covici-Friede Publishers New York

Online: <<http://www.rhythmiclight.com/books/TheGlisteningBridge.pdf>> [Accessed 10/7/2004].

Redhead, Steve (1990), The End-Of-The-Century Party: Youth And Pop Towards 2000. New York: St. Martin's Press.

Rees, A.L. (1999) A History of Experimental Film and Video London: BFI.

Rees, A L (2004) *Video and the Argument from Design* IN: Littmann, S. Hatfield, J. (eds) Experiments in Moving Image, 2004 Epigraph, London.

Reichardt, Jasia (1968) *E.A.T. and After* Studio International, Vol. 175 No. 900, May 1968.

Reichardt, Jasia (ed.) (1968) Cybernetic Serendipity. The Computer and the Arts. A Studio International issue, published to coincide with the exhibition *Cybemetic Serendipity* at the ICA, London, August 2 - October 20, 1968. Studio International, July 1968.

Richard, Vallière, T. (1981) Norman McLaren: Manipulator of Movement, The National Film Board Years 1947-67 London: Associated University Press.

Richter, Hans (1947) *A History of the Avantgarde* in Stauffacher, Frank (ed.) (1968) Art in Cinema. San Francisco: Art in Cinema Society San Francisco Museum of Art.

Richter, Hans EASEL—SCROLL—FILM [Internet] *Magazine of Art* February, 1952 Available from:
<<http://www.rhythmiclight.com/articles/EaselScrollFilm.pdf>> [Accessed 17/3/2004].

Rickitt, Richard (2000) Special Effects: History and Technique. London: Virgin Books.

Robbins, Kevin (1996) Into the Image: Culture and Politics in the Field of Vision. London: Routledge.

Rokeby, David (2004) *softVNS 2 real time video processing and tracking software for Max* [Internet] Available from:
<<http://www.interlog.com/~drokeby/softVNS.html>> [Accessed 5/11/2003].

Rosenberg, Harold (1959) *The American Action Painters*, in The Tradition of the New New York: Horizon Press.

Ross David (1978) *A Provisional Overview Of Artists Television In The US*, IN: Battcock, Gregory, 1978 (ed) New Artists Video - A Critical Anthology. New York: Dutton.

Russett, Robert, and Starr, Cecile (1976) Experimental Animation, Origins of a New Art New York: Da Capo Press.

scopac.org, (2004) [Internet] webcast screened at New York: The Kitchen, April 2004. Available from: <<http://www.scopac.org/WebcastApril2004.html>>

Sherburne, Philip (2003) [Internet] *Splitting Bits, Closing Loops: Sound on Sound*

Online: <<http://addendum.mit.edu/e-journals/Leonardo/lmj/sherburnelmj13cdintro.html>> [Accessed 18/10/2004].

Sherwin, Guy (2004) artist's statements, luxonline website, Available from: <<http://www.luxonline.org.uk/work/id/603368/index.html>> [Accessed 7/1/2004].

Siegel, R. K. and Jarvik, M. E. (1975) *Drug-Induced Hallucinations In Animals And Man* IN: R. K. Siegel and L. J. West (eds); Hallucinations; New York: John Wiley & Sons.

Sitney, P. Adams, (1973) Visionary Film. New York, Oxford: Oxford University Press.

Sprekle, Roland (2001) *STEIM, A Reconstruction* essay for Playground Touch Manifestation, Bern, Switzerland September 7-16, 2001.

STEIM, [Internet] Available from: <<http://www.steim.org/steim/>> [Accessed 5/10/99].

Sterne, Jonathan (2003) The Audible Past: Cultural Origins of Sound Reproduction, Durham, NC: Duke University Press.

Stauffacher, Frank ed. (1947) Art in Cinema: A Symposium on the Avantgarde Film Together with Program Notes and References for Series one of Art in Cinema. New York: Arno Press, 1968.

Suzuki, Yoshiyuki ed. (2003) Improvised Music From Japan Tokyo: Improvised Music From Japan.

Tarsia, Andrea (2000) *Time And The Immaterial* in Philpott, Clive, and Tarsia, Andrea (2000) Live In Your Head: Concept and Experiment in Britain 1965-75 Whitechapel Art Gallery, London

The Enemy Within (1986) video: *Strike!*, London: Rough Trade.

Ticklish (2005) *Here Are Your New Instructions*, CD Textile Records, Paris (issue number unannounced).

Toop, David (2004) Haunted Weather: Music, Silence and Memory. London: Serpents Tail.

Turim, Maureen (1983) *Video Art: Theory for a Future* in Kaplan, E. Ann (ed) 1983 Regarding Television: Critical Approaches, an Anthology. Los Angeles: University Publications of America, The American Film Institute.

Teitelbaum, Matthew, ed. (1992) Montage and Modern Life 1919-1942 Cambridge, Massachusetts: MIT Press.

Valli re, Richard T. (1981) Norman McLaren: Manipulator of Movement. The National Film Board Years 1947-67. London: Associated University Press.

Vasulka, Steina (2004) Vasulka Video: Performance Experiments in Moving Image University of Westminster 25-31 January.

Vasulka, Woody (1978) *Video Feedback With Audio Input Modulation And CVI Data Camera* [Internet]
<http://vasulka.net.zkm.de/web/Kitchen/PDF_Eigenwelt/pdf/148-149.pdf>
[Accessed 5/9/2003].

Vasulkas, Woody, Steina, (2004) [internet] Available from:
<<http://www.vasulka.org/>>
[Accessed 3/2/2002].

Velguth, Paul (1947) *Notes on the Musical Accompaniment to the Silent* in Stauffacher, Frank, ed. (1947) Art in Cinema: A Symposium on the

Avantgarde Film Together with Program Notes and References for Series one of Art in Cinema 2nd ed. New York: Arno Press, 1968.

Vidvox (2004) [internet] Available from: < <http://www.vidvox.net/>> [Accessed 21/04/2002]

VJamm, (2004) *Audiovisual VJ Software* [Internet] Available from: <<http://camart.co.uk/vjamm/>> {Accessed 9/2001}

VJCentral (2001) [Internet] Available from: < <http://www.vjcentral.com/>> [Accessed 3/2/2002].

Wees, William C. (1992) Light Moving in Time: Studies in the Visual Aesthetics of Avant-Garde Film. Berkeley CA: University of California Press, [Internet] Available from: <<http://ark.cdlib.org/ark:/13030/ft438nb2fr/>> [Accessed 27/11/2003].

Whitney, John, (1980) Digital Harmony: On the Complementarity of Music and Visual Art. Peterborough, New Hampshire: Byte Books.

Whitney, John, and Whitney, James (1947) *Audiovisual Music in Art in Cinema*, Stauffacher, Frank (ed.) (1968) San Francisco: Art in Cinema Society San Francisco Museum of Art,

Wilfred, Thomas (1947) *Light and the Artist* The Journal of Aesthetics and Art Criticism. Vol. V June 1947 No.4 [Internet] Available from: <<http://www.rhythmiclight.com/articles/LightAndTheArtist.pdf>> [Accessed 8/11/2003].

Williams, Raymond (1974) Television: Technology and Cultural Form. London: Collins.

Youngblood, Gene (1970) Expanded Cinema. London: Studio Vista [Internet] Available from: < <http://artscilab.org/expandedcinema/book.pdf>> [Accessed 3/9/2003].

Youngblood, Gene (1984) *A Medium Matures, Video and the Cinematic Enterprise* in Druckrey, T. (ed), 1999 Ars Electronica, Facing the Future. Cambridge, Mass, London: MIT Press.
[Internet]
<http://www.aec.at/en/archives/festival_archive/festival_catalogs/festival_artikel.asp?iProjectID=9326> [Accessed 20/7/2004]

Zettl, H. (1978) essay *The Rare Case of Television Aesthetics* Journal of the University Film Association 1978, vol. 2, Spring.

Zizeck, Slavoj (ed) (1992) *Everything You Always Wanted to Know About Lacan, but Were Afraid to Ask Hitchcock* London: Verso.