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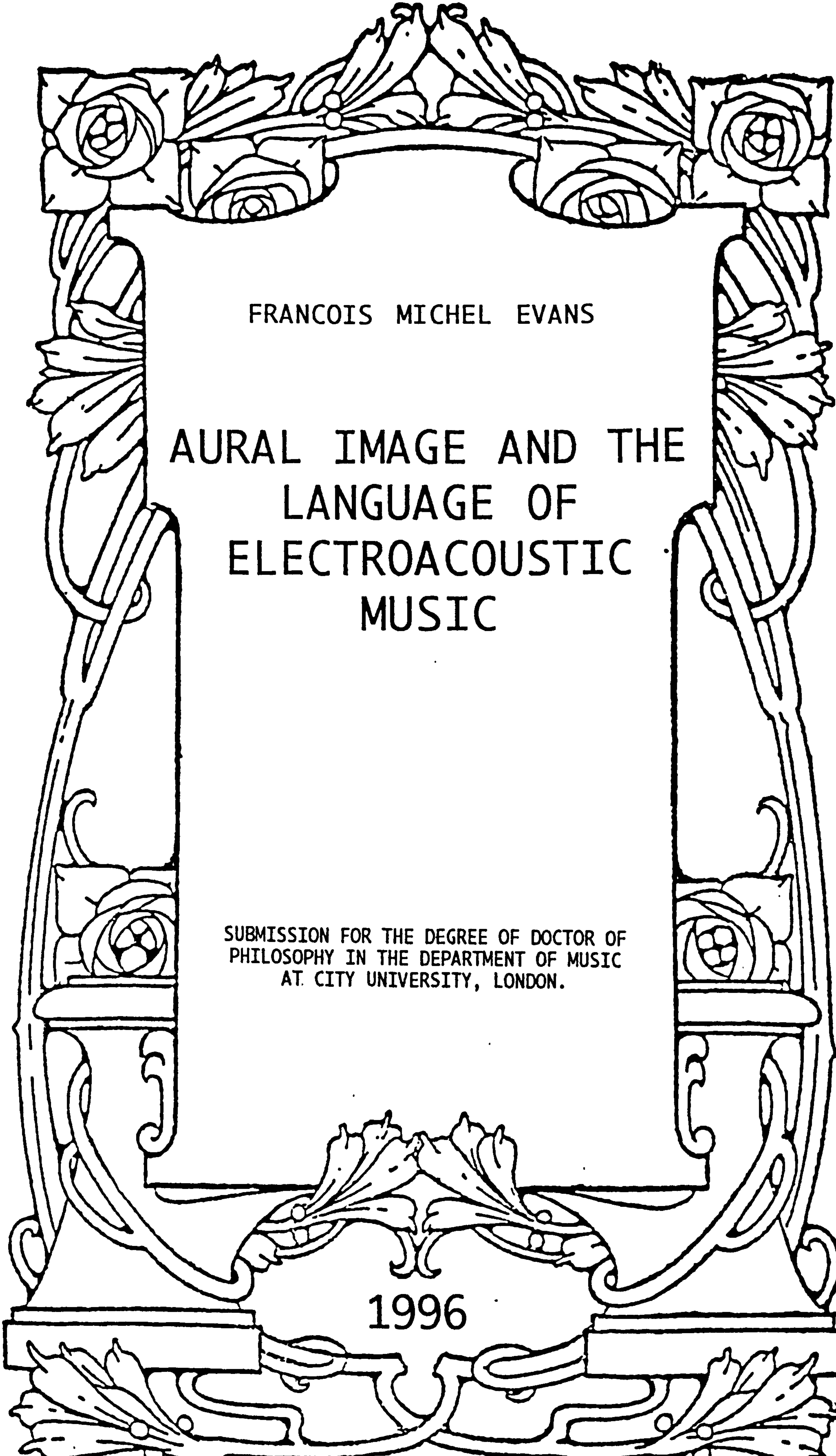
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FRANCOIS MICHEL EVANS

AURAL IMAGE AND THE
LANGUAGE OF
ELECTROACOUSTIC
MUSIC

SUBMISSION FOR THE DEGREE OF DOCTOR OF
PHILOSOPHY IN THE DEPARTMENT OF MUSIC
AT CITY UNIVERSITY, LONDON.

1996

Aural Image and the Language of Electroacoustic Music

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François Evans,
November, 1996.

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Note: the words 'he', 'him' and 'his' are used in the genitive sense throughout the text.

Aural Image and the Language of Electroacoustic Music
François Evans

Abstract

A thesis in electroacoustic composition presented as a set of five electroacoustic works: *Manches en bois ...manches de joie*, *Repeal*, *Suite from 'List of Contents'*, *Corporation* and *Conquête de l'espace* recorded on digital audio tape and accompanied by scores and a text. The whole forms the sharing of a personal strategy for electroacoustic composition.

The text is in two parts. The first, through five chapters, expounds the author's approach to composition and shows how it is based on filmic models for the treatment of sound and aural image.

Chapter One explains the author's concept of 'aural cinema' and defines briefly some analytical terms of reference needed for subsequent chapters. Chapter Two describes a general-purpose model for the language of film sound as developed by Claudia Gorbman, so that it can later be compared to aural cinema. Chapter Three describes the author's perception of how his music is heard by his audience and, in applying Gorbman's filmic model to the seemingly incompatible world of aural cinema, develops a term of reference for approaching electroacoustic music using aural images in composition -the *phonoscope*. In Chapter 4, the relationship between these two models: *diegetics* and *phonoscopy* is examined as it relates to the author's technique of composition. Finally, Chapter Five lays down some preoccupations of the author: transformation, experiential rhythm and some ground-rules for a 'phonoscopic' approach to composition.

Part Two of the text (chapters Six to Ten) shows how the author's approach to composition works in practice, by describing the making of the five pieces which form the main part of the thesis, and the composer's intended communication with the audience.

François Evans
November, 1996.

Pour Papa et Maman.

All things are possible to him that believeth.

Mark (9:23)

Part I

Aural Cinema

C'était le trésor. Trésor impossible à décrire. Les objets du tiroir ayant tellement dérivé de leur emploi, s'étant chargé de tels symbols qu'ils n'offraient aux profanes que le spectacle d'un bric à brac de clefs anglaises, de tubes d'aspirines, de bagues d'aluminium et de bigoudis.

It was the treasure. One impossible to describe. The objects of the drawer having derived so much from their use, were so loaded with symbols that they offered the uninformed nothing more than a bric-a-brac of spanners, aspirin bottles, aluminium rings and hair curlers.

Jean Cocteau. *Les Enfants Terribles*.¹

¹ Taken from Jean-Pierre Meleville's 1949 film adaptation of Cocteau's play of the same title.

Chapter 1

Introduction

1.1 Music as a Way of Listening

When composing, one is constantly aware of the obligation to invoke a response from one's audience. I intend the work presented to act as a tool for invoking response, representing a highway along which an imaginative intelligence can communicate messages subliminally. The semantics of music has much to do with the responses it manufactures. For a composer to be understood, he must understand the hearing codes instilled in his audience.

As electroacoustic² music has developed, audiences and composers have become more conscious of alternative ways of hearing to adapt to those compositional systems not based on an *a priori* experiential or psychological aural attitude (Emmerson 1986 p17). Sometimes, having learnt a code, an audience may find that a piece of music contains no message at all (wholly abstract music).

This chapter explains some useful terms of reference to analytical perspectives that are referred to later in the text.

1.2 Denotation and Connotation

1.2.1 Aural Objects, Aural Images

Aural image is the effect that a sound has on our perception of it. It is the impression formed after interpreting something heard. How an aural image is interpreted will depend on its context in experiential time and space. The types of aural image are so numerous and ephemeral that they are impossible to classify. They are amorphous by nature. The sound of a seagull for example may invoke such disparate 'pictures' as the sea, of 'freedom', of flight etc. Likewise, a pitch or text-based cue like the sound of *Eine kleine Nachtmusik* played on a music box may evoke

² I interpret the term *electroacoustic* to denote the production or processing of sound that involves both electric and acoustic means.

associations of babies falling asleep. Simultaneously, this latter *aural object*³ (a noumenon⁴) can be interpreted purely in pitch terms as part of a harmonic progression. 'Objects' in this sense are difficult to perceive in that they have to be considered as entities without essence. The 'essence' of an object is something additional that we infer from that a *priori* object, its 'connotation'. Interpretation of aural image and the success of a composition that exploits the denotation and connotations⁵ of this image depend totally on the aural attitude - the 'listening criteria' being used by the auditor at the time.

1.2.2 Aural Metaphor

Without an aural image, a sound object has no implications. It could be said that all aural images derived from a sound object are metaphors of each other.

To pass from object to implication, denotation to connotation, an association between various levels of aural image must occur.

Wishart (1985) and Bernstein (1973, video passage on transformation via metaphor) both imply that in order to insinuate a metaphor, a transformation is necessary:

metaphorical interpretation depends on the existence of a transformation. It is the mediation between the sound of a voice and the electronic voice which gives rise to a metaphorical interpretation.

(Wishart, 1985 pp90-91).

³ An 'aural object' is a tangibility apparent by hearing.

⁴ Noumenon: 'thing-in-itself' contrasted with appearance or phenomenon in the philosophy of Kant. Noumena are the external source of experience but are not themselves knowable and can only be inferred from experience of phenomena.

⁵ For further reading on denotation and connotation see Chapter 10: 'Language and Thought' in Hilgard et al. (1975), specifically pp 271-272 and p296 'Summary', paragraph 3.

1.2.3 Aural Abstraction

While a sound object may not have immediate meaning, there is a pleasure in listening to sounds that are beautiful for their own sake. A well-crafted bell, for example, produces an evolving spectrum that most find beautiful. Schaeffer (1966) coins the term *écoute réduite* - a 'reduced' listening by which sounds are apprehended without relating them to their origin. It must have been very tempting to do this when the first experiments were conducted with recordings, and sounds could be disembodied from their physical sources so easily. One could hear the sound for its own sake and begin to manipulate it.

We enter a difficult and subjective aesthetic realm here: absolutely any sound object can be beautiful, depending on the way the composer encourages it to be heard. This again depends on contexts surrounding that object in terms of the sound landscape in which it is situated.

The beauty of a sound when considered apart from its apparent source or any aural image may depend on one of many abstract and subjective considerations. A long list of examples comes to mind: the sound's purity, its clarity, simplicity, uniformity, inherent contrasts, variation, repetition, co-incidence, the 'cleverness' of a particular pattern inherent in the sound, its evolution, presentation, apparition, its detail, complexity, internal interaction and unavoidably - subconsciously-perceived association and identity.

The abstract qualities of a sound contribute to the satisfaction we feel when hearing it perhaps because it affirms to us that overall, there is some order in the nature that surrounds us, of which we are all a part. We can reproduce and play with this order in artifice. Good music is beautiful because it 'speaks' this order and celebrates what is significant in existence.

Completely 'abstract' sound with 'sonic impact' is then a metaphor for the purest essence of natural order.

If the above categories appeal *because* they are themselves metaphors for nature, then when composers compare the relative benefits of sound with 'sonic impact' to sound with 'metaphorical import' (Wishart, 1985 p91), then it is

important to be aware that *both* are metaphors. They differ only in their degree of abstraction from the identity of a representative object, in the direction of the 'essence' of that object in terms of natural phenomena, and not from the nature of metaphor itself.

All sound is a metaphor for existence. If all an object has in any case is its essence, then *absolutely* abstract composition cannot be viable. An object without its essence is nothing (see footnote 5 p3).

Abstract music then can never be completely abstract, by nature of its existence. The more abstract something is however, the closer it is to a pure, distilled essence of nature.

1.3 Language Models and Electroacoustic Music⁶

1.3.1 Landscape

Wishart defines the landscape of a sound object as the *imagined source*⁷ of the perceived sounds (1985 p75).
Landscape is a product of the aural image of a sound object.

Using sound images in the virtual space of the loudspeakers, we can create a world somewhere inbetween the concreteness of ...opera staging and the world of musical relationships. ...the concreteness of musical staging is replaced by a dreamlike landscape hovering between musical articulation and real world events.

(Wishart, 1985 p90)

Now defined, it would be useful to examine the landscape model and discuss some ways in which it can be used to include all kinds of discourse and develop relationships between various syntaxes.

⁶ This section assumes an understanding of the terms designated by Emerson (1986) pp18-19: aural and mimetic discourse, abstract and abstracted syntax.

⁷ Source: in the sense of 'where a sound object is coming from', its background, its history.

1.3.2 Routes of Discourse

Routes of discourse are possible between ''musical' articulation' and 'real-world events'. The following chapters present methods by which such relationships can be set up and exploited to produce a language in close touch with human emotions, a language that speaks directly to the heart (section 1.1).

1.3.3 The Need for Analytical Perspective

The music presented with this folio of composition functions around subconscious processing. The processes of creation involved can only be explained clearly by referring to semiological terminology.

Arguments will be based on the theory of certain filmic and psychological models which are related in exciting ways for electroacoustic composers.

Before delving in to these rationalisations, the reader needs to be equipped with an understanding of some basic terms. Differences in terminology between academic disciplines are rife. Terms useful in the discipline of linguistics need to be learned before they can be applied to the language of music, and one inevitably finds that such terms are more suited to their original discipline than to those for which they are borrowed. The response of academics is either to redefine those same terms, or to invent new ones - both of which approaches tend to complicate the issue.

Both approaches have been taken in these writings, borrowing the most appropriate term wherever possible, and in one instance (chapter 3), deriving a new one.

The following three sections prepare the reader with an explanation of some basic terms for the text.

1.3.4 Semiotic Tools

In semiological terms, signs⁸ have traditionally been divided into three types (Flew, 1979 p327). These are given here as they are referred to later in the text.

index a sign that represents its referent by having been associated with it in the past, ie a sign set up by *conditioning*. The sound of lightning signifying a storm is an example here.

icon a sign that represents its referent through *formal similarity*, for example a circuit diagram represents the circuit itself.

symbol a sign representing its referent by being embedded in a formal system, - representation via a formal *syntax*, for example a written language.

1.3.5 Tropes

From linguistics, the use of an expression in a different use from that which properly belongs to it is called a *trope*.

Tropes are of four types (Oxford English Dictionary). These are given here as the types are referred to later in the text:

⁸ Sign: something that stands for something else or summons up an idea.

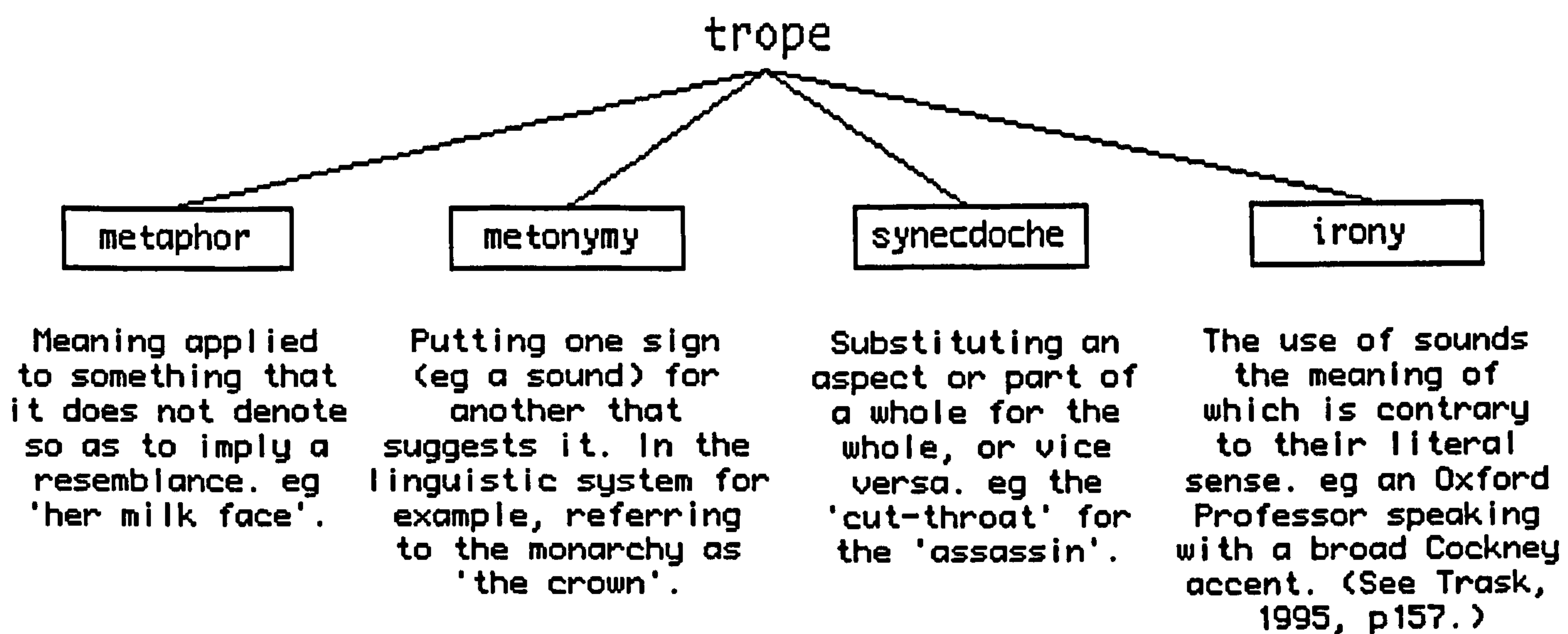


Fig. 1.1 Tropes (all applicable to sound)

1.3.6 Nattiez' Analytical Perspectives

Following Molino, Jean-Jacques Nattiez (1990) designates a tripartition to explain the nature of art. *Poiesis*, the process of creation; the *trace* or object itself for example the musical score, tape or recording designated by the *neutral* level and the *esthesis* the process of reception and decoding itself. In the chapters which follow, I attempt to discuss the relationships between my poiesis (creation) and the resulting esthesis (reception).

Chapter 2

Filmic and Aural Cinema

2.1 Introduction

This chapter may seem to steer away from the context of music as such, but its points are necessary to establish the contexts from which subsequent chapters need to be read.

2.1.1 Background

Von Sternberg, Hawks, Lang, Ford, Dreyer, Lubitsch, Pabst, Mamoulian, Vigo and others explored almost all the possibilities of sound in narrative representational cinema, and between 1928 and 1933 it is generally accepted they established virtually the entire vocabulary of modern sound film language¹. Although the aural images (section 1.2.1) that my composition throws up are not 'objects' as such, I do feel I use them in intuitively cinematic ways. The process of rationalizing this intuitive process has caused me in my research to examine, from a composer's point of view, the general principles by which film sound language works. This chapter attempts to do this, and then applies the model to my view of electroacoustic composition in general.

The human ear listens selectively when confronted with discrete but simultaneous sound streams² (see section 3.2.3) - take for example the phenomenon of being able to hear and make sense of the conversation of a couple in a pub while other people are talking simultaneously. Those streams ignored may continue to exist without intruding on consciousness, unless they change suddenly in an unusual way. Which stream is focussed on is a decision made by the listener (according to criteria discussed in chapter 3). Where film sound is concerned however, listening is usually directed *for* the listener by film sound processing. It often surprises people the extent to which

¹ Gorbman, 1976 p113.

² This is unless of course the auditor assumes that two or more sound streams are actually one. See sections 3.1.4 and 3.2.3.

sound worlds are manufactured by film sound engineers in such a way as to direct this listening.³

Sound in the cinema is treated to mimic the behaviour of the mind as it tries to make sense of what is received by the ear; the digestion and interpretation of film sound are done for the listener so that a smooth, appropriate interpretation of the director's narrative can be conveyed.

The relationships between film sound language and the language of electroacoustic music are interesting. Certain principles in cinematic sound language apply to electroacoustic composition technique in poetic ways whose exploitation is still at a young stage. Games with filmic narrative can also be played out with the more abstract narratives of aural cinema. Some relations between the two media are examined below, looking at empirical theorems in which 'what happens' presages over 'what is done'.

2.1.2 Comparing Aural and Visual Objects and Images

Objects and images can be aural or visual in origin (eg the sight of a bird, or the isolated sound of birdsong). Section 1.2.1 defines aural objects and images. Objects are abstract and open to interpretation, images are those interpretations derived from an interaction between the 'primary' aural image denoted by an object (our 'first impression' of that object), *within a particular context*.

What ties visual and aural images together for me is that how they are interpreted is not directly dependent on the method used to perceive that object, eg 'bird is bird whether seen or heard'.

³ For further discussion on this topic as it relates to cinema, see Williams, (1978). Lewin, (1959) gives a summary of the principles behind traditional film sound language, and Bordwell & Thompson (1992) (especially chapter 7) gives a clear introduction to the syntax of film sound.

2.1.3 Synchrony, Action Resonance and Emotional Resonance

There is an interesting time-based phenomenon that occurs when synchronizing sound to picture. I have applied the principle to my composition substituting sound gestures for visual actions. The phenomenon is understood implicitly by sound dubbers working with film and video, I have called it *action resonance* because, like a filter, it can be 'tuned' or 'tweaked' to a point of maximum effect at the crest of a Gaussian curve.

Imagine synchronizing the sound of a punch with the moving image of one man hitting another, both men fairly close to the camera. As a sound dubber, one might assume that the sound effect should co-incide exactly with its associated image. Not so. Introducing a slight asynchrony between sound and image can cause the effect of the action to seem more effective.

At the subjective critical offset point between sound and image (generally accepted amongst sound dubbers as lying between one to three frames after *or before* co-incidence of sound to image) an *action resonance* occurs like a good, 'cracking' kick, (a 'ka-pow' rather than single 'pow').

When this principle is applied to the synchrony of sound-sound interactions, the effect on the listener can be perceived as predominantly kinetic, have a predominantly emotive effect (*emotional resonance*), or balance between both. Examples abound in all the pieces presented with this folio except perhaps the work *Manches en bois ...manches de joie* which is more faithful to abstractly-determined formative elements. For action resonance listen to the point at 7'37 in *Suite from List of Contents*, for emotional resonance - 4'36 in the same piece (the developed 'switch' sound is synchronized over the previous line in such a way as to make the change seem 'brutal').

2.1.4 Image Identity and Image Inference

Image is independent of the manner in which it is interpreted from its evocative object. We have to distinguish between what the image is, and *how* that image or interpretation is derived.

In discussing the 'cinema of aural image', I aim to examine relevant work that has been done in rationalizing the field of cinematic sound hierarchy, and attempt to apply this to the concert hall so that inferences can be drawn from an appropriate context.

2.2 The Language of Film Sound: Gorbman's Model of Diegesis

2.2.1 Story Space: *diegesis*

Diegesis is narrative story space. A grandmother may tell her grand-children a story. Already we have three diegetic spaces: the space of this thesis, the space of the example with the grandmother, and the space of the story that she tells which may itself contain flashbacks which open into further diegetic convolutions. One of the functions of narrative is to create one time within another - the time of the telling and the 'internal' time of the plot. *Diegesis* then is the spatio-temporal world of the action and characters implied by the narrative in a story.⁴

In developing a model for the way sound works in narrative cinema, Claudia Gorbman⁵ distinguishes between different uses of sound in film to outline levels of cinematic narrativity⁶. Sound in film can be categorised not only according to its rôle as 'dialogue', 'sound effect', 'background sound atmosphere' and 'film music', but according to its relationship to the narrative. These latter relationships are complex and abstract but lay down the foundations for an analysis of the rôles sound takes on when composing with reference to aural image in electroacoustic music.

⁴ See Gorbman, 1980 p185.

⁵ Gorbman is a lecturer in comparative literature at the University of Indiana. For background, Gorbman's book and a list of some of her published articles relevant to this writing is included in the bibliography.

⁶ In which she expounds on the varying levels of intimacy sound can have with the narrative it propagates.

Gorbman's diegetic sound types are described below. The relation of her model to electroacoustic music is made in chapter 3.

2.2.2 Diegetic and Non-Diegetic Sound

Diegetic sound is sound coming from a character or object in the direct story space of the film; for example, the voices of characters, sounds made by objects in the story or music coming directly from instruments in the story space.

Non-diegetic sound is sound not coming from a source in the direct story space, for example the Max Steiner score accompanying *Gone with the Wind*.

Gorbman says of non-diegetic sound:

Being a relatively abstract and subliminal entity, it has the power to emphasize or render ambiguous the distinctions among various levels of narrativity.

(Gorbman, 1974 p17)

2.2.3 External and Internal Diegesis

Diegetic sound can be *external* or *internal* depending on whether it is heard by the characters of the story or not.

Temporal Relation:	Space of source:	
	<i>Diegetic</i> (direct story space)	<i>Non-diegetic</i> (non-direct story space)
Displaced diegetic: sound <i>earlier</i> than image	<u>External</u> : sound flashback; image flash forward.	Sound marked as past, put over images (eg sound of a Winston Churchill speech put over images of Britain today).
	<u>Internal</u> : memories of character heard.	
Simple diegetic: sound <i>simultaneous</i> with image	<u>External</u> : dialogue, effects, source music ⁷ .	Sound marked as simultaneous with images, put over images.
	<u>Internal</u> : thoughts of character heard	
Displaced diegetic: sound <i>later</i> than image	<u>External</u> : sound flash-forward; image flash back with sound continuing in the present; character narrated earlier events.	Narrator in present speaks of events shown as being past; sound marked as later put over images (eg reminiscing).
	<u>Internal</u> : character's vision of future heard.	

Fig. 2.1 Table of Diegetic sound types⁸

The illustration below summarises the differences between the main categories of diegesis.

⁷ Source music is music in the film deemed to be heard by the characters of the narrative, eg the sound of music from a radio when a character switches the radio on.

⁸ After Bordwell & Thompson 1992 p205.

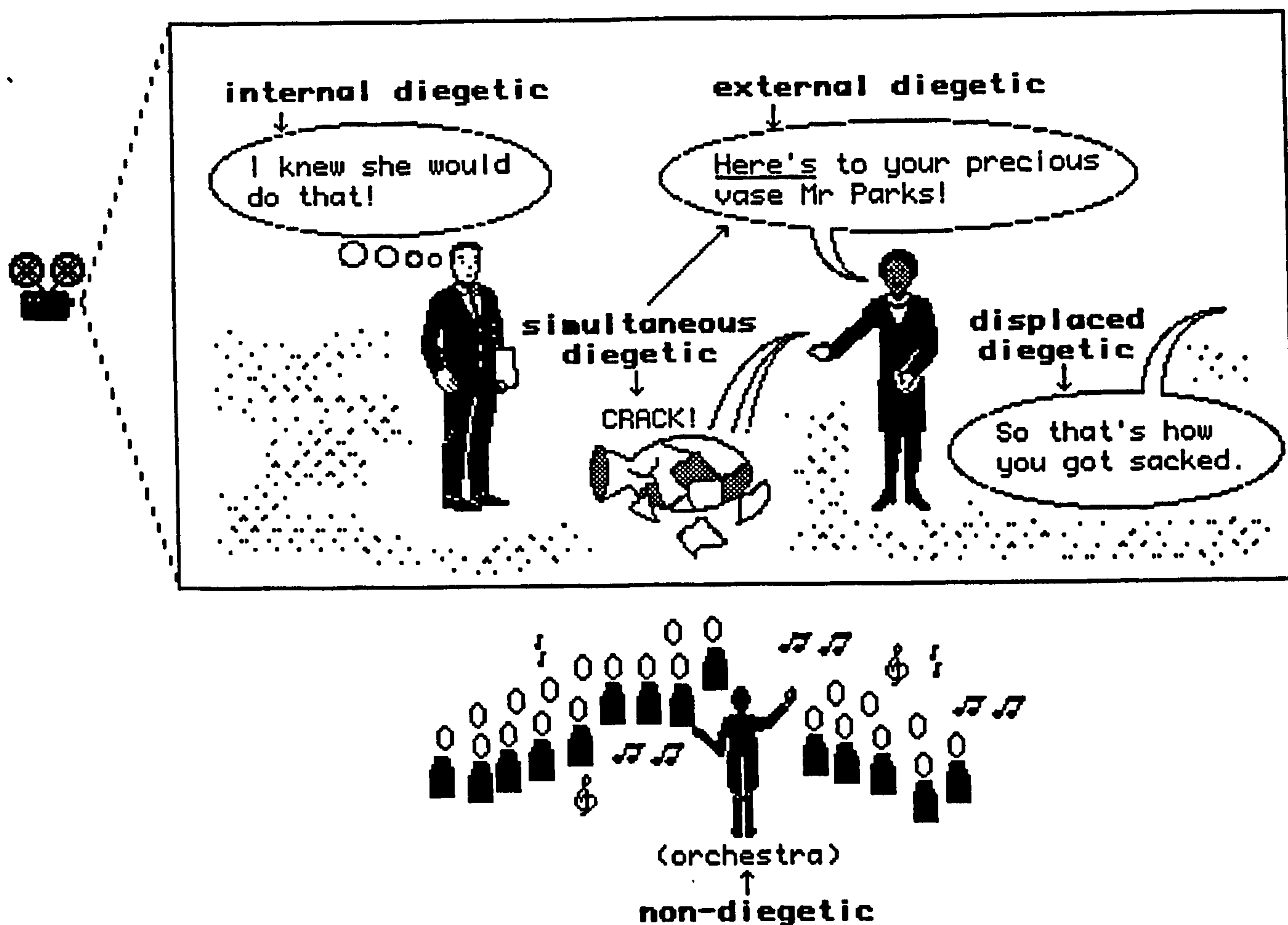


Fig. 2.2 Illustration of the basic types of diegesis

In the above illustration, the woman on the right speaks at the 'present' moment of the narrative with sound that belongs directly to the 'present' diegesis of the film. This is *external diegetic* sound. As the woman speaks, we hear the sound of the vase she breaks as it hits the ground. This sound is simultaneous with the image - *simultaneous diegetic*. The man on the left does not speak his thoughts, but we 'hear' them, in his voice, without seeing his lips move. The inference is that he is thinking what we hear him say. This is *internal diegetic* sound. Meanwhile, we also get to hear a disembodied voice -perhaps the voice of the lady's friend speaking to her from a conversation *after* the scene being presented on the screen. The diegesis of this sound is *displaced* in time, this is *displaced diegetic* sound. Orchestral 'film' music accompanies the scene above. This music encourages its audience interpret what is going on from the screen in a particular way, without actually being a direct part of the narrative conveyed. It is not *directly* related to the narrative. This is *non-diegetic* sound.

2.2.4 On and Off-Track Sound -Masked Sound

On-track sound is sound that the diegesis gives us to believe exists, which we *infer* but do not necessarily hear on the soundtrack. For example, a woman screams at us while a train goes by behind her. The train drowns out the woman's voice. Despite not being audible at this stage, the woman's voice remains 'on-track'. This 'masking' is a special case of on-track sound, by diegetic inference.

Off-track sound is sound not belonging to the film at all. The voice of the cinema manager for example telling his audience that there will be a short intermission in the middle of the film.

2.2.5 On and Off-Screen Sound

On-screen sound is sound that appears to have a source that is visible on the screen.

Off-screen sound is sound that can be heard, but that comes from a source situated outside the frame of the screen; for example, we hear a mother call to her daughter while seeing the shot of a little girl playing in a garden. The mother's voice here is off-screen sound.

2.2.6 Extra-Diegetic and Meta-Diegetic Sound

Extra-diegetic sound is sound only indirectly related to the central narrative of the film. An example of this occurs in Fritz Lang's *Fury* (1936)⁹ in which a shot of cackling hens is inserted among shots of gossiping townspeople spreading the false news of 'killer' Spencer Tracy's arrest. The sound of the hens here is extra-diegetic.

Meta-diegetic sound is sound apparently narrated or imagined by a character as secondary narrator. For example The murdered wife's voice in Fritz Lang's *Scarlet Street* (1946) that rings in Edward Robinson's ears; or the sounds of

⁹ NB It is not necessary for the reader to have seen any of the films described in this chapter.

tennis in Michelangelo Antonioni's *Blowup* (1967) as David Hemmings walks away from a mimed tennis match.¹⁰

As Gorbman has said of her terms:

Ultimately these terms are arbitrary and unsuitable for careful film analysis, since what is metadiegetic for one auditor may be extradiegetic for another.¹¹

Hence, we must be careful to understand that multiple decodings may be possible.

2.3 Diegetic Games

'Games' can be played with diegetic fields. What is interpreted from the ensuing narrative structure is empirical. The same compositional process can affect the narrative in totally different ways depending on context. Games can be played with diegesis in the sense that rules governing sound source are explicitly or implicitly broken. Examples will show the way this can be achieved. Diegetic games can be an extremely emotive medium. In Pier Paolo Pasolini's *Salò, or the 120 Days of Sodom* (1975)¹², a diegetic twist serves to put the cherry on the cake of desperation felt at the end of the film. The narrative techniques used before this scene have been relatively cold in their approach to re-telling de Sade's tale, but in the final scene, the plaintive *Veris leta facies* from Orff's *Carmina Burana* is brought in as we watch a young guard working for the town's officials, relishing in keeping watch over the courtyard in which other youths are being tortured and killed. The music is non-diegetic and the audience feels that the director is sympathising with them in his choice of music. Almost sadistically himself however, Pasolini then kills any chance that this sentiment has of taking root, by destroying any notion that the music might be enforcing a notion of sympathy. The camera pans around the room in which the guard is watching and settles on a wireless with its

¹⁰ The 'knife' auditory hallucination in Hitchcock's *Blackmail* (1929) also represents metadiegetic sound.

¹¹ Gorbman, *Teaching the Soundtrack*, (1976) p450.

¹² This film is banned in Britain. A cinema version was released in the 1970s in this country but in a form censored beyond recognition by the British Board of Film Classification. Ironically, the reasons for the censoring are identical to the morals the film attempts to convey.

light on. Apart from the non-diegetic Orff, there seems to be no music coming from the radio. There is a possibility that the music is coming from the radio, but if this were so, it would put the musical strains into a wholly new and horrifying context: -one in which the guard had deliberately left his radio playing, indifferent to the sensitivity that it is adding its own ironic accompaniment to the horror in view.

As if to 'twist the knife', Pasolini directs the guard to climb from his viewing chair, stoop down to the radio and retune it. The Orff disappears replaced by grating FM interference.

Diegetic games exploit the fact that audiences are aware that there is more to the story than diegetic narrative - they allow the director to speak his opinions through a reticulated narrative.

2.3.1 Synchrony and Sound-Action Associations

As described in section 2.1.3, co-incidence is a powerful tool in communication. As an example, we can examine a scene from the Italian director Mario Bava's film *La Maschera del Demonio* (English title: *The Mask of Satan* (1960)). At night, old Prince Vaida walks while alone in his lounge to the piano and plays a minor second. Almost synchronously after this, we hear a strange sound coming from outside the stone walls. The sound is ambiguous in nature, it could be the sound of a bowed stringed instrument, a night owl or a distant wolf baying, but its pitch is the same as one of the two piano notes being played.

This moment can be interpreted in a number of ways: that Prince Vaida is in touch with the animals outside or that perhaps he has control over the non-diegetic sound. By any interpretation, the effect deliberately implies a mystical relationship.

2.3.2 Synchrony and Narrative

The same process causes a completely different effect in my sound work for Robin Mahoney's short, futuristic film *Camping* (1992). The moment involves a man picking up the

receiver of a 21st-Century telephone. A futuristic sound was produced for the ring. No visual index existed to show at what moment the telephone rang except for the physical reaction of the man as he picks up the receiver. Placing the ring too early against the character's response makes him appear lazy and reluctant to answer the call, being seated as he is next to the telephone. Placing the ring too late before the pick-up, causes the man to seem 'on edge' and impatient. Pushing the sound effect a few film frames before the pick-up gives him apparently superhuman reaction times.

2.3.3 Diegetic Aural Metaphors

Michael Wadleigh's film *Wolfen*¹³ (1981) displays several types of story-telling by metaphor. A diegetic aural metaphor is used when the noise of the motor of a panning camera is synchronised to the turning movement of the head of a private intelligence organisation's employee, as he turns fairly slowly from one surveillance TV monitor to another. This co-incidence lends the man an almost machine-like essence, without suggesting that he is anything other than human. The effect is presented very subtly as it is obvious that the man could well be surrounded by the whirring motors of video machines and electronic cameras in his machine-filled work place. It is a deliberate audio-to-visual co-incidence.

2.3.4 Aural Metaphors from Inferred Diegesis /Possession

The killing werewolves in *Wolfen* (section above) are hidden for most of the film, and are made more conspicuous by this absence. Subtle transformation of everyday sounds in the film is sometimes used to suggest their presence in ways that an audience might only pick up subconsciously. For instance, when a zoologist in the film escapes from his workplace on a motorcycle, the revs of the engine suggest the contours of a wolf's howl. The same technique is used later in the film with the sound of police car sirens. The

¹³ Sound effects supervision and design for *Wolfen* was conducted by Andrew London and Robert Grieve. A detailed analysis of the sound work on this film rewards investigation of its use of symbolism and leitmotif. The wind sculpture mentioned later, for example, implicitly represents the first American settlers, the frequently used sound of Chinese bells is used as a leitmotif for white capitalism.

wolves are everywhere, but nowhere. Interaction between diegetic and inferred diegetic sound is left in confidence with the auditor.

In this example, one sound can be said to be 'possessing' (in the spiritual sense) another¹⁴. In a further scene from *Wolfen* that intercuts between killer's-eye-view and that of the human prey, the repetitive sound of a flapping wind sculpture nearby is heard prominently and associates involuntarily for the auditor with the sound of a pounding heartbeat. There is of course no heartbeat, just as we are never shown the stalking killer. The trap is set. Everything is left to inference by the auditor.

2.3.5 Extra-Diegetic Aural Metaphors

In 1977, on request from Luis Buñuel himself, Mauricio Kagel composed music to accompany Salvador Dalí and Luis Buñuel's surreal film *Un Chien Andalou* (1928). In a scene where a man chases a woman in a room, Kagel adds the sound of two dogs scrapping. This is the only sound effect added to the film. The result is very effective in suggesting that the two characters are behaving like dogs, but the fact that the metaphor chosen is so distant from the subject of the narrative, and out of context with filmic tradition of the time, that it suggests irony and turns film as a depiction of reality into a more abstract art form.¹⁵ The literal 'sounding' of the metaphor subjects it to a literal interpretation.

¹⁴ This technique is used in a more abstract way with the convolutions of bassoon recordings used in *Conquête de l'espace* (see chapter 10).

¹⁵ The evocative principles behind the effectiveness of surrealism as an idiom are discussed in Chapter 5.

2.3.6 Linking Diegetic Fields /Possession

The film composer John Williams said of a section of his music for Oliver Stone's film *Born on the Fourth of July* (1989):

I think together we found a way to make almost musical sound effects which would be like part of the morphine hallucination - this is not really music but it is a musical patina covering this event.¹⁶

Here sound effects are used both to give direct voice to the on-screen action and also to serve a non-diegetic rôle. Diegetic fields can be linked. Doing so may involve a compromise in the way the sound is interpreted diegetically. For example, here if perceived as non-diegetic film 'music', the sound may seem strangely distorted, if perceived as sound effect, the sound may seem oddly 'musical'. In fact, it is devised to be interpreted as both, simultaneously.

2.3.7 'Sounding' the Visual Object

This technique in film serves to increase the significance of a depicted object. In *Wolfen* there is a view from a helicopter of a suspension bridge with giant radii of steel cables. This is accompanied first by the sound of a piano string being scraped, and later, when a man crosses the bridge, by the sound of a harp glissando. It is almost as if the object in the picture itself were being played. Gorbman might describe this as 'onscreen asynchronous metadiegetic sound'. 'Onscreen' in the sense that objects being viewed can be considered as if they were being played; 'asynchronous' in the sense that we cannot see the bridge cables being played at the time of viewing, but 'metadiegetic' in the sense that the sound conceivably relates to the form of the object shown.

This technique can be described as *sounding the visual object*. Examples of it abound in film and usually serve to increase the imposition or significance of the visual object 'played'. An example from my own composition is cited in section 8.2.1.

¹⁶ BBC Radio broadcast, 1989.

2.3.8 Summary

In cinema then, communication on an emotional level can be achieved successfully by setting visual objects or sounds up in contexts that confuse meaningfully the way in which those objects are perceived. It is not sufficient to draw attention to another means of interpretation unless what can be *deduced* from that perceptual form is relevant to the presentation. These are equally applicable to an electroacoustic composition in which sound objects are welded together by their aural images.

2.3.9 Diegesis and Reality

The language of film sound reflects the model of a human's interpretation of the world around him (section 2.1.1). When, for example, one's attention strays from the anecdote an acquaintance is recounting, to focus on the design of the horrendous sparkling but narratively unrelated brooch on her lapel, one is crossing diegetic fields, changing the narrative level for oneself.

As our attention wanders, fields of interest on which it settles may be interrelated, or may not. Our perception of reality at any moment could be considered as a conglomeration of concentric and interlinked diegetic fields.

2.3.10 Diegetic Poetry

On ne peut pas distinguer dans la pensée ce qui serait la pensée et les mots pour l'exprimer.

In thought, we cannot distinguish thought itself from the words to express it.¹⁷

The film maker Jean-Luc Godard excavates the webs of human processing of reality in his films. This closeness to the subjectivity of experience explodes the boundaries of narrative convention and emancipates the medium to poetic form. One instance, an extraordinary scene from *Vivre sa Vie* (To Live Her Life) (1962), exploits numerous diegetic spaces

¹⁷ Words of a philosopher Nana meets in a café, from Godard's *Vivre sa vie* (1962), transcribed from the film.

simultaneously. The scene can be watched and watched again to uncover forever new narrative perspectives that can have their parallels in electroacoustic music.

The film tells the story of a beautiful girl called Nana¹⁸ who becomes a prostitute. The film is divided into separate scenes headed by full-screen cards giving scene number and title. The scene in question, is number twelve: *Encore le jeune homme - Le portrait ovale. Raoul revend Nana.* ('Again the Young Man - The Oval Portrait, Raoul Sells Nana On').¹⁹

The scene begins with a shot of a young man, Raoul, sitting reading. From our perspective, his book - 'Poe: Complete Works', obscures his mouth. Nana is standing, looking out of the window. The scene is silent. We know that Raoul is reading to her because the text of the story being read appears as subtitles.²⁰

The picture goes black, and the voice of an older man emerges, narrating the Poe. The words 'vivid light' are used, but the picture is black. The image cross-fades back to the scene with the man reading, his mouth still obscured by the book from which he reads. Because the older-sounding voice of the narrator does not seem to belong to the young man, there is a confusion as to the source, diegetic or otherwise, of the story-telling sound. We do not know if the voice belongs to Raoul or to the disembodied narrator. The incompatability of Raoul's age and the apparent age of the voice of the narrator enforces this confusion.

The narrator (or Raoul) says "I looked at the painting again, fixedly", Raoul stops reading and looks up from the book to Nana, almost as if he were behaving as the character in the story being read. The fact that we are not sure whether Raoul is talking or not (whether Raoul is the source of the voice of the narrator), opens the door to an interpretation of the film as if he and Nana were a reflection of the Poe story's own events. The use of an

¹⁸ The name of the character is ironic in French, because 'Nana' is also a slang term for a 'girl', in English a 'bird'.

¹⁹ 'The Oval Portrait' refers to Poe's short gothic story of the same name. See Edgar Allan Poe. *Selected Tales* (1845), reprinted Penguin, (1994) p188-191.

²⁰ It is interesting to note that the style (or 'font') of the text used for these subtitles is identical to that used in a tear-jerking film Nana had seen earlier in a cinema, about the life of Joan of Arc.

older man's voice, serves to separate the on-screen action from the Poe story. An umbilical cord between diegetic and extra-diegetic has been set up.

Next, Nana asks if the book is his, then, incredibly, the *narrator* (the invisible older man's voice) of the Poe answers her - "No, I found it here". Heretofore, Raoul's words were depicted in subtitles in the film. (Nana might just as well be asking Raoul if the 'voice' were his, and the answer given would still apply!) Godard has made the story space of the Poe, and the story space of the room enclosing Raoul and Nana become one. In this plastic universe, there is no longer a distinction between diegetic and extra-diegetic. Action, narration and morals are fired together.

A further narrative dimension emerges in the Poe story itself which is highly significant to the film. The tale tells of a painter who paints a perfect likeness of his wife. On completion of the work which he describes as being 'life itself', he finds that his wife has died. There is ambiguity in the tale in that comparisons are made between the colour of the artist's paint and the colour of his wife's blood. Poe infers that if art becomes too perfect a representation of what it depicts, it effectively 'takes over' from what it depicts, that art in a sense can 'destroy' what it represents if it depicts it too well. Indeed some art does this; through stylisation, it forces us to interpret aspects of reality in new ways, so effectively altering our perception of reality.

Godard is playing with audience perceptions of the distinction between what 'is' (meaning), and the symbols used to describe that object. He implies that things can only be how they are described: that nothing 'is' anything as such, but is dependent on the meanings one has associated with it.

The French philosopher Lacan had this point in mind when he posited that as important as what somebody is saying, is knowing *who* is talking; and what that person really means by what they were saying (Lacan, 1969).

Godard's work is in the language of emotion. Diegetic interactions self-fertilize. There is a clouding of the distinction between object and meaning - in the same way

that Poe's story clouds these distinctions. Meaning *shapes* narrative content, narrative content dictates form.

At the end of the film, the semantics are so knotted that Nana, the central character, loses her meaning in the convoluted narrative. As Godard explains through reference to the Poe story she 'dies', and indeed, in the main action of the story and for no apparent reason other than a philosophical one, the girl is caught in crossfire and shot by rival pimps.

Godard makes no distinction between what something means, and how it is represented while to a large extent in his work, content dictates form, narrative is affected *by* that form.

2.4 A Diegetic Model for Electroacoustic Composition?

The Godard example shows how playing games with diegetic types can give expression to narrative concepts that would otherwise be difficult to express. Gorbman's models cannot be applied simply in a filmic approach to the irrevocable logic of the dream worlds of electroacoustic composition. Visual objects (on or off-screen) are not equivalent to aural images except in a very crude way. However, the way in which these diegetic categories are grouped is an interesting premise for pinning down an approach to electroacoustic composition that objectifies the criteria by which meanings are ascribed to sound, and that sees these criteria as a means of generating narrative. In this way, approaches to the use of sound with the silver screen of the cinema²¹ can be adopted and adapted to the virtual screen of the concert hall.

To 'harness the dream', composers need a model with which to interpret and assess material in terms of the aural imagery which, abstract composition or not, an audience *will* always,

²¹ One needs also to contemplate that film sound has its own aural imagery. The filmic experience thus comprises both a 'cinema' and an 'aural cinema'.

voluntarily or not, be sensitive to. Why ignore this world or be afraid²² of it?

²² During a conversation with the composer Tristan Murail, I asked him why he consistently avoided the use of mimetic referents in his music. He took the Boulezian line (*Relevés d'apprenti /Notes of an Apprenticeship* trans. Herbert Weinstock [Paris, Seuil, 1966 /New York, Knopf, 1968]) that it was difficult to organise mimetic sounds into mental categories, and implied that this was not an approach one could readily keep a compositional control over. Personal communication, IRCAM, 4/5/1993. (See section 3.5.3).

Chapter 3

Listening Systems

"That which is born of the flesh is flesh; and that which is born of the Spirit is spirit."

Christ, in John 3:6.

3.1 Essence

3.1.1 Dead Sound

In telling of the genesis of our world, ancient Hindu folklore tells of a time when the gods found a place for everything until they were left holding the most valuable thing in the world. They thought long and hard for a place to hide this, the ultimate of treasures, and finally decided that the safest place to keep it would be somewhere so obvious it was the last place men would look for it.

Man has constantly sought to understand and to take control of the spiritual by a manipulation of physical parameters ...parameters of the 'flesh'.

In 1952 at the Westdeutscher Rundfunk, Karel Goeyvaerts made attempts, in a sense, to do this; to control the metaphysical via the chronological by trying to produce what he called 'dead sound' - a composition that existed outside of time. This he sought to realize by recording sounds on a tape recorder in the 'pause' position.

Stockhausen, seeing his colleague's misconceptions in rational terms, also misses the point that escape from a physical to a metaphysical dimension cannot be sought by the terms of the parameters that vary that dimension. In personal correspondence he writes to Goeyvaerts:

Your notion of a 'stationary' tape-recorder that takes sounds out of time is a good idea, but impracticable. Even if one were to let one or several sounds run together in a temporal 'zero', the statically recorded sound would still have a temporal duration. ...Perhaps one would be talking in terms of a length of 2-5 mm ie 1/390 - 1/156 sec.

Toop, (1984) pp379-391. (My italics.)

What needs to change is an *audience's* perception of it. We know well that music based on tonal or tonally-derived harmony can invoke an emotional or spiritual response in its audience. This affective quality of music can be shaped when a composer is *open* to the *emotional* effects caused by the music as he or she composes.

Effective music evokes a controlled emotional response from its audience. While this response can be elicited by juggling with the absolute values of an absolute field, the controlling factor of the emotional response, the ordering principle, the process of *composition* itself cannot wholly be driven in terms of the mechanisms designed to control these absolute parameters. For me, composition has to be driven by a constant re-appraisal of, and sensitivity to, the emotional result triggered in its auditor.

What then *are* the criteria on which an emotional response is based? What triggers emotional responses in music and how important should these be?

3.1.2 Essence over Ingredients

Without context, no object can invoke meaning. Without meaning, the object is 'meaningless' and its 'essence' is lost. As Dalí has said of painting:

Painting is merely photography done by hand, consisting of super-fine images the *sole significance* of which resides in the fact that they were seen by a human eye and recorded by a human hand.

(Dalí¹, 1973 p404) (My emphasis.)

The significance of the painting is not in the objects it portrays but the way they have been interpreted by the artist.

The nature, power and significance of a sound object in composition can be ascribed when the composer focuses on

¹ Salvador Dalí in Salvador Dalí and André Parinaud: *Comment on devient Dalí* (Paris, 1973) p404.

that image while articulating the object.² In my own composition both approaches - abstract and abstracted - are taken up, although I have tried to fight abstracted interpretations in my belief that *any* object can be used to convey any message, and the message, not the object, is the only thing over which we have tangible control.³ Having to define images as part of one's composition, forces one to a certain extent into an object-oriented mode of writing. Whilst the music is not about the objects themselves, one must have some substrate from which to derive its images.

3.1.3 Acousmatics

The term 'acousmatic' (Schaeffer, 1966) describes a listening without relating sound objects to their sources. But saying how a sound is 'not' heard, does not really describe how we *are* hearing it. Ideally, in reduced listening, we are appreciating the abstract timbral qualities of the sound.⁴

Our mental apparatus however is not predisposed to do this, and part of the enjoyment of listening to electroacoustic music remains the appreciation of the natural or implied sources and their interactions. For me, a balance needs to be struck between the fidelity of aural images and the abstract timbral qualities of the sounds used in acousmatic terms.

Sometimes, the two can interfere. For example in *Corporation*, recordings of voices are sometimes distorted to pass from a mimetic into an acousmatic mode of listening.

3.1.4 Spectralism

Spectralism as an approach to composition, manipulates harmony on a model derived from the Fourier analysis⁵ of evolving timbres. However, the human mind interprets timbre in many different ways. A bell can be listened to in purely

² This principle is discussed more in chapter 5.

³ Paradoxically this goes against the 'Boulezian' line. (See footnote 22 in Chapter 2.)

⁴ Janzen's 'Euphony' (see section 3.3.4 (ii)) relates in part to this.

⁵ Fourier analysis: the analysis of a periodic function into its simple harmonic components.

colouristic terms - an 'acousmatic' attitude. We can also interpret a sound as an inharmonic spectrum, an evolving 'chord' rather than a timbre. For those of us used to the heritage of the tonal system and its related modal writings, chords are inevitably understood in relation to a formal harmonic system.⁶ As tonality represents a formal system, listening in this way might be termed *iconic listening* (section 1.3.4).

While composing purely with spectral analyses as a resource is a fulfilling approach to composition (see section 10.3 (ii)), I also enjoy playing with the 'meanings' that sounds and chords can imply. Of course 'meanings' are ephemeral, they cannot be tamed like pitches, they interact chaotically to infer associations dependent on contexts set up in the piece itself, its presentation and its audience. There seem to be too many variables here for 'adequate' control.

When mixing sounds with deliberate recourse to their sources, the listener inevitably refers to one of the 'essences' of the sound object, for example, *Conquête de l'espace* (see section 10.4.2 (iii)) uses the transformed sound of a locomotive to denote the essence of a great weight being moved, of transport and inevitability.

Essences are 'of the essence'. Again, they are ephemeral and cannot be controlled in terms of the way sound objects themselves are controlled. In the processes involved in electroacoustic composition however, sound *objects* are the only thing that can be 'touched'. In my composition, I try to harness the ephemeral to convey 'gestaltic' messages subliminally.

How do we control something that cannot be touched directly?

⁶ Which system may well be derived from properties apparent in the spectral analyses of the source material used in the composition. Cf Jonathan Harvey's *Mortuos Plango Vivos Voco* (1980).

3.1.5 Describing the Indescribable

Analysez la conscience, vous n'arriverez pas à saisir autrement que par des mots un moment de la pensée.

Try as you might to define conscience, you will not be able to capture a moment of thought without words.

From the script of Jean-Luc Godard's film *Vivre sa Vie* (1962)⁷

Communication between composer and audience has to be via some quasi-rational code, for example speech. Leonard Bernstein when invited back to guest lecture at Harvard tried to explain how music expresses:

Music has intrinsic meanings of its own which are not to be confused with specific feelings or moods and certainly not with pictorial impressions, or stories. These intrinsic meanings are generated by a constant stream of metaphors, which are all forms of poetic transformation.

(Bernstein, 1973)

The reason metaphors and other tropes (section 1.3.5.) convey 'gestaltic' messages so effectively and *vividly*, is because they *break* the very rules of the code in which they are used, via 'poetic transformation'. To communicate experience expediently then, one has to use the rational system, in an irrational way, this happens also to be the principle behind surrealism.

⁷ (The scene in which the philosopher talks to Nana in the café.)

3.2 Experiential Time

3.2.1 The Nature of Experiential Time

Memory, prophesy and fantasy, the past, the future and the dream moment between are all one country living one immortal day. To know that is wisdom. To use it is The Art.

Barker (1987)

Parler c'est presque une ressurection par rapport à la vie, en ce sens que quand on parle, c'est une autre vie que quand on ne parle pas. Et alors pour vivre en parlant, il faut passer par la mort de la vie sans parler.

To speak is almost a ressurection from life in the sense that when we speak, it is another life from when we do not speak. And so to speak while living, one has to pass via the death of speechless life.

Godard (1962)

Barker's quote here refers to the 'time of experience' through *which* metaphorical codes are broken. Experiential time is the time of the 'here and now', that continuous moment of our existence. A person when asked how he is feeling may answer "I am feeling fine". This 'am' defines the continuous moment of experiential time which he 'exists' in his present.

Godard's quote above, highlights the difference between the experience of the narrative of speech and that of our own existence. Importantly, it highlights that we can only consciously exist in *one* experiential state at a time. This has relevance for the way I articulate essences in my music and is discussed further in section 3.4.5.

3.2.2 Relationship between Diegetic Space and Experiential Time

Diegetic space is inextricably linked with experiential time. We live in a world of interaction between our thoughts and the exterior world. The continuously evolving experiential time of the moment that we exist and the story or diegetic space of that time can be considered as one.

3.2.3 Selective /Directed Listening

Humans 'filter out' background sound to focus attention on one particular source of sound. For example, we can focus on the news on the television while other people in the room are talking.

Hearing is consciously directable (section 2.1.1).⁸

Aural metaphors function in the same way, only one conscious figurative listening mode can function at a time. Three questions here preoccupied me in the composition of the works:

1. Can an audience's listening modes be steered by aural image in a piece of music?
2. If so, to what communicative ends could this technique be used?
3. Economy and organicism being yardsticks of 'good' music for me⁹, to what extent can a single sound object be used to convey a meaning or meanings?

3.2.4 The Ascription of Significance

Schaeffer (1966) associates the term 'acousmatic' with 'reduced listening' (*écoute réduite*). The tendency to identify a stimulus with an associated identity or identities is what is being 'reduced' here.

⁸ I understand this from personal experience that has thrown up questions that my compositions try to answer. This experience happened as follows: when lying on my front in an empty house, reading a book, I could hear the ticking of my wristwatch. Without moving my head, I then became aware of a quiet, distant continuous noise that had begun outside. When focussing mentally on the sound of the object, I found I could no-longer hear my watch. Intrigued, and again without moving my head at all, I refocussed my mind on my watch and its sound reappeared within about a second. Without focusing on either of these sources, neither was audible.

⁹ Stravinsky writes "in general, it is more satisfactory to proceed by similarity rather than by contrast. Music thus gains strength in the measure that it does not succumb to the seductions of variety. What it loses in questionable riches, it gains in true solidarity." (Stravinsky, 1942 pp31-32).

Research continues in developing sound processing systems and algorithms for live sound transformation that alter these identities. Daniel Teruggi of the *Groupe de Recherches Musicales* (GRM) in Paris points out:

This attitude towards acousmatic composition enlarges its possibilities since it introduces the idea of transforming the acoustic material of recognizable sound sources, creating a new perception of their acoustic identity...

(Teruggi, 1993)

We must remember that nothing has to represent anything that it may not traditionally represent (cf section 1.2.1). Nothing tangible 'means' anything in particular, because it could represent anything, depending on its context and the way it presents itself (the context and form in which the composer presents it).

As the German philosopher Kant (1724-1804) has put the paradox, referring to 'essence' as 'nature':

The order and regularity in objects, which we entitle 'nature', we *ourselves* introduce. The understanding is itself the lawgiver of nature.

Kant (1781) in Flew (1979) p190. My emphasis.

Hence, nothing 'is' anything without context.

3.2.5 Context

...everything is modified by the context of what went before.

(Wishart 1985 p23)

Context can be real or implied. Each form can be as significant as the other, for example the sound of bagpipes may or may not actually require an accompanying sound atmosphere of the Scottish highlands to connote 'Scotland' because the instrument is already imbued with connotations of the landscape of that country.

3.2.6 Enforcing Significance

Conspicuousness, the fidelity of the essence of a sound object can be varied in different ways.

Contrast ascribes significance. Two examples show how the volume of a sound does this: *The King of Denmark* by Morton Feldman which, like many of his works, remains intensely quiet in its exploration of the acoustic 'inner' sound world from *ppppp* to a deafening *P*. At near silence, tiny changes of sound become magnified. In a quiet context, louder sounds are given more presence and more appearance¹⁰.

Taking this to extremes, John Williams discusses his music to Hitchcock's *Family Plot*¹¹. We are shown a scene where it becomes quickly clear that a villain has escaped from a room by an open window as the camera shows the empty window with its curtain blowing in the wind.

JW: -I composed a scherzo as the camera whipped up to the room, there is an accented chord, and he [Hitchcock] gave me a very great lesson: he said I love your music as he runs down the hall ...when the camera stops on the window, stop your music, don't play because the sudden silence will indicate absence ..the absence of the killer ...the vanished person, louder than any orchestra chord that would ever punctuate.

Here, 'absence' is made conspicuous by the absence of something else -the music that has represented the killer.

3.2.7 Enforcing Degrees of Significance

Having looked at the theory behind how denotation and connotation manifest themselves and how the two interact, it would be useful to build a model of the human internal map of the sound world. A map that electroacoustic composers

¹⁰ *Conquête de l'espace* has an example of this (see section 10.6.4 bars 95-107).

¹¹ Williams, 1988.

could use to exploit the way their audiences hear so as to communicate musical messages or 'essences' more artfully.

3.3 Our Internal Map of the Sound World

Music is a meaningless noise until it touches a receiving mind.

Hindemith (1952) p55

3.3.1 The Ambiguity of Aural Space

The problem with trying to define the ways people hear is that, as Bernstein says:

...it lends itself more easily to descriptions in purple prose than in equations.

(Bernstein, 1973)

We are faced with the problem of what Wishart calls 'the intrinsic *ambiguity* of aural space' (Wishart, 1985 p85 [my italics]).

3.3.2 Criteria on Which Responses are Based: First Thoughts

Things change according to the way we perceive them. Thus, in hypnosis, a musician could be made to hear beautiful music that does not exist. If the subject were asked to notate (or 'rationalise') this music, it is not guaranteed any result on paper would be beautiful music. What is changing is not the piece (which, in effect, is irrelevant!), but the way in which the piece appears to be being made to be heard and the contexts that it itself sets up. Hypnotic effects do produce physiological reactions.¹²

¹² There is the example of tactile hallucinatory response in IMAX's experiments with three-dimensional imagery. IMAX, a Canadian cinema research company have worked with all sorts of formats for improving the audio-visual experience, and it is interesting to contemplate parallels between their findings and possibilities for approaches in aural cinema.

What are the implications of tactile hallucinatory response to the language of electroacoustic music? Firstly, one needs to stay open to all possible interpretations of a sound when composing with it. Work continues in the development of three-dimensional sonic imaging and it is not implausible that once independent three-dimensional sound¹³ can be reproduced, that similar responses may occur. There will be a fall in dependence on the suspension of disbelief.

The human body responds *physiologically* and spontaneously to perceived changes in conditions. Can the same be achieved of an audience through a piece of music? Can a piece be

Their research has led them to develop a very well rendered three-dimensional image. So convincing is the result that in tests, IMAX witnessed tactile hallucinatory reactions from some of their audience. They refer to this as the 'cream pie' effect. An audience being shown a film of giant three-dimensional water molecules floating towards them, have reported *feeling* the molecules touch their faces as these objects seem to pass through them like ghosts.

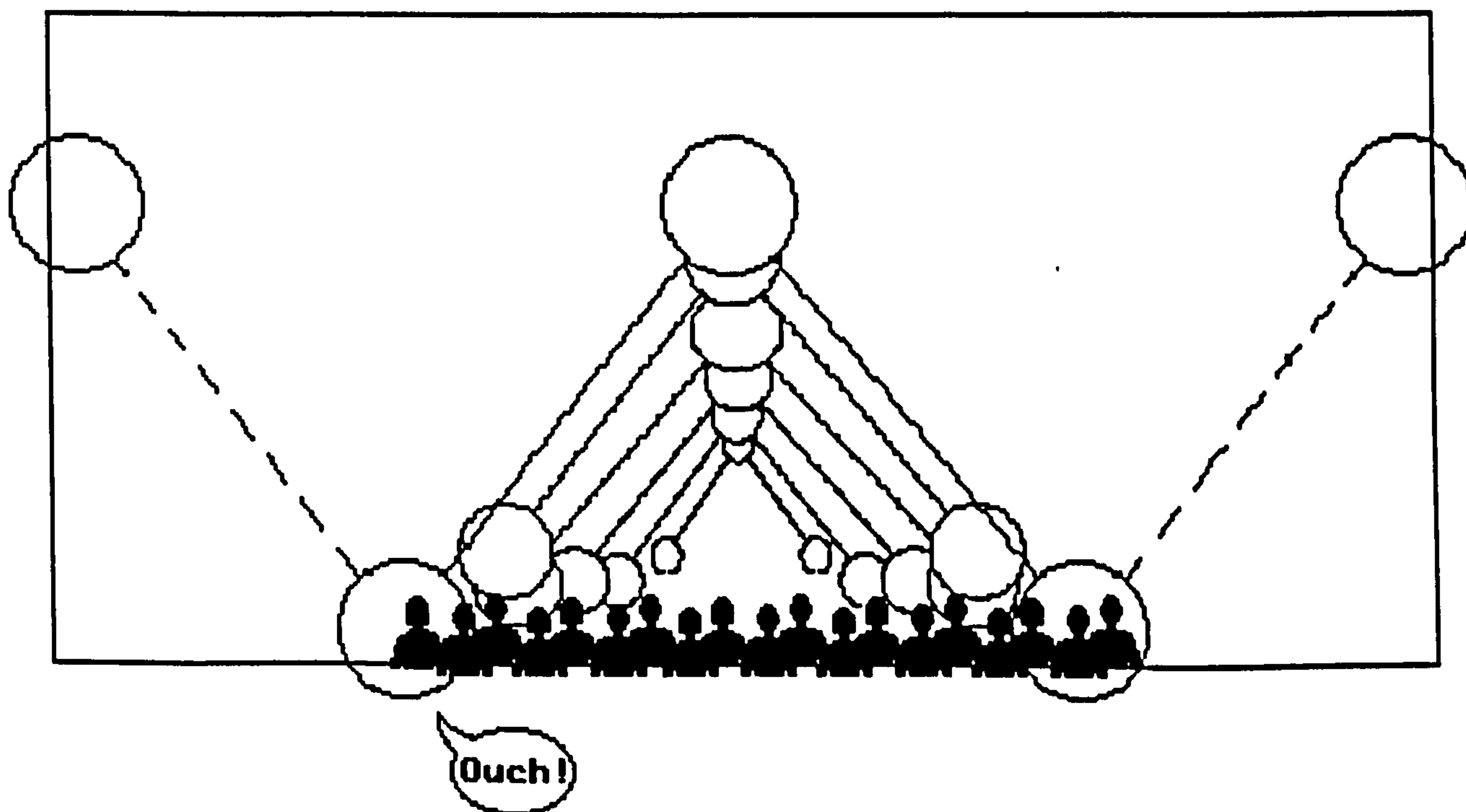


Fig. 3.1 IMAX 'cream-pie' effect

¹³ While advances have been made in three-dimensional imaging by manipulating phase relationships between sounds, 'independent' here refers to the kind of sound spatialization that could reproduce the effect, for example, of a fly buzzing from the ear of one audience member to the other. This kind of three-dimensional imaging is not currently possible with traditional loudspeaker setups.

composed that will persuade an audience that something implausible is happening?

The answer seems to depend on:

- (i) How convincing the presentation is;
- (ii) the audience's willingness to suspend disbelief.
- (iii) The shared conviction (or 'faith') with which the illusion is presented.

The degree to which an audience is willing to suspend disbelief is established partly by composers through their own reputations, through programme notes, reviews and hearsay. It is more difficult to define how to make the illusion itself more credible. One answer can be observed in the paintings of Dalí who applies natural perceptual principles -the 'rules of drawing' to systems of reality that have no correlate in the world outside that of surreal art.

3.3.3 The Importance of Social Conditioning on Understanding

Human conditioning - the imposition on an object of those relations without which knowledge and thought are impossible - arms the listener with models for interpretation. An example of the exploitation in sound work of conditioning, is the effect of distance on the listener of vocal sound sources. A vocal sound recorded with microphone in close proximity

...may imply intimacy or threatening dominance.
Distance, a sense of eavesdropping or detachment.
And at various stages in between, a sense of interpersonal communication or more formalised social communication.

(Wishart, 1985 p80)

Physical distancing parallels social distancing. The composer may tap *into* realms rich in connotation.

3.3.4 Janzen's 'Routes of Appeal'

Janzen (1986) lists nine 'routes of appeal' in 'computer' music that are not all described as being 'intrinsically musical':

- (i) *Kinesthetic stimuli*, for example involuntary reactions to rhythm and beat, for example tactile sensation produced in the viscera by a large drum and the pleasantly disorientating effect of syncopation.
- (ii) *Euphony*: a subjective term. The degree of consonance, 'prettyness' of single or grouped timbres belongs here.¹⁴
- (iii) *Illusions of the ear*: sounds that exploit the ear's 'mistakes' in perception.
- (iv) *Literal congruence*. For this term could be substituted the term *mimesis*¹⁵ whether by direct recording of the sound being imitated, or imitation of its characteristics by another sound source. Games can be played affecting the 'recognisability' of the sound object taking us into this category.
- (v) *Formal congruence*: basing changes in a sound or sounds on natural models that do not necessarily belong to music, for example repetition, growth and contrast.
- (vi) *Mathematics*: the application of permutational logic to sound, for example the composition of Xenakis based on stochastic models.
- (vii) *Convention*: exploitation of a framework of familiarity (exploiting historical idioms) for example tonality. As Janzen (1986, p86) says of tonality:

The convention of the equal-tempered scale still weighs heavily on composer's shoulders today, precisely because there is such a vast installed base of tonal instruments that have been built particularly to reproduce approximations of that scale.

¹⁴ NB Janzen's 'Euphony' does not distinguish between the 'prettyness' of a chord (games of consonance and dissonance) and my own interpretation of Schaeffer's term 'acousmatic'. See section 3.1.3.

¹⁵ Mimesis: the imitative representation of sound in the world.

Quotation and poly-idiomaticism belong here.

(viii) *Aural symbols*: the basing of material on psychic archetypes. This goes beyond the metaphor. For example the use of the number '13' with its satanic connotations in Crumb's *Black Angels* (1970). It is tempting to surmise that in another of Crumb's works -*Ancient Voices of Children* (1970) the *symbolic* value of instruments such as a toy piano is a main contributor to the way the piece communicates.

Perspective is important when using aural symbols. Janzen proposes that archetypal symbols can be used with Xenakis' UPIC system¹⁶. But there is a misconception here. The UPIC relies directly on its 'scores' to produce its sound. Unlike traditionally notated scores from which Janzen seems to be making his assumptions, the UPIC score is the set of instructions that go to produce the piece of music. Graphic symbols whose shapes do not take into account the axes of time and pitch or volume of the UPIC rarely produce useful musical results. UPIC 'scores' have a characteristic 'look' about them related to their effect on the system, they are functional. Janzen's suggestion is similar to the approach of one Madrigal composer who sets the words *occi nere* (black eyes) with two black semibreves. The effect is interesting visually to the interpreter, but not necessarily to the listener. Whereas with madrigals, sung in the home, the interpreter would have *been* the listener, psychic archetypes seem of little value other than to the composer when working with a system such as the UPIC.

With Crumb, whose scores are works of visual art in themselves and a delight to view as well as to hear, there is a sense that psychic archetypes with associated occult power (such as the numbers 7 and 13) are used first to imbue their music with that power rather than for any *a priori* mathematical properties that they may have.

Whether such power exists is not irrelevant to the present discussion. More important than the symbol is the conviction or faith with which the user or listener believes in a power that might be associated with it. As Napoleon Hill says:

¹⁶ UPIC: *Unité Polyagogique de la CeMaMu*. For a complete description of this graphical composition system the reader is referred to Henning Lohner's *The UPIC System: A User's Report* in *Computer Music Journal* Vol.10, No.4, Winter (1986) pp42-49.

all impulses of thought have a tendency to clothe themselves in their physical equivalent.

(Hill, 1937 p58)

I believe that 'belief' is as potent a force as energy and matter.

(ix) *Synaesthesia*: music suggesting sensations from organs other than the ear, for example Scriabin and Messiaen's chromesthesia. Titles and programme notes often corroborate intent here.

3.3.5 How we Hear Music

Perception depends on three components: a context (real or inferred), a sound object and a listening criterion (see section 3.4.3). These are discussed further in the next sections.

3.3.6 Conclusion

It is useful in composition to interpret less passively the aural attitudes auditors use to listen. An approach that patronises the way in which sound is interpreted, is one that taps directly into the psyche. A model, the *phonoscope*, arms the composer with a tool to do this. Through a model of the internal map of the sound world like that on which Gorbman bases film sound, human systems of reality can be played to and delighted.

3.4 The Phonoscope

What needs to be emphasised here is not the meaningless discriminations of pitch, loudness and duration, but the useful discriminations that make it possible to perceive events. ...For Man, there are classes, subclasses and instances of identifiable sounds in countless variety, even if one limits consideration to those that can be named. In general they have not been studied under controlled laboratory situations.

(Gibson 1968, p89)

There is a problem here: the 'discriminations that make it possible to perceive events' or, more importantly, the *processes of discrimination themselves* are structured existentially and cannot by their nature be rationalised, depending as they do on context and the socio-cultural conditioning of the onlooker, and there is a danger that overly-simplistic models might result as one aspect of the truth is exploited at the expense of another.

Metaphors point to inferences. We need to look at the way those inferences are derived (the 'poetic transformations' to which Bernstein [1973] refers [section 3.1.5]), and to find a term that refers to the listener and the 'aural attitude' with or even '*through*' which the listener interprets the sound's image.

3.4.1 Klanganschauung

Vocabulary is unspecific and poorly defined when referring to aspects of the psychology of listening. More appropriate terms for 'aural attitude' might be the Latin *modus audandi* or a derivation from the German *Weltanschauung* ('view of the world'), *Klanganschauung* - 'view of the sound'. The term 'phono-scope' is designated here and will be used from now onwards.

3.4.2 Phonoscopes

The *phonoscope* is an abstract concept. It is an aural attitude, a type of attention - the mental criterion a listener employs at any one moment, to ascribe a meaning to an aural image. It can be considered as the 'particular' experience of a sound. It determines by which single¹⁷ quality a sound is being appreciated at a particular moment in experiential time. For a clear example of a 'switch' between phonoscopes, see Fig. 3.4.

¹⁷ I am following Maltz (1960) in arguing that only one such line of interpretation (eg a phonoscope) may be heard through at a given instant. There may of course be countless phonoscopes which the mind flips instantaneously between. Meanwhile, we may not necessarily be aware that we are 'flipping' between these perceptive states, inferences from each merging into an overall, subjective interpretation of what is being heard.

The phonoscope is a perceptual property controlled by the listener that determines whether for example a recording of bird-song will be heard or analysed as bird-song, or as a series of high-pitched squeals, a fast, high-pitched melody produced by a disembodied whistling voice etc. phonoscopes can be thought of as perceptual fields *through which* sound streams travel as they are understood. They can also be considered as loosely related to diegetic fields in film, though there are important differences between them (see sections 4.1 to 4.3 inclusive). Phonoscopes are experiential in nature and imponderable. The interaction (see section 3.5 and Chapter 5) of phonoscopes presents to the composer of electroacoustic music a model with which metaphysical essence can be fixed and conveyed.

The 'recipe' to implicate a phonoscope is 'sound object + context'. This is discussed in more detail in the section below.

3.4.3 How Messages are Communicated via Phonoscopes

Let us take a simple example: bar 129 of *Corporation*. Here we are in the second movement of a piece for church organ, clarinet and tape. Because of the church organ, the implied venue is a church which dictates an element of context (what the church represents for us is being made significant by our being *in* a church). The tape part and clarinet do not normally belong to the context of the church. The tape at bar 129 plays a snippet of processed recording from the telephone system. The pre-recorded voice of a telephone operator saying: "sorry, the number you have is not available"¹⁸. Already, an object (a British Telecom telephone recording) and context (the church) each highly charged with their own connotations are juxtaposed into the same space. The reactions from possible interpretation of these, are set to spring.

¹⁸ The word 'dialled' after the word 'have' has been removed from the recording.

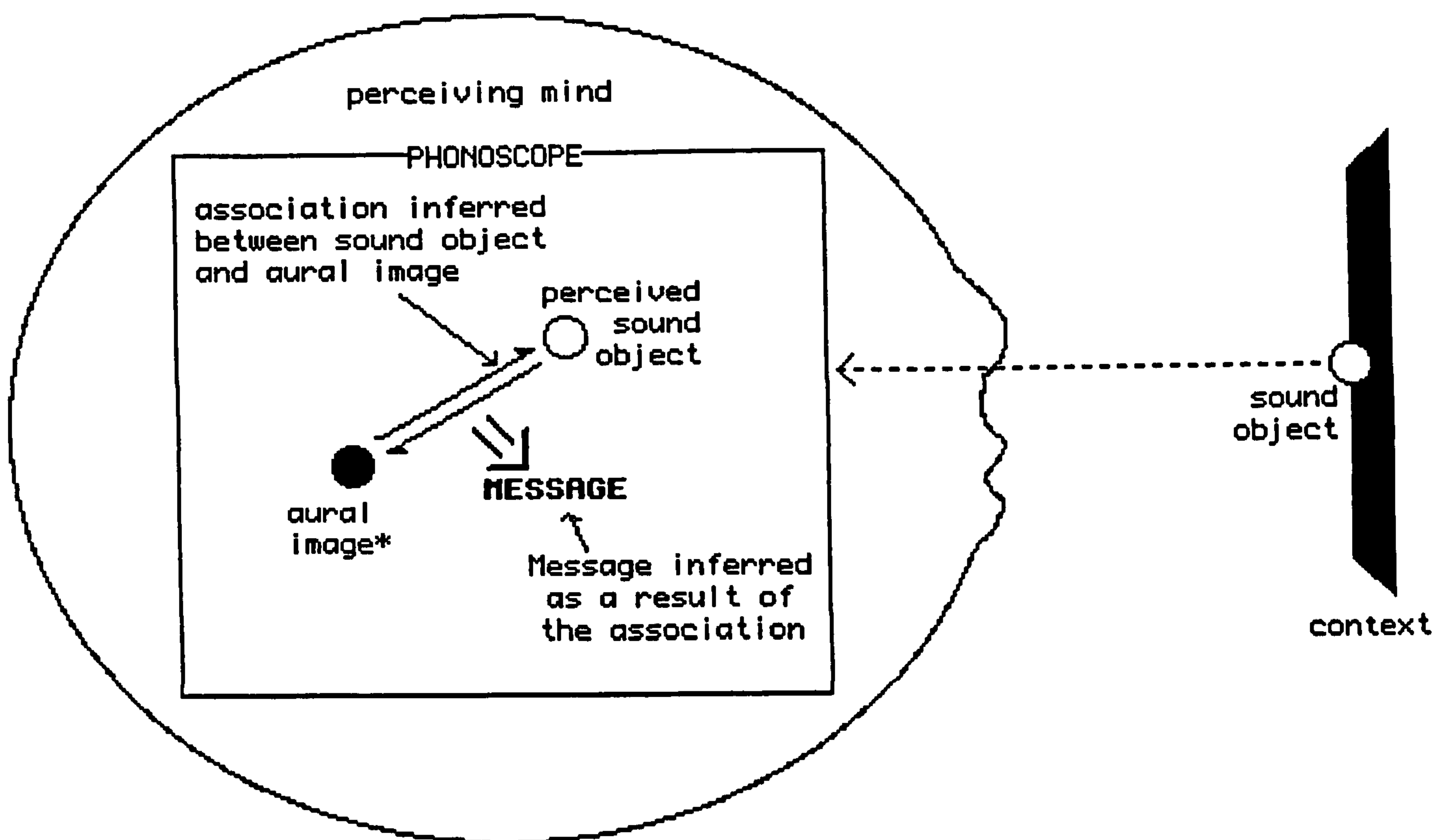


Fig. 3.2 How messages are communicated via phonoscopes¹⁹

The *aural image* appearing in the mind of the auditor on perception of the sound object in its context is very difficult to describe precisely in terms of the written word. The result of the combination of these significant sounds in the context of the church is a *feeling*. This is the reason for which this writer expresses these essences through the language described. As a medium, electroacoustic music allows essences to be invoked from the mind of a fellow human. The presence of 'churchedness' with its religious connotations, the power of God over man as contrived and wrought by church leaders are being associated with a recording of a perhaps patronising voice that speaks over the telephone. The pre-recorded voice is polite, but this is an 'unmeant' politeness because the recording does not come as the result of a direct human contact to the query of any caller. (This in turn hints at the dehumanising effect of technology). The telephone recording can be

¹⁹ Only key psychological reactions have been shown here. What goes on in the mind of course becomes much more complex after this. The rôles of sound object and context can be reversed, as (sound) objects themselves can be interpreted as contextualising agents to an objectivised context.

* Aural image here is inferred as a result of the reaction between perceived sound object and its context.

repeated whenever triggered. The voice tells us that the number we require is "not available" when we know that it could be. The voice represents the 'amorphous monolith' of the corporation. The essence invoked is one of a patronising, secret, monopolising body that has control over the lives of those who are made dependent on it. The *message* implied is produced as a result of an association between the essence of the corporation and the essence of Man's church. The result of this message in the auditor, it is hoped, is to reflect a sense of paranoia, fear and awe. The *phonoscope* or 'human listening context' here is again difficult to define. It is the frame of reference via which the listener feels he can interpret the signs being presented. Some auditors through conditioning (or through a lack of imagination) find it difficult to accept any inferences they might make as being an intended part of the composition they hear.

A criticism that might be levelled at this point is that '*phonoscopic*' composition relies not so much on the quality, inherent beauty and sound fidelities of the elements of the recording, but more on the fidelity of their essences (sections 3.1.1 and 3.1.2). The beauty of the phonoscopic model however is that it does not just stop at essence as mimetic entity. Another phonoscope is that aural attitude by which listeners appreciate an inherently beautiful sound - the *acousmatic* phonoscope. There are others.

As a piece is composed, the composer may decide to search out further routes in the phonoscopic domain. Routes exploited will depend on the idiosyncrasies of the composer and the messages intended to be conveyed, however it is decided to convey these. (See section 3.5).

In a sense, describing in absolute terms the way these reactions occur can be thought of as 'tearing open' the goose that lays the proverbial golden eggs. Aural images can be grouped according to the phonoscope that invokes them. 'Set' theory can only be applied crudely to this phenomenon though as it is 'gestaltic' and not absolute - the listener constantly re-evaluates as different experiential states are flashed between. The 'Venn diagram' system is still useful when contemplating phonoscopes:

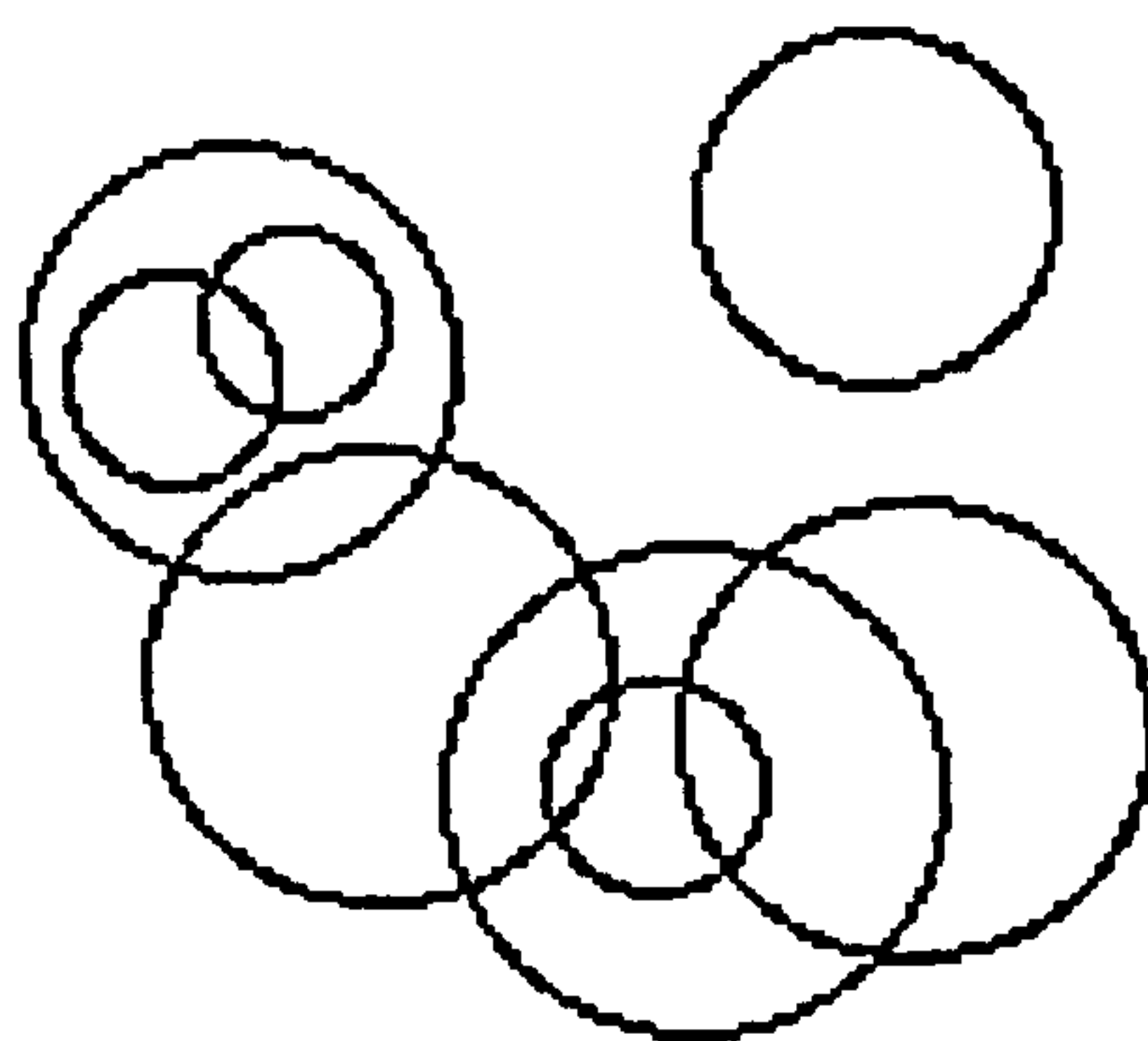


Fig 3.3 The Venn geometry of phonoscope inter-relation
Aural images fall within the circles and can be members of more than one phonoscope at a time.

In the diagram, each circle represents a phonoscope, a route by which an aural image (however abstract) is inferred from a sound object. Where phonoscopes intersect, a sound object is being interpreted in two ways (though not simultaneously, see section 3.4.5).²⁰

Phonoscopes exist alongside and within²¹ each other. They (a particular mode of interpretation) can be made to appear and disappear either gradually or suddenly but cannot by definition (section 3.4.2) be made to alter in nature: an auditor may change from one phonoscope (mode of hearing) to another, but the phonoscope itself remains unchangeable.

Formalists such as text-based and certain spectral composers²² may restrict themselves whether deliberately or not to a *monophonoscopic* working.

§

§

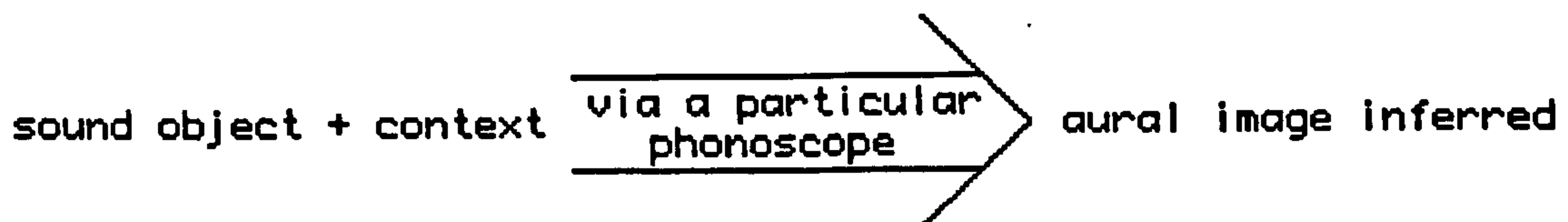
§

²⁰ For example, the messages 'disgusting' and 'beautiful' can be conveyed simultaneously with the sound of a crackling cough. In the mimetic phonoscope the sound may have unpleasant connotations, in the acousmatic one, it may be made to sound interesting and even beautiful through sibilance enhancement, equalisation and mixing with short delays. To further suggest an acousmatic interpretation, the composer may introduce the sound by making it evolve from a timbrally-similar sound stream which does not relate to the image associated with a heavy cough to be later conveyed.

²¹ One means of interpretation may stem only from another in a compositional context, eg a significant timbre may exist as part of a spoken word which in turn makes up part of a larger word which in turn makes up part of a sung line.

²² Spectral composers: composers basing their harmony on the results of Fourier analysis eg (on occasion) Gerard Grisey, Tristan Murail, Marc-André Dalbavie and Jonathan Harvey.

Summarising the basic interactions here then:



in turn:

aural image + originally-perceived sound object $\Rightarrow$ metaphorical relationship $\Rightarrow$ message conveyed

A great deal of mental processing is going on. 'Sound object-context' relationships presented in phonoscopic electroacoustic music can thus be very simple on the surface, but can pander to very complex interpretative resources on the part of the listener. Chain reactions occur in the mind, as contextualised objects trigger the appearance of aural images²³ which interact to produce a message. Messages again react with contexts to produce further images which *set up their own contexts*. The reactions continue in a turbulent world of associations. Audiences think these thoughts are theirs. In my music, I try to trigger these responses and use *them* as part of the piece.

The turbulence here is a figment of the auditor's interpretative imagination, and not necessarily an inherent quality of the piece itself. This 'turbulence' is very much a 'chaotic' model - something that happens inevitably to results controlled by an excessive number of variables.

Phonoscopic composition requires that the composer trust his intuition (see section 5.2.6) by referring to and trusting his own listening experience.

²³ It could be said at this point that once invoked, the image from an abstract sound object no-longer has any reference to the way it is perceived. The image is now 'in the mind' as an object ready to do the business of evoking image and denoting meaning. The tag 'aural' can now be lost. The use of an image is independent of the way in which it is perceived (ie by sight or through hearing).

3.4.4 Crossing Phonoscopes

Several types of experiencing sound (phonoscopes) have been discerned. More will be discussed. In listening, we can consciously or unconsciously change the way we 'experience' sound, ie we can 'change the phonoscope'. We can experience sound in one or more phonoscopes serially. Others figure in a very real sense, but subconsciously, either applied to the same sound stream (however we decide to discern that stream), or to the components of a sound mass: for example, the speaking vocalists as opposed to the line of, say, the 'cellos in Berio's *Sinfonia* (1968-9).

By *objectifying* phonoscopes, they become a window for regulating the communication of messages.

In 1985 I heard by chance a piece of music on the radio by an amateur Irish composer called Gerard Escoffier who recorded real-world sounds and would transfer the recordings played back at different speeds from one tape recorder to another in order to produce a chromatic scale. He would then use these copies to splice and mix together simple tonal pieces. Phonoscopic relationships are implied occasionally, but never explored.

A particular moment in the opening of one of the pieces - *Siren & Firen* fascinated me. The work opens with a fire-engine's siren starting up in a long, slow upward portamento. Once it has reached 'working pitch', the siren then starts to alternate pitch by step across a major third. Suddenly, the two pitches being alternated both drop by a semitone, and then again by another semitone and the piece continues with a tonal tune played 'on the siren'.

The fascinating moment is that perceptual point at which fire-engine siren *becomes* fire-engine siren-type sound being used to play a tune; something that a real fire engine cannot do. The interesting thing here is that as soon as the tune begins, the image of the fire-engine disappears and we no-longer hear its sound as that of a fire engine, but more of a 'dirty synthesizer' sound.

Graphically then:

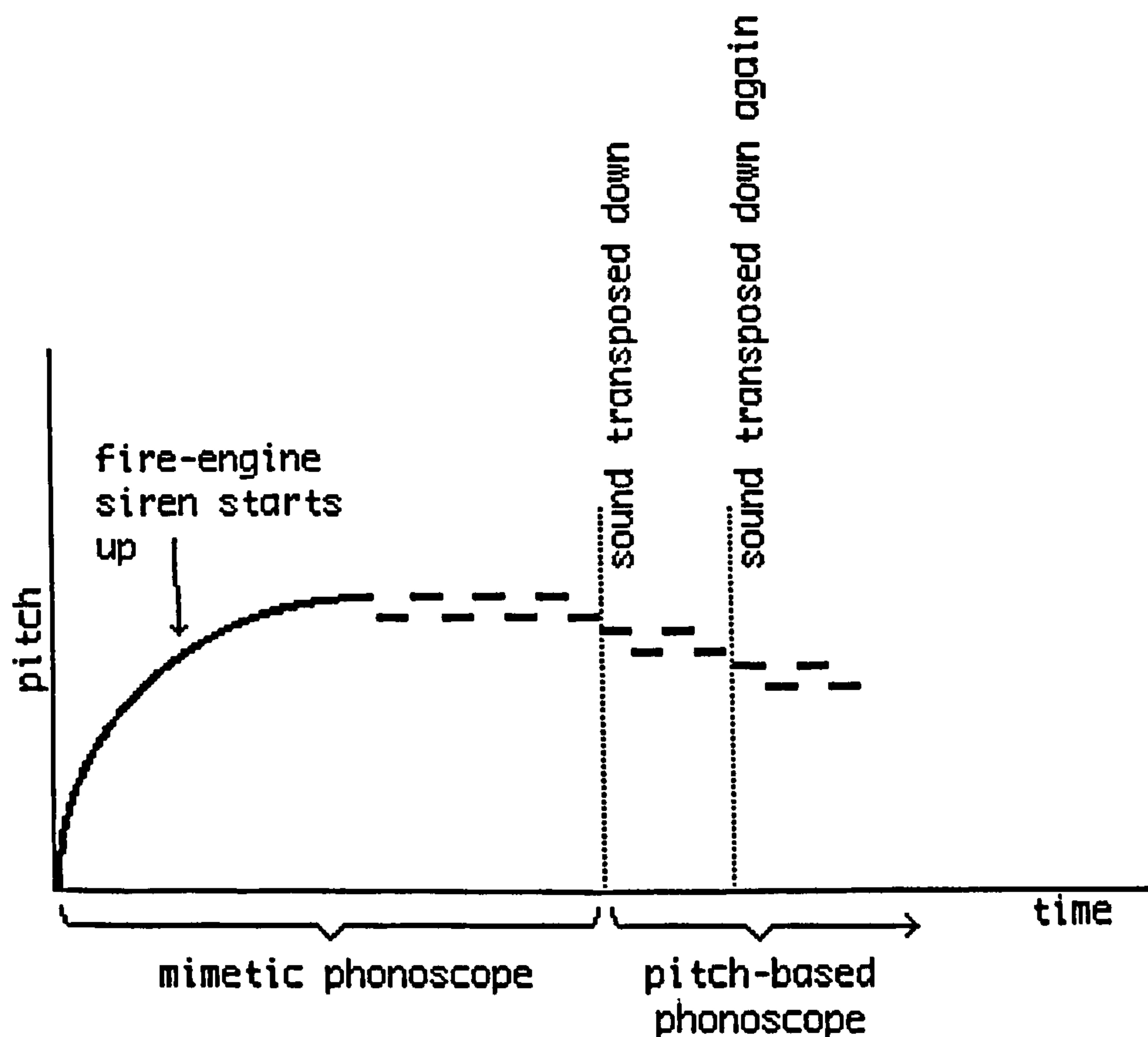


Fig. 3.4 Phonoscopic shunting in Escoffier's 'Siren & Firen'

At the first sound transposition, the formal system governing the music changes to a pitch-based one. At the opening of the piece, the formal system relating to the icon of the fire engine is 'real-world sound'.

Crossing the phonscope radically alters the image, which changes when the rules relating to its phonscope are broken by those of another.

From this principle, research has been conducted into the ways and uses of 'tightrope walking' between phonscopes.

In theory, phonoscopic fields can be crossed between in one of two ways:

- (i) by altering the sound *object* for example by spectral transformation;
- (ii) by altering the sound object's *context*.

In practice, the distinction between these two shunting methods is not clear.

3.4.5 The 'One-Message per Phonoscope' Rule in Film

In discussing ways to combine sound effects and non-diegetic music, the film dubbing mixer Frank Lewin (1959) says:

As a rule it is unwise to suggest in the music what the sound effect portrays realistically at the same time.

(Lewin, 1959, p118)

The reason behind this in phonoscopic terms is because both express the same thing at the same time via two different phonoscopes: the message conveyed by a formal musical system, and the message conveyed by inference from a signifying sound effect. The phonoscope opens up a rich compositional form in which messages can be transmitted via different phonoscopes. In my experience this can produce music with a depth of meaning that may require of its audience repeated listenings for it to reveal its treasures.

Filmic convention according to Lewin dictates that there should be one message per phonoscope. In electroacoustic music however, any number of messages and phonoscopes can be superposed in compositional structures.

Lewin gives an empirical case:

Applied to the soundtrack of a film, this would work as follows: when both music and sound effects accompany, for example, scenes of a railroad train under way, the music should not try to simulate the sound of the train where the sound effect does the same thing. Rather, at the same time the sound effect projects the sharp click of the rails, the rumble of the cars and whine of the engine, the music might move in broad sustained sounds - the combination of the two elements, complementing each other, would then convey not only the idea that this is a train in *motion* but, through the expressive force of the music, would suggest as well something of the *power and impressiveness* of the scene.

Lewin, (1959) p118. (My italics).

The sound effect 'projects' something else, but the (non-diegetic) 'music' 'moves' of its own accord. It is autonomous. These two components of the soundtrack speak in

different ways. The sound effect pretends to be coming from something on screen. The music 'expresses' 'power and impressiveness'.

For Lewin, while music should not sound like sound effect, the opposite is not the case:

Many sound effects actually approach the character of music, either because they are strongly rhythmic or have definite pitch (whistles, bells). It becomes that much more important in such instances to treat them as though they were part of the musical score.

(Lewin, 1959 p118)

For Lewin, sound effect may become music, music may not become sound effect. Therefore in the narrative filmic context there exists a phonoscopic hierarchy for Lewin.

Lewin implies that audiences can hear only through one diegetic field at a time. This theory does not hold true for the *subconscious* processing of perceived elements by which more than one diegetic field can be sensed *through* simultaneously. We do not always need to be consciously aware that we are doing something for us to do it. It is not required that we be aware that we *are* perceiving something, for us to be able to perceive it. The information enters on a particular subliminal level. Music analysis may be necessary to find the means by which an inference is made and 'brought to the conscious fore'. This does not always help the listening process.

Distinctions between what is 'music' and what is 'sound effect' in film are no longer cut and dry²⁴. For intelligibility, reticence still exists from both directors and dubbing mixers in the dubbing studio to break with film sound convention. Work might need to be done where intelligibility compromises a musical style evolved to communicate more subtle messages. These limitations seem to exist less with the artform of electroacoustic composition for the concert hall.

²⁴ An example can be cited from Iva Davies' score to Russell Mulcahy's film *Razorback* (1984). The film opens with a court scene underscored by a slowly-moving, low synthetic-sounding bass line. The scene cuts to a boat sailing into harbour after the bass line has come to pause on its final note. It is then that we realise that the bass note is actually the sound of the ship's horn! This is another example of shunting between phonoscopes.

3.4.6 The Impossible List

Through this text, I have avoided naming phonoscopic fields because I wanted to give free-rein to subconscious creativity²⁵. Part of the 'fun' of composing involves 'not knowing' where one is going. While as Stravinsky has said, 'limitations define the form' (Stravinsky, 1942, paraphrased), an adventure is more exciting if an element of unpredictability can be incorporated, even if it is one that can have dramatic effects on the result in terms of the way it comes across to its audience.

Due to their inherent subjectivity, phonoscopes resist definition and classification. Janzen's 'routes of appeal' already roughly outline the basic listening criteria (section 3.3.4).

Classification of phonoscopes is not really productive when we have them already to hand working constantly and freely in our own minds. I feel that for myself, intuition intuition is sufficient here. For those for whom such classification might be useful, the 'Plan of Classification' and 'Tabular Synopsis of Categories' printed at the opening of copies of Roget's Thesaurus (Longman, 1962) gives an exhaustive list of seemingly all aspects of existence divided into six main categories: Abstract Relations, Space, Matter, Intellect, Volition and Affections. The subdivisions in these groups could each be said to represent a 'term of listening' or phonoscope. For rationalists among us, this is a good starting point.

²⁵ See Maltz (1960) chapter 6 which explains in depth how conscious effort can stifle creativity.

3.5 Phonoscopic Composition

...irrational juxtapositions having the logic of the dream - as Picasso told his mistress: "we didn't any longer want to fool the eye; we wanted to fool the mind" the displaced object ...enters a universe for which it is not made, and, however commonplace, becomes strange - consider the human eye portrayed as a fossil fragment, its soft, wet frailty impossibly translated into hard dry stone.²⁶

3.5.1 First Principles

Lewin's conclusion (section 3.4.5) seems to be that for sound 'components' to complement each other, they must be seen to function from discrete phonoscopes. If polyphonoscopic composition derives from the model of the language of sound in film, two further implications can be wrought:

- (i) the composer needs to be aware of his sound in terms of *all* the phonoscopes it invokes for him.
- (ii) The composer needs to be aware that only one phonoscope can be extant for any one audience member at any one chronological moment, although, through an audience's 'reflecting' on the piece during first or subsequent listenings, or after hearing the piece, further inferences can be made through the psychological reactions described in section 3.4.3.

Through the process of reflection which is a voluntary or automatic 'montage' of aural image and context, an experiential simultaneity can be considered as messages interpreted via different phonoscopes are juxtaposed. Thus, two contrasting interpretations can be considered simultaneously.

The French composer Michel Jarrell does not follow this principle in his recent monodrama *Cassandre* (1994), and illustrates vividly this phonoscopic limitation. The effect was described by some audience members at its première at the

/Cont...

²⁶ Sewell, Brian: *Mutant Titles* in the *Evening Standard* newspaper, London. Thursday 21/2/1991 p21.

Théâtre Musicale in Paris as 'very frustrating'²⁷. Based on a monologue by Christa Wolf, Jarrell's work has an actress on the stage during the whole performance *speaking* (not singing) loudly to the audience, while accompanied by an electroacoustic ensemble playing largely pitch-based music. It was *impossible* to focus on the accompaniment and the meaning of the actress' words at the same time. Jarrell's aim in this work was perplexing: was the intention for his audience to hear the music 'out of the corner of their ears'? This seemed a terrible waste because the instrumental writing was sublime and so interesting in itself. Had the actress been singing, the music would have drawn more attention to itself, as singing slows speech down allowing music to be perceived and appreciated between word interpretation, while also breaking down the barriers to interpretation of the pitch-based working. Sung speech opens the doors to an appreciation of any accompanying music which functions according to rules of pitch and not speech (the linguistic phonoscope). In Jarrell's monodrama then, his *music* could not be listened to in its own terms. One could either focus on and follow the narrative of the words, or one could concentrate on his music for electroacoustic ensemble and tape at the risk of missing a section of the story. Only one 'way of hearing' may be focussed on at any one time.

The speed of declamation permitting, the words of the libretto in a *sung* work lie on the border between interpretation as speech and from the pitch-lattice phonoscope.

The Jarrell example throws light on other principles: that

- (iii) there is a quantum time necessary for a phonoscope to be established...

...as when the actress spoke very slowly, it was possible for one to 'swing' between phonoscopes. When she spoke quickly, this tended to imprison attention in the speech phonoscope.

It is important to note that:

²⁷ *Cassandre*, monodrama by Michel Jarrell premiered at the Théâtre Musicale, Chatelet Paris 4/6/1994, author's notes.

- (iv) experientially, one is not necessarily *aware* as such either consciously or perhaps unconsciously of a crossing of phonoscopic boundary - one does not have to be. And
- (v) that no sound stream is exempt from polyphonoscopic interpretation.

It is the listener who controls how he or she listens. Those that work in film sound have developed to a fine but by large implicitly-understood art, the processing of sound as evaluated and responded to by an idealized perceiver.

3.5.2 Subjective Interpretation

Which phonoscopes are inferred, and what messages may result will of course depend to some extent on the experiences of the auditor.

As Chuck Jones²⁸, a master of the genre puts it when referring to the music accompanying the animated cartoons he directed:

here the composer does not define his intention; he does not tell us what he means, or what axe he is grinding. So we all form our own ideas, and when some lout comes along and presumes to interpret *his* way, we get all stuffy and hot under the collar, and resentful, and start muttering, "...where the devil does *he* get off, the big stuffed shirt." Rightfully, too. He has the right to think or say what he wants to, and ours is the right to disagree as vociferously as we will.

Jones (1946) p368

Interpretations are subjective, but this does not have to be a problem. The composer may share his experiences by presenting a music which may seem surreal to some - the auditor 'does not understand' any implications that may or may not be being hinted at. The art does not seem to have an inherent order or logic about it. Part of the beauty of phonoscopic art, is that it enables composer and auditor to experience their differences.

²⁸ Chuck Jones was the director of many early animated cartoons, perhaps most notably the 'Tom & Jerry' series.

3.5.3 A Chaotic Compositional Model

Opening up the reactions between collages of aural image and context to formal structures based on phonoscopic interpretation, reveals a chaotic, and by implication uncontrollable compositional model. Even if a piece or a section of a piece of phonoscopic composition does not seem to make any musical sense for the auditor, his own internal logic processes will infer *something* from what is being sounded, however illogical. While there is no limit to the range of associations that can be made via these reactions, audiences tend to assume logic in a work and will try to find it.

Interpretation involves a highly complex processing of information that occurs both on conscious and subconscious levels. One does not have to be 'aware' of a message for the message to have been passed.²⁹ This is one of the beauties of phonoscopic composition: messages can be passed subliminally. The only awareness an auditor might have of a message is a subtle and sometimes completely unconscious 'feeling', which may well be interpreted as an extrinsic inference rather than something one is aware one has been told.

The composer hence need not fear any loss of control felt when working in the chaotic medium of phonoscopy. Rather, he must constantly be attuned to implications arising from opening up phonoscopic fields through '*image-context*' *chain reactions* (section 3.4.3) in his composition caused by the introduction of new sound material whether fresh or re-processed.

3.5.4 Composing with Phonoscopes

While phonoscopes can be heard 'through' with an *experiential* if not temporal simultaneity (section 3.5.1), the nearest one can get to combining them is to 'tightrope walk' between them. These principles can be demonstrated quite effectively with a visual model that works in exactly the same way: the famous two faces/candlestick optical

²⁹ (Whole societies can be manipulated in this way!)

illusion. Does the diagram below show two white profiles, or one black candlestick?

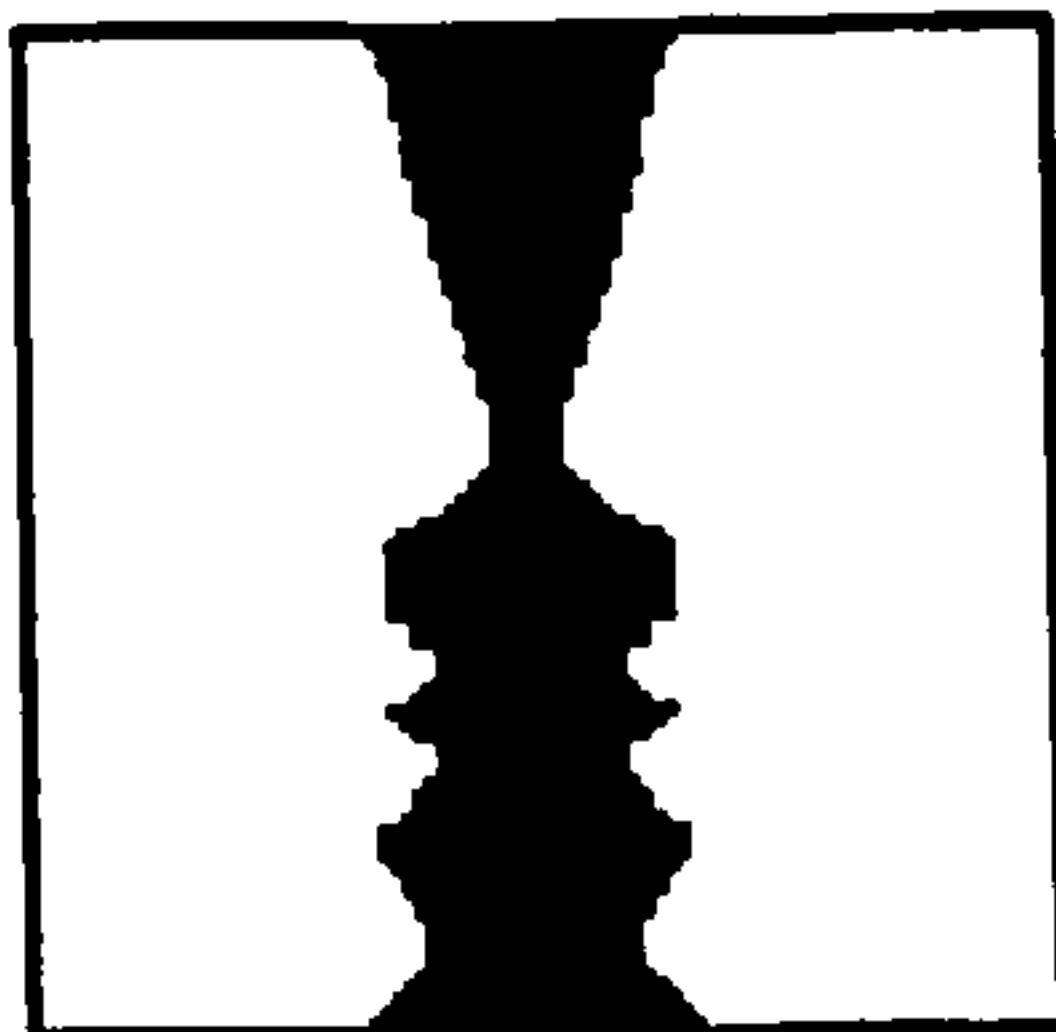


Fig. 3.5 The two-faces/candlestick illusion

One will also notice by staring at the diagram that it is psychologically impossible to perceive the two simultaneously³⁰. The nearest one can get is to forget both interpretations (faces and candlestick) and simply see the drawing as an abstract design. In doing so however, with the conditioning to associate with these two 'mimetic' interpretations of faces and candlestick, interpretations will tend to 'pop' about between faces, abstract and candlestick (see section 3.1.3).

Let us examine a simple example that 'tightrope walks' between phonoscopes: an extract from Strauss' *Don Quixote* (Op. 35): *Fantastische Variationen über ein Thema ritterlichen Charakters* (Fantastic variations on a theme of knightly character). At one moment, the shape of the rush of pitches played on upper woodwind is synchronised to a wind machine's dynamics in exactly the way autumn leaves might react were nature's wind blowing them. Strauss borrows from a natural model making that model 'resonate' through interaction between pitch and mimetic phonoscope. We are being presented sound in several different ways, simultaneously (polyphonoscopy). This of course does not take into account that the wind machine is not itself 'wind' and that the sound it produces cannot be considered part of the pitch phonoscope. Without the wind machine however, the 'leaf' image evoked in the mind's eye, disappears.

³⁰ It could be said that one could try to perceive the illustration as a pair of faces 'pressed up' against a candlestick. However, because the only way the candlestick can be seen is as a darkness between the faces, as soon as one contemplates the faces, the image of the candlestick 'disappears' by becoming this darkness.

To function, sounds employed to open up new phonoscopic fields *must* be considered a part of the diegetic space of the piece of music being performed. If, during performance of a contemporary opera for example, a fireman were suddenly to walk briskly onto the stage, look at the audience very seriously and shout "FIRE! -EVERYBODY OUT!", the audience would probably not question whether this was part of the opera, or 'real', (subjective term). The fireman is not part of the diegesis. Adjustments would have to be made to the libretto and perhaps the music for the fireman to enter the diegesis of the opera.

Such examples may at first appear flippant, but the principles on which they work lie at the heart of producing exciting and surreal art.

3.5.5 The Importance of Carrying Associations Through, Premises from the Folio

The pieces in the composition folio of this thesis display the formal results of an approach that embraces the principles of spectralism, but at the service of 'narratives' imposed externally (eg *Camping*) or derived from sound object-context interactions (examples in *Corporation*, and *Repeal*). Once chains of associations have been set up, the composer *sees through* the chain and carries possible implied associations onward to avoid conferring messages unintentionally.

Phonoscopic composition can be used to expand more formalistic models that have been present in twentieth-century genres.

3.6 Conclusions

The problem in trying to rationalise phonoscopy and its uses is that by its very nature it cannot be rationalised. Its laws are subjective and governed entirely by context and imagination.

To compose with phonoscopes, one needs to allow the subconscious - the fountainhead of imagination - free rein to suggest its own forms, and then set about making sense of

the chains of images inferred, regulating their release and making them interact in required ways.

Chapter 4

Relationships between Diegetics and Phonoscopy: Implications

4.1 Introduction

Having been defined by an application of filmic sound types to electroacoustic music, the phonoscope takes on a life of its own. There are similarities and important differences between phonoscopes and their parent diegeses. Comparing and contrasting diegetics and phonoscopy can give us a clearer concept of how a phonoscopic composition might function, by examining the ways in which diegetic games do and do not apply to the composition of electroacoustic music.

4.2 Parallels

When applying models such as Gorbman's (section 2.3) to the medium of electroacoustic music, the diegetic field becomes equivalent to the phonoscopic one. Unlike the audiovisual medium however, phonoscopic electroacoustic music has to refer to the aural *images* it conjures up rather than sounding to an on-screen visual object. While the soundtrack refers to the screen, electroacoustic music for the concert hall is more limited in terms of its visual object resource.

As such, every element of the electroacoustic composition can be considered as a part of the diegesis. Diegetic primacy is lost, all phonoscopes are diegetic, they simply enable the story to be told or messages to be passed in different ways. All these messages are part of an overall narrative, and it is *from* this narrative that the mind decides how the 'ear' perceives and the imagination of composer and listener describe what the mind understands (section 1.1).

4.3 Fundamental Differences between Diegesis and Phonoscopy

While both of these are types of interpretation of a narrative, *diegetic* structure is part of the film itself and presented to the onlooker. The *phonoscope* is directed not from the sound, but from the *listener*: it is how the listener accepts the sound. The work is done by the listener and cannot be done by the sound, although of course the composition may change this (cf the Escoffier example in section 3.4.4).

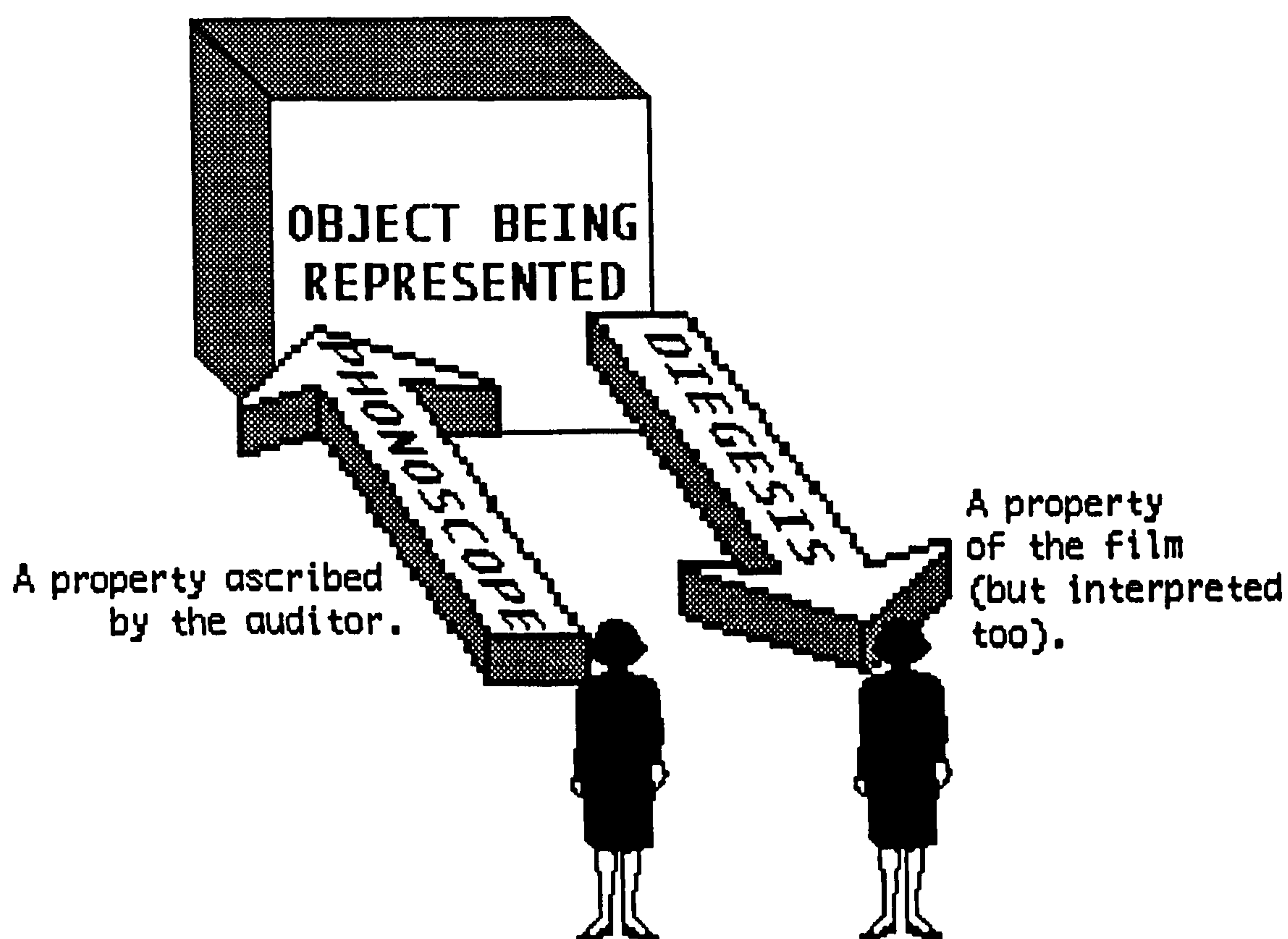


Fig. 4.1 The inherent directivity of diegesis and phonoscope

While it is from a diegetic interpretation of sound in electroacoustic music that the notion of the phonoscope is derived here, the phonoscope is of course a much more primal concept than diegesis. Diegesis is a way of presenting one level of a story, the phonoscope is the level on which a single aural image is interpreted.

An understanding of a piece of music is based on the criteria used to perceive a sound and not on the sound as built. The paradox appears once again (cf section 3.2.4):

only the spiritual (the intangible essence) is 'real' because this is the only thing that 'is' something definite - 'raw' objects (or *noumena* [section 1.2.1]) can be interpreted in countless ways according to context.

In the cinema and its related audiovisual media, however it functions, the narrative is at the service of the story to be told. In the concert hall, the hierarchy is reversed: the story to be told depends on the phonoscopic routes that 'object + context' interpretations suggest.¹

4.4 Applying Diegetic Models to Phonoscopic Ones

4.4.1 Mixing Metaphors

A study worked on for a short film² serves as an example to section 4.2 above, and illustrates a limitation of the application of filmic sound convention to electroacoustic music for the concert hall. (This example is presented as an electro-clip in the DAT recording of the folio of compositions presented).

The director was very fond of repeating to me 'don't mix the metaphor' during work on his short film that told the story of a soldier returned from a bomb blast in Northern Ireland, who suffers as a result from acute tinnitus. The brief was to produce the inner-ear sound worlds that the soldier heard. The way in which this sound, which belonged only to the soldier, could also play a non-diegetic rôle as accompanimental music was interesting.

In one scene, our hero crouches by his colleague's grave and lights a match. The camera stays focussed on the match and soldier for a while before cutting to a photograph of the dead man on his parents' sideboard.

¹ It will be shown that *limiting* the phonoscopes that are suggested by this chaotic process can be used to turn the hierarchy back on its head so that stories can be told and ideas conveyed through messages.

² *Pulse* directed by Sean Geoghegan at the National Film & Television School, 1991-2.

The director explained that from the match-strike to the shot of the photograph, the audience needed to understand what had happened to the soldier - his past is not otherwise explained explicitly in the film. It was suggested that the sound of explosions in northern Ireland, ambulance sirens, helicopters and voices be used.³

In working with these elements, constant re-interpretation of element and context provided the means for a striking, self-governing surrealism. The sound of a helicopter taking off, for example involved a surge of energy from the sound of the motion of the blades that when carefully synchronised to the main character's pained sigh at the grave-side, lend his action a new emotional dimension. Playing with filters and volume curves to shape the helicopter's lift, suggested curves that reinforced the expressions on the soldier's face. Finding the closest trace demonstrated the phenomenon by which the audiovisual attains an *emotional resonance* (cf section 2.1.3).

To convey through the cue the colleague-soldier's subsequent death in hospital and the explosion as being the cause of the main character's tinnitus, the cliché of the bleeps of the life support machine was borrowed, fading-in before changing to an uninterrupted tone to represent death. As the qualities of the component sounds of hospital blip (when continuous) and tinnitus whistle were similar, being separated in the phonoscope of *écoute réduite* only by their relative pitches, it was a simple matter to transpose the continuous blip up to *become* the living soldier's tinnitus. The effect of this on the *narrative* was not however acceptable to the director. The brief had been deliberately not to confuse the metaphors.

The continuous tone of the life support machine represents a metaphor for the fellow-soldier's death and nothing else. The tinnitus comes solely as a result of the live soldier's exposure to the explosion. Otherwise the two sounds are narratively unrelated.

³ Aiming for economy in the quantity of source material, the sound of a match striking itself was taken and transformed into an explosion from which the various sounds that describe the past could be worked together to produce a sound flashback montage. (See sound clip included with folio of composition).

It can be very tempting for a composer to exploit congruences between sounds via a second phonoscope (in the above case, a purely qualitative perception). In the non-applied medium of free electroacoustic composition, a composer more often has the luxury of mixing metaphors and exploiting *backwards*, any iconic (see section 1.3.4) results.

At the service of the narrative then, the sound streams in this film project had to be kept separate. While useful, the sound studies for this film are not included with the accompanying folio which limits itself to free electroacoustic composition so that the effects of mixed metaphors can be explored more fully.

4.4.2 Organicism

The ideal of economy of working materials in film (and electroacoustic composition for the concert hall) can be worked towards by limiting the number of sound streams, and when it is required to signify through a new diegetic field, to pull the sound stream into it from a field. A scene from Stanley Kramer's *On the Beach* (Culver Pictures, 1959) provides an example. A couple are upstairs. Downstairs, a group of drunken sailors sing out of tune. In the scene upstairs, an emotional problem the couple have resolves itself and to enhance this, the singing of the sailors downstairs is heard to tune up, soften, become sober and melodious to reflect not any particular change in the voices downstairs, but the change in the main characters' emotional state.⁴

Section 3.5.5 touched on the importance of carrying associations through, and there *must* be a logic if sound streams are going to be made to cross diegetic fields in this way⁵. The example above carries the association through in that the changed, euphonic version of the sailor's song could be interpreted as a re-interpretation of it by the main characters. Beauty is in the eye (or ear) of the beholder; as the emotional problem resolves itself, the

⁴ ie The sound of the voices has not in reality changed, only the couple's interpretation of it.

⁵ In this example, of course, the song of the sailors passes from diegetic sound (source music) to non-diegetic sound (see section 2.3.2).

couple stop seeing or hearing things around them as being so bad. We hear (i) *for* them, and (ii) as they *interpret* the sound. Since this is subjective, the only way it is made clear (in this example) is actually to change the harmonies, tuning and melody of the off-screen diegetic sound and indeed going on in this example to add massed voices of choirs to express the inner spiritual transformation. What is interesting here is less what is done to the sound, and more *the way in which its audience is expected to change its interpretation of the sound stream*. I find myself using changes of interpretation of the sound stream as I compose.

By borrowing from a sound stream pre-existent in the diegetic space, two purposes are served: (i) the film becomes more believable as the non-diegetic sound is rooted in the diegesis; and (ii) the medium becomes more economical in its use of referents: sound that did not belong, *belongs*.

A French master of the diegetic game is Michel Fano. Some scenes from Alain Robbe-Grillet's 1966 film *Trans Europ Express*⁶ use Fano-produced sound montages and are interesting⁷. The way in which sound is used here has implications for the use of aural image in electroacoustic music for the concert hall. A complete analysis of the sound work in this film would take a book in itself to explain. We shall limit ourselves to one or two relevant examples.

In the film, narrative influences from unrelated fields inter-react with fantastic effect. In the introduction to the film for example, the narrator's voice, as it tells us what is happening, for no apparent reason starts to accelerate. The words are delivered faster and faster to reflect an increase in tension as the scene progresses. We are aware that the central character is running away from a bomb that is about to explode, but there is nothing in the sense of the words of the narrator to suggest that they should be delivered with increasing speed. The rate of delivery of the narrator's words is being modulated by a force from another diegetic field - that same force that would otherwise be controlling the heartbeat of the character getting anxious, the rate of the action, the speed

⁶ Como films, produced by Samy Halfon.

⁷ Other films featuring Fano's sound work are *l'Homme qui ment*, *Le territoire des autres* and *l'Immortelle*. As well as Fano, other films using sound in interesting ways are Mizoguchi's *The Crucified Lovers*, Jacques Rivette's *The Nun* and Pereira dos Santos' *Vidas Secas*.

of the person running away from the bomb, the level of tension felt by a person experiencing the situation (the viewer). Thus the sound 'itself' could be said to 'disappear' as we focus attention on the external controlling energies being applied to it. This makes for a very organic sonic environment without compromising on emotivity. Essences are preserved and given voice through the fewest number of sound 'ingredients' (cf section 3.1.2)^{8,9}.

The beauty of cinema of this sort is that while it does not pretend to *represent* reality (however fantastic), the narrative remains intact and credible. Surreal influences in the language of the narrative serve only to heighten the drama.

Trans Europ Express is a complex of inter-related time experiences. The director and writers of the film are characters in it, and listen to their own narrative outlines on tape recorder. The film is about its own making, but also has an inner, seemingly unrelated, fictitious story with which the narrative is inextricably linked.

My composition exploits such convoluted narratives, these are discussed in Part II.

4.4.3 Transformation I

I change how an object is interpreted in my music in one of three ways: *morphologically*, by *context-changing* or by *occlusion* or *masking*. Whilst a morphological change is 'forced' and requires a period of time to effect itself, context-changing is implied and instantaneous.

(i) Morphological change

The sound of a human trying to imitate a bee, transforming into the sound of a swarm of bees in Wishart's *Vox V* (1986) is a classic example of this kind of transformation. The *Suite from List of Contents* also has such a transformation

⁸ These techniques have parallel implications for electroacoustic composition in the concert hall.

⁹ Non-diegetic music is used very sparingly in the film, being snippets from Verdi's *La Traviata*.

from 8'30 to 9'00 in which a sound like polystyrene being rubbed, gradually turns into the sound of a vinyl record playing at its end.

Spectral transformations can be effected by a combination of linear portamenti, and the fading in of new, or fading out of expendable partials from one frequency of sound (state) A to an equivalent frequency of sound (state) B. This requires that start and end states be more or less periodic:

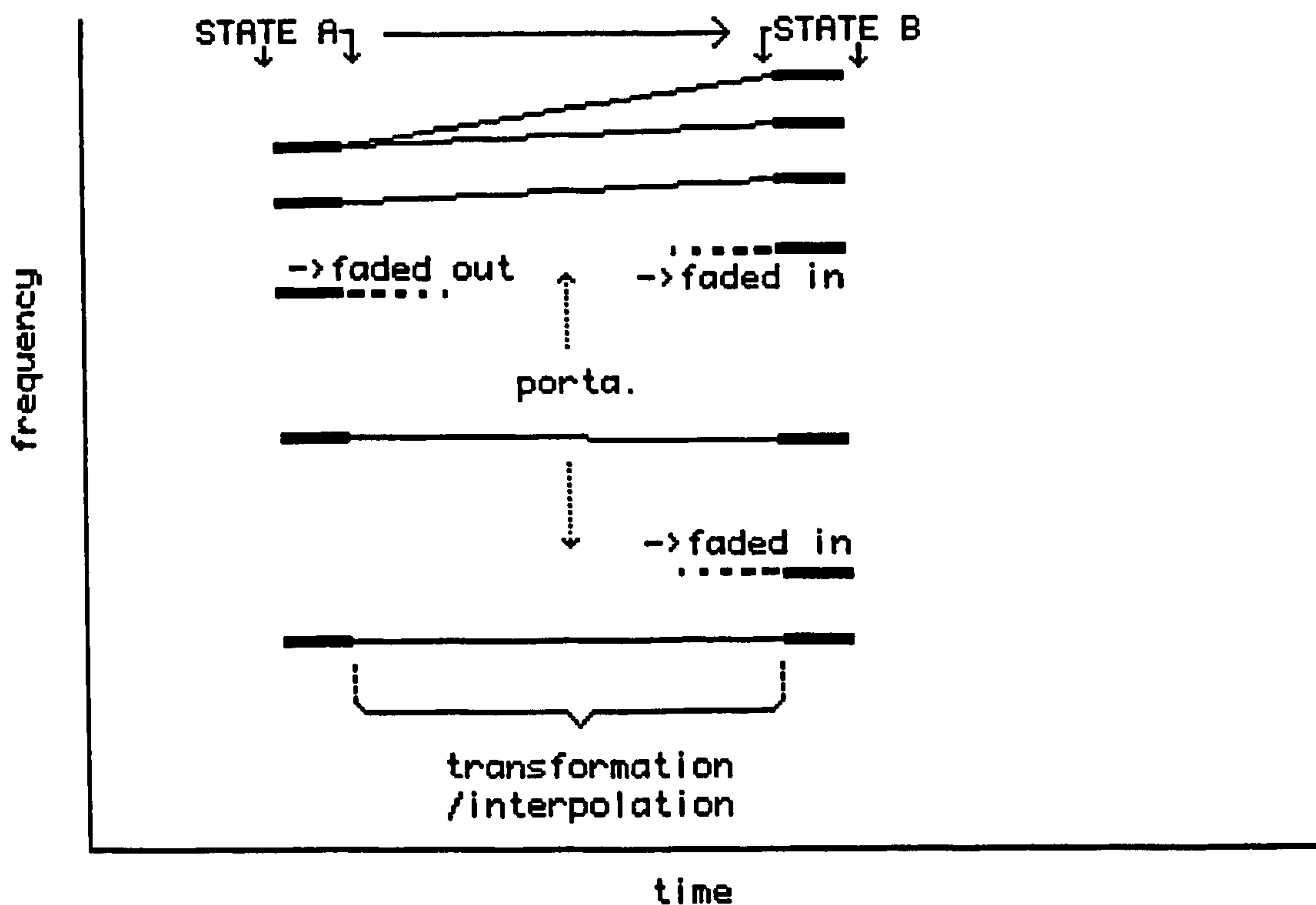


Fig. 4.2 Standard method of spectral transformation

Distortion of a sound is a primary way of separating referent from meaning in speech. Take the example of someone who wishes to talk about alternative representations of a word like "America". To *distance* the word from common first impressions of what 'America' might represent, the word may deliberately be stated by the speaker in a distorted or 'over-purposeful' way: for example "What is Am-e-ri...ca?".

What is interesting about this principle is that there is a similarity between the signification conveyed, and the technique used to convey it. As we are transforming a *meaning* from the usual; so we are transforming a *sound* from its usual interpretation. The physical effects of transformation on sound

/Cont.

objects however are by no means always parallel to resultant changes in associated aural imagery. When these do happen though, a composer does well to *exploit* the co-incidence as part of the complex of his narrative. On one aural plane of understanding (/through one phonoscope), the co-incidence may be of use.

(ii) Context-Changing

In his painting *Spain* (1938. See Plate 1), Salvador Dalí paints a woman most of the top half of whose body can be seen only by a re-interpretation of the outlines of fighting horsemen in the desert distance. Her nipples are the stylized heads of two jousters *distorted* in such a way that they can also be interpreted as nipples, depending on which perspective *context* one chooses to interpret them against.

In *Spain* then, both techniques of transformation are being used together. A painting, being a 'still' art form, is able to present these two methods of transformation simultaneously. A distortion in the decorative arts which exist outside of time, may *only* however be a *stylization*. The only way for a decorative artist to escape this, would be to produce a stylization that perfectly fitted both interpretations. This effect is shown in the 'two faces /candlestick' optical illusion in section 3.5.4. Dalí deliberately avoids this in *Spain* to influence the way in which the painting is perceived, such that some interpretations are more easy to infer than others.

While both types of transformation - distortion and context-changing - are possible in electroacoustic music, because music exists only in time, both may also be presented as a *continuous* evolution not necessarily dependent on discrete 'steps' (cf Fig 4.3 above), or on a permanent stylization (the heads of the jousters in the Dalí). Dalí uses perspective in such a way that both contexts may be inferred.

A sonic example of transformation by context changing is the Gerard Escoffier example described in section 3.4.4. In figure 3.5; it is the sound transformation process *itself* that implies and indeed *produces* the context by which a certain phonoscope is inferred. Instant global pitch transpositions of sound material for example, are not a property of a fire engine's sound in the mimetic phonoscope.



Plate 1

Salvador Dalí: *Spain* (1938)
Oil on canvas, 91.8cm x 60.2cm
Boymans-van-Beuningen Museum, Rotterdam
(formerly Edward James Collection)

They are in the pitch phonoscope though. By being sensitive to the listening contexts implied by different kinds of sound manipulation, transformations by context-changing can be generated.

(iii) Invasive Masking (Eclipsing)

Masking involves hiding the point in the transformation of a sound object at which one interpretation of it 'switches' into another.

Transformations by invasive masking in sound can be effected in different ways. The 'hybrid object' can exist only in the mind's ear for example, two sounds, one a human voice produced by a synthesizer that sounds deliberately 'electronic' and the sound of a real, human voice. The hybrid 'object' is the similarity apparent between the two sounds. The occluding object is represented in the sound world by some distracting sound that appears louder than the sounds one is changing from and to, and that occurs at the instant when one ends and the other starts. If properly timed, this can assist in effective transformation.¹⁰

A sound transformation that works in this way is described in my piece *Repeal* (in which a piano's sound turns into clocks) in section 7.4.9.

(iv) Auto-Occlusion

Hybrid objects (sound or visual) may behave naturally in ways that can cause self-occlusion. The drawing of the merman below illustrates this:

¹⁰ This technique of masking is used in section I of *Repeal*. See section 7.4.9.

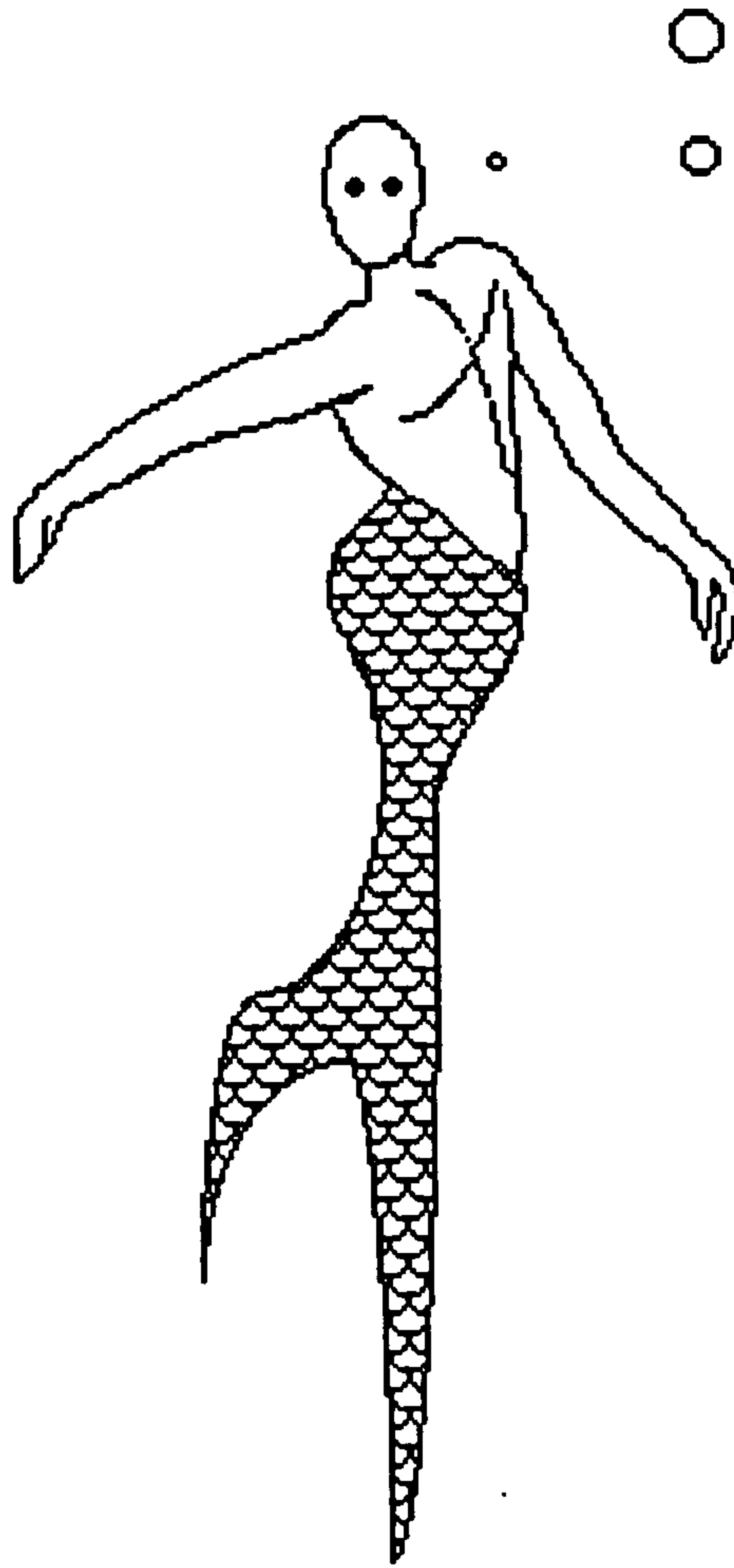
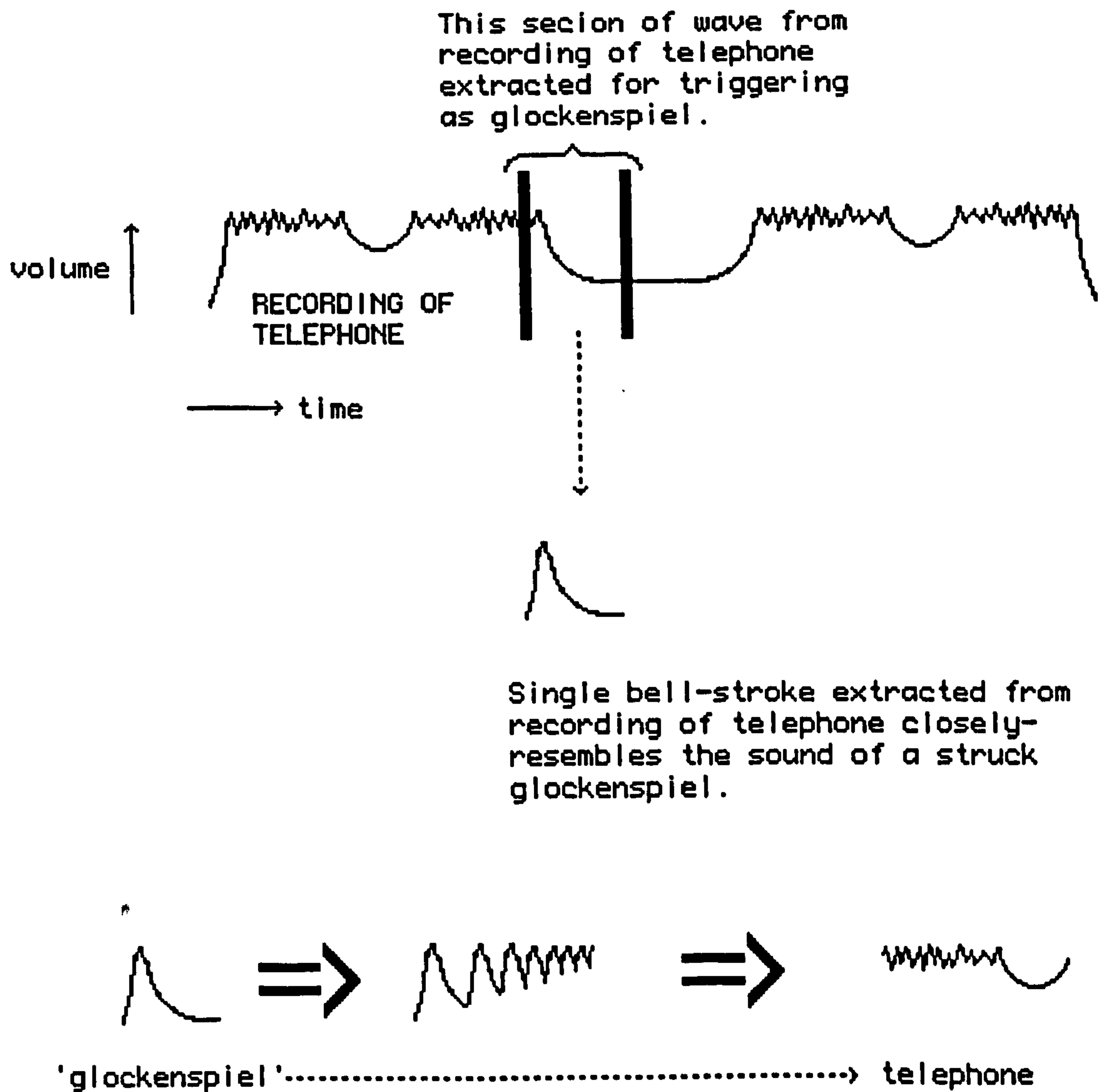


Fig. 4.3 Self-occlusion

...The interface between scales and skin cannot be seen because the merman is twisting round on himself. 'Hiding the join' for reasons abstracted from physiological properties ascribed to or assumed from the visual (or sound) object, can be used to convey convincing transformation (from real skin, to synthetic fish scales!)

Transformations from one implied context to another can cause meanings to be ascribed. In a scene from the surreal short film *List of Contents* from which the music of *Suite from List of Contents* is derived, a transformation from source music to another diegetic sound serves to convey the extent to which a character is out of touch with reality. He is lost in his own 'world'. The central character imagines he is listening to a classical symphony from an imaginary turn-table in the middle of his lounge which he controls with a real remote control unit. Suddenly the telephone rings, and he is snapped back into reality. To help the audience through this, to share in the pivoting from one of the character's experiential states to the other, one sound is chosen to be a member of both experiential states.

A symphony orchestra can mimic a telephone with a trilling glockenspiel. For the film, a mock-up of a section of classical symphony was made including a passage for glockenspiel. The passage ends with a trill on the instrument before the orchestra comes in as if after a cadenza. Meanwhile, to plant the 'seed' of the telephone into the orchestra, an extract of the recording of a telephone is made and used separately to mimic the single strokes of the glockenspiel.



'Telephone' is reproduced by accelerating the rate of re-triggerings of the extracted sound. Original sound of telephone can then be faded in quickly, in sync. with the artificial telephone gesture created.

Fig. 4.4 Intra-diegetic transformation

The final effect in the film is one of a glockenspiel playing solo with orchestra, ending on a trill that then takes up the repeated 'two rings and a pause' of a bell-telephone during which the rest of the orchestra continues, as if the glockenspiel part had stopped at that point.

The visual contextualising shot of a telephone at the point at which glockenspiel sound *becomes* telephone, helps to anchor the meaning of the sound for the audience here.

Our sound world is rich in resources for a communication by the matching and adapting of sound morphologies common to two phonoscopes, according to the message that needs to be conveyed.

We return to the subject of transformation in section 5.2.1.

4.4.4 'Sounding' Aural Images

Section 2.4.7 described the effects of 'sounding' visual objects in the audiovisual medium. Having no accompanying film, electroacoustic music must be self-referential - sounds have only their own aural images to sound here. To achieve this, a concert work must first itself set up these aural images a *re-interpretation* of which it may then 'sound'.

4.5 Propositions

4.5.1 Meta-diegetic Sound, Summary and Conclusion

In film production today, job rôles are becoming polarised between 'music' composers and 'sound designers'. With this, a separation of non-diegetic and diegetic sound is being reinforced; this is unfortunate when working with a hybrid of the two produces an economy that involves audiences more, drawing them irresistibly into the narrative.

In electroacoustic composition, the diegetic types of film sound, can be merged into one, and single sound objects treated simultaneously according to different phonoscopes.

Like film sound, phonoscopic art is composed to 'hear for the hearer', to guide its own interpretation of itself. It

demands a relaxed, 'un-self-conscious' listening.¹¹ The composer of phonoscopic music may use any mode of human perception to 'tell his story'. Gorbman reduces diegetic types to distinct categories (section 2.3), attempting to do this to phonoscopes restricts the subtleties of their use (cf section 3.4.6). Janzen's model (section 3.3.4) gives us a very general structure that might be used to define phonoscopic groups, but rationalisation is the task of the psychologist here and not the sorcerer-composer who *depends* on mystery. As Albert Einstein is reputed to have said, "the most beautiful experience we can have is the mysterious".

¹¹ Paradoxically, one cannot consciously listen unconsciously to something. (Those that 'try', can but fail.) Any phonoscopic composition has to be taken on its own merits.

Chapter 5

Rudiments of Phonoscopic Composition

...it is to this area combining psychology of music with investigation of deeper levels of symbolic representation and communication that future research must urgently be addressed. Such value systems remain to a large extent unconscious

Emmerson, 1986 p21.

5.1 Introduction: A New Polyphony

Having turned the spotlight away from the sound, onto the way it is interpreted from implications derived in sections 4.3 to 4.4 inclusive, some principles by which a phonoscopic mode of composition might function can be established. It should be stressed here that 'phonoscopy' is nothing new. Its inherent approach serves simply to give a perspective on the way in which electroacoustic composition (particularly my own) functions, and the way in which such composition may be approached and composed. Similarly, phonoscopy is not an alternative means of composition, but an attitude from which diverse approaches to composition can coalesce with the advantage that it might negate uneasy feelings of a 'loss of control' over material felt by many composers when, explicit mimetic references are made and sources identified in their music.

5.2 Rudiments

5.2.1 Semiology and Transformation

In a phonoscopic context, transformations would be grouped according to semiological categories (section 1.3.4). There is a problem however: the relationship between the transformation of sound objects may have little to do with parallel changes in their respective aural images. What images are perceived and the messages inferred will depend entirely on the context in hand and the subjectivity of the phonoscopes in play. A general categorisation of transformation according to semiological criteria is

therefore impossible. As it is, as signs, start and end states of a transformation can be interpreted in different ways: iconically (by formal similarity), indexically (by conditioning) and symbolically (in relation to a syntax) (section 1.3.4). Any type of sign can transform into any other, and so the mode of interpretation also changes. We do not hear sound according to semiological categories, but according to more direct modes of interpretation: 'is this a sound I recognise?'; 'what does this sound mean for me?', rather than 'how have I *interpreted* this sound'. In turn, a sound object may be interpreted with experiential simultaneity (see section 3.4.5) according to more than one of these semiological categories. In electroacoustic composition, interpretation is dependent on context.

The effects of sound object transformation on resultant aural image follow the 'logic of the dream' (section 3.5). This metaphysical, parallel, object-image interplay during all sorts of physical transformation processes are what have driven this research for a number of years. Part II of this thesis takes just such a contextualised view so that some of these relationships can be demonstrated and explored to provide an approach from which further experimentation can proceed. Reactions of connotation occur in an unfathomable 'chemistry of essence' that makes the medium of electroacoustic composition so attractive. 'Scenes' can be interpreted in many different ways simultaneously (section 3.4.5). Each interpretation adding a different perspective to feelings conveyed.

Transformations in terms of abstract sound are fairly easy to carry out. Spectro-morphological transformations (section 4.4.3 (i)) of mimetic start and end states, rely on a crossing between modes of listening (phonoscopes). For example, if changing from the sound of windscreen wipers beating, to the sound of a heart beating, there may be a point in the middle of the spectral transformation at which the sound is neither windscreen wiper, nor heartbeat. At such a point, the sound is abstract. A change in aural attitude may be required to hear this abstract hybrid, from mimetic to 'qualitative' and back to mimetic.

In this way, a composition may exploit poly-phonoscopy. A hybrid sound that cannot be seen from the same phonoscope as either of its parent forms, is a product of the process of transformation *itself*. Whether any transformation may take

place *without* leaving the phonoscope from which it is perceived depends entirely on the phonoscope itself. It may be difficult in a spectro-morphological transformation to proceed via a route that never leaves the first phonoscope being referred to, unless one 'cheats' by transforming very quickly. This would however be tantamount to a kind of occlusion. Were a transformation to proceed from one *abstract* sound (qualitative phonoscope/listening) to another, then this problem would not arise. Neither would there be such a problem for the transformation of say one human face into another, if at each stage (or frame of film) the face in view could be perceived as a 'feasible' one and not a temporary and meaningless hybrid. Each transformation has to be taken on its own merits in the context of what the composer intends to convey.

(i) Indexical Transformation (transformation relying on conditioning).

To transform anything, it is not of course necessary to change a sound physically. Indexical transformations rely not on brute distortions of sound, but on conditioned associations between aural images. In *Repeal*, a development of clock-like sound objects culminates in the appearance of the Greenwich Mean Time signal. This is a kind of transformation, a natural progression of sound based on conditioned associations: - both the sound objects are associated, as 'markers of time'.

(ii) Iconic Transformation (transformation relying on formal similarity).

Getting sound objects to mimic each other in a piece of music makes for iconic transformations which form the base supporting musical variation as a formative agent. These take on a complex hierarchy as one considers what *aspect* or essence of a sound one mimics. For example, succeeding spectro-morphological gestures may base themselves on the 'energy-line shapes' of their predecessors.

In *Corporation* bars 144-145, the recording of a voice is treated in such a way as to caricature the way in which it is uttered. The speaker says "that will enable him to use his entire imagination." The syllable "-tire" of "entire" is spoken with emphasis in the original recording and an accompanying downward portamento. The effect is subtle.

Time-dilation (stretching a sound in time) of this particular syllable enabled one interpretation (of many¹) to be made. The downward portamento is taken up in bar 146 in the other instruments with a see-saw of glissandi, (but this is just *one* reason for the appearance of this latter section).

- (iii) Symbolic transformation (transformation relying on objects being embedded in a formal system or syntax).

As has been stated, effecting a transformation using the rules governing change for one phonoscope can cause simultaneous but different changes to occur in another. These latter changes are not always concurrent with development processes that might have been set up within one phonoscope. This can pose a dilemma for the composer as changes made relating to one phonoscope cause unrelated, 'chaotic' changes to occur in the other phonoscopes at a given moment. To 'harness the dream', composers must be sensitive to all phonoscopes while they make changes in a single one, and must include only those changes which are, as far as possible, meaningful in all the senses implied by the music.

An example at 6'40 in *Suite from List of Contents*, we hear the sound "shikatatouquah" this sound exists simultaneously in three phonoscopes: it represents a machine sound (mimetic phonoscope), it represents a vocal sound (another, related mimetic phonoscope) and it represents a sound to be appreciated qualitatively, away from source (acousmatically). Changing the sound spectrally (while referring exclusively to the acousmatic phonoscope), may stop it from sounding like a human voice in the mimetic one. Likewise, changes in the mimetic phonoscope with respect to source identity as 'human voice' may take the sound away from any intended restrictions in the acousmatic phonoscope and the mimetic phonoscope as it relates to the sound sounding machine-like.² Thus meaningful changes in one

¹ This moment in *Corporation* involves a rich knot of phonoscopes and is discussed in detail in the text on this work in Chapter 9.

² In fact, the intention with this use of the sound in the film from whose music the *Suite* comes, was to convey the fact that the effect of the remote control unit that the sound accompanies was *imagined by its owner* and not actually real. While (i) remote control unit machines do not make human vocal sounds, (ii) human voices do not normally sound like machines. In this way, a balance is struck for the onlooker

phonoscope may not sound meaningful in another. In this case, the composer must either take an alternative route, or, as I prefer to do, follow the chaotic effects of the change in another phonoscope, to see where one can go from there. This I find gives my music some of the turbulence of surrealism.

Choosing routes of discourse within each phonoscope that convey meaningful and relevant tales in the electroacoustic work makes for more organic working and is in accordance with the tenets of a good counterpoint³. In this case however, the counterpoint being worked is not between voices, but between phonoscopes. *Polyphonoscopy* is a central means of processing musical development in much of the accompanying folio of composition.

The logic of reality can be the composer's toy.

Section 3.5.3 pointed out that audiences will tend to seek a logic in a seemingly chaotic sonic landscape. The keys to interpretation are inherent in the causality of the transformations presented.

(i) Causality

When producing convincing transformation, it is vital that it be based on characteristics of the properties of the start and end states. Spontaneous transformations *must* be articulated in a manner that satisfies the characteristic physiology and behaviour of the source and destination states.

Examples in digital visual transformation today, too often fall into the trap of happening 'brutally': the change is not originated in the starting state, but imposed on it. Simple, mathematical curves are used to translate one point and colour into another. The effect on the viewer of this approach may cause them to see and accept one state; see a meaningless but appropriate transformation and then see and

between the effect as real for the film's main character, but imaginary in so far as we the spectator are concerned.

³ In 'good' counterpoint, all lines fit together and resolve euphonously while remaining true as far as possible to their thematic identity. In polyphonoscopy, different (and perhaps related) *meanings* are implied by different interpretations of the same music. They fit together, and should make some sort of sense, even if it is the sense of the ambiguity of a human emotion, a political paradox etc.

accept another state, without actually being convinced that the first object actually and spontaneously transformed *itself*, into the second.

Let us assume that we wish to transpose in a manner convincing to the audience from one state A to another, B.

At the time of writing, the most common practice is to produce an artificially-regular change from a fixed point in time - the moment at which A is due to begin transforming; to another point corresponding to B's starting state, at the end of the transformation. More effective, would be a transformation that progresses according to gradual change from the characteristic *behaviour* of A to that of B.

Even in this way however, the ensuing metamorphosis may still lack credibility. A needs a 'reason' to change into B. There has to be a catalyst or causative agent. A is A and B is B. The only 'reason' discernible for the change, may seem to be the passive transformation itself for which a suspension of disbelief may still be required.

For a really effective change, state A must *itself* spontaneously change into state B from an apparent behaviour within A itself, and not imposed from without (this is an important distinction which relates to the ascription of character discussed in section 3.1.2). One must be able to consider the three sound states A, B and the transformation as one single character. The whole must seem to have a life of its own related to the start and end states themselves, the 'character of change displayed by the states' must be autonomous.

This involves much more work for the composer who must have an intimate understanding of the character given to his sounds and the contexts in which they exist before A can turn into B by a change that acts *from* A, and not merely 'upon' it.

The choice of start and end objects is important too. It helps if common properties can be found between them to help define the shape of the transformation. This may need some derivation from the behaviour of A for the most effective route of transformation to be deduced. The manufacture of convincing transformation is more a product of human than machine processes.

(ii) Regulating Recognition

One's interpretation (the aural image) of a sound object can be made to appear, disappear and mutate by contextual changes and by occlusion, what Wishart has called 'contextualising cues' and 'masking' (Wishart, 1985 pp81-4). In the former case, he gives the example of a soprano screaming and panting while accompanied by a piano on a concert platform, then cites the same example without the piano. The piano serves as a 'contextualising cue' to make the difference of soprano in a 'performance' sense and a woman screaming and panting for some other reason - insanity, religious ecstasy etc.

By regulating recognition then, phonoscopes are changed and audiences 'tempted' to make inferences.

5.2.2 Conditioning

The three types of sign: index, icon and symbol each refer to their own type of formal system to which we have been conditioned. Conditioning allows expectations to be prepared. Formal systems to which one refers as a conditioning system can be pre-existent (for example rules governing the natural environment), or specially-contrived for a work. Usually the two are related intimately.

(i) Pre-existent Formal Systems

If not preceded by a pattern setting up a different context for example, the greater the number of times something is repeated, the more likely an audience is to think that it will be repeated again. This is the principle of desensitising. Repetition and co-incidence (synchrony) are the agents of leitmotif.

In poetry, the rhyming words at the ends of lines automatically associate with one another despite being separated by other words. The connection may also be made through the context that the poem itself sets up.

Break, break, break,
On thy cold gray stones, O Sea!
And I would that my tongue could utter
The thoughts that arise in me.

Tennyson

'Sea' rhymes with 'me' and we are automatically charged with contemplating what the possible relationship between the breaking sea and the author of the poem could be.

Based on the natural world as a formal model, if an audience hears a particular sound object coming from a particular direction, they will first assume that it originates from where it is heard.

Desensitising can be used to make objects appear seemingly from nowhere. An effective technique for this is to desensitise an audience to a sound by first introducing it until it is slightly less than barely noticeable (with respect to its volume or spectral interpolation [section 4.4.3]), before fading it out completely. Soon afterwards, the sound is brought in properly. Its appearance will be noticed less, and due to desensitising, accepted as expected. Appearance is about a sound object already being present in the state in which it is acceptable according to the conditioning of the contextualising formal system of which it is a part.

(ii) Contrived Formal Systems

Film can set up its own formal systems. In the second half of Adrian Lyne's film *Jacob's Ladder* (1990) Singer (the main character) is in bed, and the film alternates quite regularly between dream state and reality. The two are presented in such a way that they are difficult to tell apart. What we are given to rely on is the form - the syntax of the film. When the editor breaks his own rule, cutting from dream to *dream*, this deliberately disturbs and disorients the audience.

5.2.3 Groove

"It don't mean a thing if it ain't got that swing."
-"How do you make it swing?"
"If you have to ask, you never know."

Louis Armstrong

Groove is in the heart

(Dee-Lite, 1990).

(i) Definition and Manifestations

'Groove', a term from popular music making is a concept vital to an understanding of communication with one's audience. We can perhaps defy Satchmo and attempt to explain groove, on the understanding that the theory is no substitute for practice.

It is only since computers have been used in music, with their inherent accuracy and ability to present data clearly, that the effect of groove on event placement has become as visible to the composer as larger divisions of meter are.

Groove is the indirect use of emotion or human 'mood' in music to shift musical events fractionally about a series of metric reference points to which their placement refers⁴. Groove can be defined in chronological terms, but by performers is more generally experienced in terms of the rhythmic context in which those events are made to exist. Groove is independent of the durations making up the grooved rhythm (it is difficult to convey via the notated score, relying more on mood indications like 'laid back', 'apprehensively' etc), and can be thought of as a *variable 'lean'*. Playing 'groovily', results in the effective conveyance of the energies of emotion in play as they affect the rhythm. Thus the well-worn phrases: "get on the groove", "get *into* the groove" invite audiences to 'tune in' to the mood being communicated. Because the order of shifts in time

⁴ In recent years, a corruption of the term 'groove' has appeared taken to signifying a repeating rhythmic pattern against which lines can be improvised. This goes against the original, implicit meaning of the term evolved during the 1960s and 1970s and shows a basic misunderstanding of the concept. The text refers to the original meaning of the term.

involved are so minuscule, the only possible way to play perfectly 'groovily' is to be *unconscious* of the rhythms one is playing. This in turn requires that the performer internalise - that is learn or have ready to improvise - the music to be grooved.

Unless improvising in real-time, it is difficult to make computers play 'groovily'. A somewhat crude way 'round this is to shift corresponding events falling periodically within a meter, an appropriate and perhaps uniform fraction of a second forwards or backwards until the desired rhythmic 'push' or 'pull' (groove) is felt on auditioned playback. This is done either by the performing composer, or by a shifting of sound material once entered into the recording system. Isolated events can be shifted independently a fraction of a second to create the 'kick-factor' (section 2.1.3) desired. Shift factors here are to the order of 0.002 to 0.005 seconds and less.⁵ Afterwards, the shifting of individual beats is adjusted according to context and the emotional result desired. This can only be done intuitively.

The physical and physiological relationship between performer and instrument has great bearing on the effective production of a good groove. The weight of a percussionist's beater will slow down his action, groove being affected by a player's 'playing' with the weight of the stick against gravity. A pianist in playing groovily will use the resistance of the spring and the weight of the keys. This has important implications for the design of human-instrument interfaces.

Concern for appropriate grooves has implications for composers of electroacoustic music who must 'perform' their tape parts whether in 'real' or 'step time'⁶. The availability of a system that allows composers to hear back instantly what they have just improvised is useful if a tape part is to groove as it should.

⁵ For film composers -this is equivalent to between 1/20th and 1/8th of a frame at 25 fps

⁶ 'Real-time' involves recording a performance as it must be replayed. Play-back facilities may allow for the performance to be recorded at a slower speed than that for play-back. In 'step-time' recording, a performance does not necessarily have to be recorded as it is going to be played back, as the placement and duration of events is entered into the recording system as distinct values 'outside' of time.

In an interview, the English composer Jonathan Harvey is quoted as saying:

We shouldn't forget music consists of gestures - hitting, blowing, scraping, singing, not pressing buttons. Technology only extends human action.⁷

The barrier between real-time and step-time composition does not have to be seen as an impasse. Gestures can be built up 'at a distance', via the machine and ideas auditioned until they flow as naturally-derived kinetic impressions.

5.2.4 Performance Context

A colleague, the German composer Thomas Hummel, expressed to me in 1992 that his '1960s' Music V-type piece' worked well when performed in museums but not while in concert halls.

Artifacts are perceived differently according to the environment in which they are presented. An appropriate environment *composes-in* to the piece aspects of the way it is perceived.

Hummel's piece depends on the fact that museums display artifacts strange for their historical and /or cultural origins. People come in *expecting* to find something strange, something that they will have to make an effort at placing in the context of their own experience. In this environment, individual exhibits receive less attention from passers-by because of their sheer number. There is no onus on the watcher to stay at an exhibit any longer than they might wish. In a concert hall, the emphasis is more on spectacle. Here, works are expected to place themselves, via their syntax, in the shared experiences of an audience which is usually required to stay for the duration. Venues reinforce this dogma by closing the doors to late-comers - and implicitly to discourage auditors from leaving.

Messiaen said that he preferred to transcribe birdsong in the field rather than at home from a tape recorder used outside because this took away the spontaneity of the music in nature. Getting an overall or general impression of the song in the field resulted in a more 'spiritually

⁷ Jonathan Harvey interviewed by Martin Hoyle in *Time Out* magazine 2/6/1993.

representative' sampling.⁸ For the composer here, context is having an effect on the way he collects his working materials and this will have contextually-determined musical results. Messiaen allows the scene to affect his interpretation of it.

My piece *Corporation (uneasy reflections on 'Camping')* was premièred in a 14th-century church in Little Missenden. I was struck by the effect of the performance context on an appreciation of the piece.

5.2.5 Presentation

What is seen affects how we hear something. In *Repeal* (bar 185) this principle is used to tie tape part to live instrument when the performer is instructed to play 'off the end of the keyboard'. (See section 7.4.9). Likewise, the woodblock in the piece *Conquête de l'espace* has a mythical rôle which dictates that it is placed separately from the other instruments. The percussionist walks over to it to play it which serves to represent one of the abstract interpretations of the tapestry. (See section 10.6.1.)

Venue, publicity, programme notes and propagated 'vibe' also of course contribute to conveying a piece as intended.

5.2.6 'Letting Go'

On ne peut bien parler que quand on regarde la vie avec détachement.

One can only speak well when one contemplates life with detachment.

Jean-Luc Godard Vivre sa Vie (1962)

A selfconscious performance lacks spontaneity. In musical performance, perfection can only be courted passively.

In the manual for a largely forgotten and underestimated electronic musical instrument -the *Ondes Musicales* of Maurice Martenot, written by the inventor comes this extraordinary passage directing the performer:

⁸ Cited on BBC Radio 3, 10.50am 29/10/'91.

It is above all through your enthusiasm in creating a fine flexible sound and through a feeling of rapture in the infinitely sensitive, that you will progress. Besides, the technique of playing is so subtle that the 'conscious self' would be far too unskilled to control it completely. You have to give yourself up completely to the continuity of the sound audibility and be in such a state as to allow extremely swift and precise reactions.⁹

When working with sound materials my reasoning is inductive as well as deductive. The material itself may come up with suggestions as to how the piece progresses.

5.2.7 Exploiting Reactions between the Pre-planned and the Spontaneous; Butterfly Effect

The tension between restraint and freedom is a fertile one.

When using mechanisms to generate pitch, harmony and rhythm, mistakes can arise in calculation. Sometimes I will allow the mistake to alter things rather than remain faithful to the system. The mechanism that generates the harmony in the cadenza of *Repeal* is an example here. Like the butterfly effect in chaos theory¹⁰ this can sometimes have drastic results.

The clarinet rhythms in *Corporation* are very much alive. Most are generated by allotting pre-generated pitch streams to freely-improvised rhythms recorded onto computer. While the rhythm is inherently human, the resultant melodic contours and the rhythms with which they are negotiated is a result of a reaction between a human-driven physiological spontaneity and a rational, predetermined and 'dead' mathematical mechanism.

⁹ Taken from *Detailed Instructions for Putting into Operation the Martenot de Concert* manual published by La Luthérie Electronique, manufacturers of the Ondes Martenot, (1960), p10. For further reading about this extraordinary instrument, the reader is directed to Jean Laurendeau's exhaustive history and practice of the instrument: *Maurice Martenot, luthier de l'électronique* Dervy-Livres, Montréal (1990) and Martenot's own *Méthode pour l'enseignement des ondes musicales*, Alphonse Leduc, Paris (1931).

¹⁰ In the *butterfly effect* in chaos theory, it is postulated that the flap of a butterfly's wings can so upset the sensitive meteorological dynamics that an unforecast tornado may be set off by it.

5.3 Aesthetics

5.3.1 Organicism /Integrity

(i) Economy of phonoscopes

Changing the parameters of a sound with respect to one phonoscope, may change the way that sound is perceived in relation to another which is also being referred to in the piece. If this parallel change is not or cannot be related meaningfully to the message the piece intends to convey at this point, then the process must be abandoned and another manipulation found.

Once an audience is 'tuned in' to a way of listening, information coming through that line of communication must be coherent or silent. An example: in bars 136-140 of *Corporation*, a recording of the spoken line "He'll do it for us Mr Id" is dilated or 'time-stretched'. The degree of stretching keeps increasing as we approach the end of the sentence to the point that the "-d" of "Id" is longer than the length of the whole, original sentence. This in turn produces what could be called 'diffraction effects'. -Individual pitches forming a melody suddenly appear from the stretched sound. The audience passes from a perception of the sound stream as speech to texture and to melody. Each of these is a mental criterion employed to ascribe some sort of meaning to a sound - a phonoscope. We pass from one phonoscope to another. The resultant melody in the 'pitch' phonoscope¹¹ is not related to the pitch material of the piece thus far. Rather than ignoring this new set of pitches, it enters the pitch resource and is taken up by the organ in bar 139 as a tiny echo.

This poses an interesting problem for composers: in what order should processing and developmental techniques proceed? Phonoscopic composition as a process has a tendency to open more doors than one can pass through in one exploration of the sound materials at hand. Inevitably, possibilities have to be left by the wayside. *Conquête de l'espace* tries to get over this problem by returning to a fresh interpretation at the start of each section so that the re-working of sound materials can begin anew.

¹¹ Pitch phonoscope: that instantaneous mode of listening employed to make sense of pitch structures extant in the music.

We have to restrict the number of phonoscopes in play, and to be aware of the fruits of transformation in all of them, when changes are made in terms of just one.

(ii) Economy of phonoscope-invoking sound objects

Based on the pieces composed, I would argue that the composer will find it useful to give each phonoscope he decides to use, a 'reducing' property - a force that tends towards cancelling down to the fewest members its set needs. For example, in the painting *Spain* by Dalí (see section 4.4.3) it is *only* men and horsemen who make up the torso of the female bust. In turn, when viewed *as* a bust, the bust is a bust and only a bust -it does not pretend to be anything else. For integrity in a phonoscopic composition, the composer might attempt to use the fewest number of sound objects to convey the phonoscope intended. The danger is that introducing further sound objects increases exponentially the number of inferable aural images from image-context chain reactions (section 3.5.3) making a semantic porridge of the fabric of the composition.

(iii) Equality between phonoscopes

In turn, there must be an organicism in the methods used to work within discreet phonoscopes. Returning to the Dalí example, the degree of stylisation in *Spain* (section 4.4.3 (ii)) is more or less equal for either interpretation of the upper part of the painting.

5.3.2 Fidelity

At first sight, a mode of composition that relies on the vividness of, and relationships between, the aural images it conjours up and the metaphorical inferences between them might be seen as one for which sound quality per se is less important. Lovers of early recordings like those of Caruso do not seem bothered by the crackle and lack of fidelity of the sound from 78 r.p.m. records. At the same time, hiss or background sounds alien to the composed music can add a desired 'live' performance context to a recording of a piece. Phonoscopically, in both these cases, these 'impurities' contextualise and add something to the work. The purity and fidelity of the recording of a sound may

therefore need to take into account on what level the composer wishes the sound to be heard in its sonic landscape.

Where the mimetic phonoscope is being used for its own sake and for no other, the fidelity of the image may be more important than that of the object. There is a tradition however in electroacoustic composition for the good object fidelity that modern technology allows the artist. From the example above then, object fidelity is contextually determined while image fidelity is determined by the phonoscopic process itself.

5.4 Conclusions

5.4.1 The Nexus

Film music is understood to act as a binding agent to the fragmented nature of film montage, what Jonathan Miller calls 'psychological adhesive'¹². It helps to encourage continuity.

A interesting example in film that has repercussions for the language of electroacoustic music occurs in the strange British film *Psychomania* (directed by Don Sharp, 1972). Tom, a young psychopath has just walked into his late father's room which has been locked for eighteen years. The doorway disappears once he has entered the room and images begin to appear in a large nearby mirror. Tom strokes the mirror's surface and we hear the vibrating sound of finger rubbing against glass. Images in the mirror show him being sold as a baby to the Devil by his mother and we hear the sound of low-pitched, singing glasses. This is related to the technique of 'sounding the visual object' (section 2.4.7) in the non-diegetic field. (The mirror also being made of glass.) Next in the mirror appear scenes of Tom as a young man riding a motorcycle at a cromlech, followed by images of him on a bicycle as a youth, then running around the centre stone of the cromlech as a boy and ending with the image of him as a baby.

¹² Jonathan Miller, *The Moving Image* documentary broadcast 9/7/'89, Channel 4, London.

As the scenes change to present younger and younger portraits of the man, the sound of the singing glass rises in pitch. The timbral qualities of the glass also resemble the pure-sounding voice of a child.

While this use of sound increases the perceived tension in the diegetic with a rise in pitch as the scene progresses, it also gives voice to the images of the young Tom, by the natural correlate between the tessitura of a male voice and the age of its owner. In addition, the sound effectively ties Tom's viewing medium (the mirror), to what is being viewed (the scenes from childhood). The two *need* to be related, as scenes from childhood do not normally present themselves in mirrors! The sound marries the images to the mirror.

In this example, the fact that multifarious aural images are associated with a single sound object serves to tie together separate parts of the narrative. The aural images tie together separate parts of the narrative, give continuity to the images being cut between, instill tension and give 'voice' to parts of the diegesis. The *variety* of aural images that can be derived from a sound object has nothing to do with its physical nature, its degree of complexity or physical beauty.

The sound object acts like a *nexus* to its aural images, an expanding set of associations. It is these aural images that are linked together in phonoscopic composition, so that sound objects themselves can then be transformed in directions related to the metaphorical inferences drawn between them.

Aural images are the reactive components of a phonoscopic complex in which diverse aural attitudes become equally valued.

5.4.2 Surrealism and the Chemistry of Essence

Phonoscopic composition if properly wrought has a tendency to produce surreal results. Surrealism has been defined as:

The evocative juxtaposition of incongruous images in order to include unconscious and dream elements.

(Collins English Dictionary, 1986)

Something unreal cannot convincingly be experienced as real until it has first been set up as real. In this way, what is essential to a powerfully emotive surrealism in electroacoustic composition is not so much the juxtaposition of incongruous images, but the effectiveness with which the relationships *between* those objects are implied and developed. Unconscious and dream elements cannot be suggested from images, aural or visual, if these images are perceived through a single phonoscope or diegetic field because incongruity is reliant on a clash of means of interpretation.

Surrealism in electroacoustic composition then, depends on a consolidation of two or more phonoscopic fields.¹³

5.4.3 Summary

Derived from diegetic games played in film, the phonoscope objectivizes aural attitude. Through it, messages can be conveyed by playing with how the musical development (or processing) of a sound object according to one phonoscope, affects how that sound is heard in others. Routes of message generation come together as one 'plays between' phonoscopes. Polyphonoscopy is a new reference to have at hand.

Phonoscopic composition can only be examined in context. Part II delivers some contexts as a folio of composition and demonstrates how electroacoustic material can be worked musically to this end.

¹³ Ironies are evolved in my composition, I believe this has something to do with the tradition of English nonsense.

Part II

Composition

Chapter 6

Manches en bois ...manches de joie

6.1 Introduction

6.1.1 A Study in Control Dichotomies

In contrast to the four pieces which follow this one, *Manches en bois ...manches de joie* is not composed intuitively. Material is rigidly controlled whether by abstract dictates of the composer, or a syntax abstracted from material generated. The piece was constructed on a number of developmental levels simultaneously. The way these levels interact in the final work led this composer to the approaches taken up in subsequent pieces. *Manches* is a very 'consciously'-structured work.

At the time of composition (1988-9), a preoccupation with different degrees of control was found to be interesting and productive. Once derived, models generating sections or layers of music could be articulated and made to interact, increasing the fertility and momentum of the process of composition.

Manches involves 'background' and 'foreground' material which is superimposed. Background material is characterized by slow-moving systems that adhere to simple generative mechanisms. Foreground material is more detailed, involves shorter rhythms and 'reacts' to the background material against which it is superimposed. This 'reaction' goes against the mechanisms that generate change in the foreground matter itself and as such represents a 'loss of control'. It is these changing degrees or levels of control that I found so interesting to work with and which, in later work, were replaced by the 'phonoscope' as a reactive means to organise sound.

In *Manches* typically:

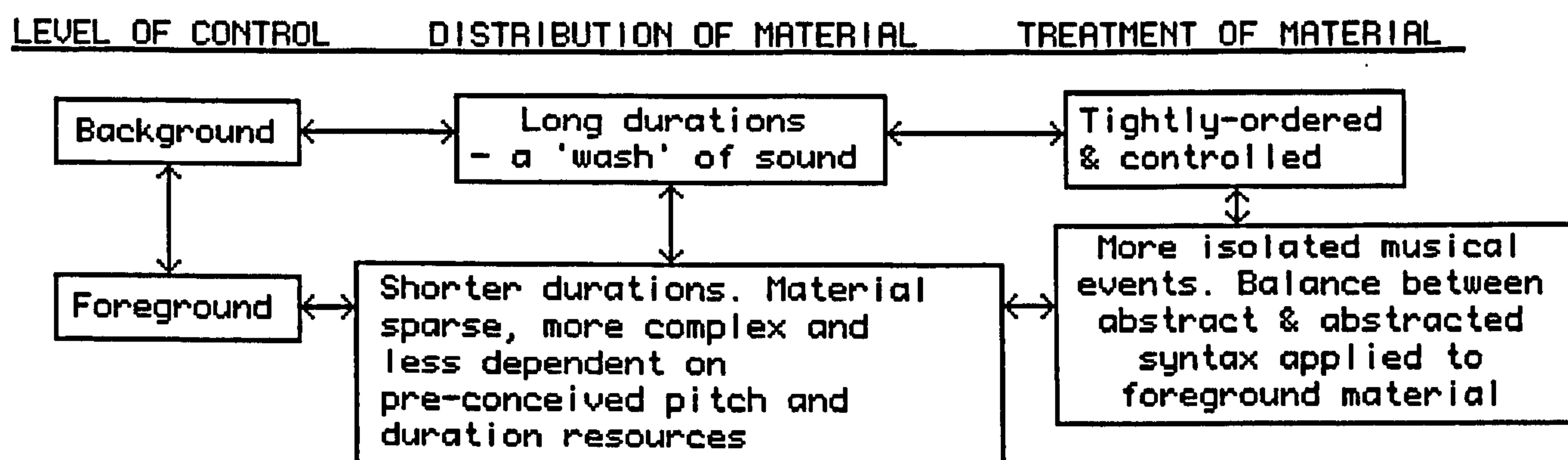


Fig. 6.1 Foreground and background material in *Manches*

6.2 Form I

The central idea in starting *Manches* was to produce a percussive, rhythmical piece with a 'woodiness' about it. The word 'joysticks' sprang to mind, connoting for me then a kaleidoscope of slender wooden sticks spinning at high speed through the air in controlled patterns.

I generated a form from ordering various similies of the word 'joystick' and interpreting these as a set of actions that the piece could follow. Roget's Thesaurus does not contain the word 'joystick', but 'joy' and 'stick' are there. Similies for these words are used, ordered and the orders interpreted into a contrived and programmatic form.¹

¹ The similies and drawn structures here were as follows:

joy: pleasure; pleasurableness; cheerfulness.

stick:

cohere	as in	stick together
support	as in	stick up
transfer	as in	stick on
rub	as in	rubbing two sticks together to produce fire

The words derived: 'together', 'up', 'on' and 'rub' suggested a form. 'Together' implies a duality and might represent two instruments that rise up until they reach and fall on a plane where their lines rub together.

Also from 'stick' came:

ninny	as in	a stick
-------	-------	---------

The final, overall plan for the piece was a three-movement work, the first movement an exposition of joy, the second a quiet 'love' duet involving two initially separate parts that rise to union at the tops of their registers. The last movement dramatic in character paying homage to the concerto in that one instrument is 'surrounded', 'trapped' and 'beaten' by others -ie in competition with them. In the end, ideas for the first 'movement' (*Manches*) proved sufficient to make an independent piece, the other two movements remaining unrealised.

Inherent in *Manches* is the idea of the two soloist instruments: percussionist and 'cello.

The idea of a 'theatre of sound' was also apparent, and it was intended to use parallels between theatre's 'backdrop' scenery to the 'live action' of the soloists.

6.3 Harmonic Context

6.3.1 The Chinese Stick Mobile

In the author's family house hung near an upstairs window was a small Chinese bamboo stick wind mobile that made pleasant tinkling sounds when blown. The mobile was examined, it had eight sticks arranged in two rows of four. Each stick when struck produced a prominent dyad, the lower pitch a property of the attack, the upper of the resultant short ring produced by the rod. The last stick seemed to have a double 'knock tone' (Fig. 6.2).

be in difficulty	as in	<i>in a stick</i>
fail		as in <i>stuck</i>
compulsion	as in	<i>sticking</i>
scourge		as in to stick (ie <i>beat</i> with)

From which was contrived the succession of events:

A foolish instrument (ninny) is surrounded and trapped,
sticks at the problem but is beaten.

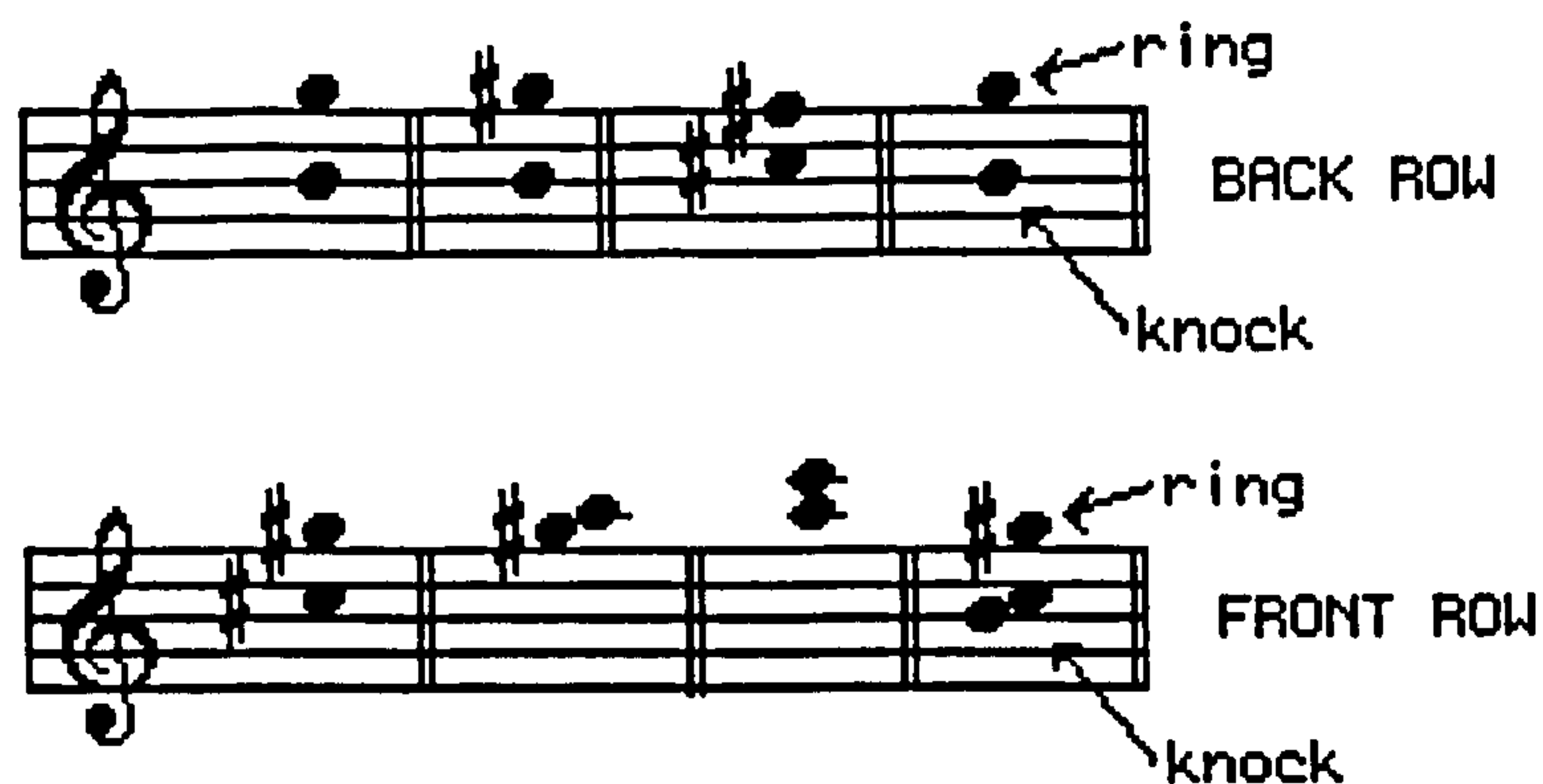


Fig. 6.2 Dyads from the Stick Mobile

Taking the fundamental of the first stick of the front row (C#) as an 'anchoring' pitch, the rest of the pitches apparent from the mobile in ordinary listening were arranged to form a mode. The extra F-natural added was audible from the mobile during a slow churning of the sticks:

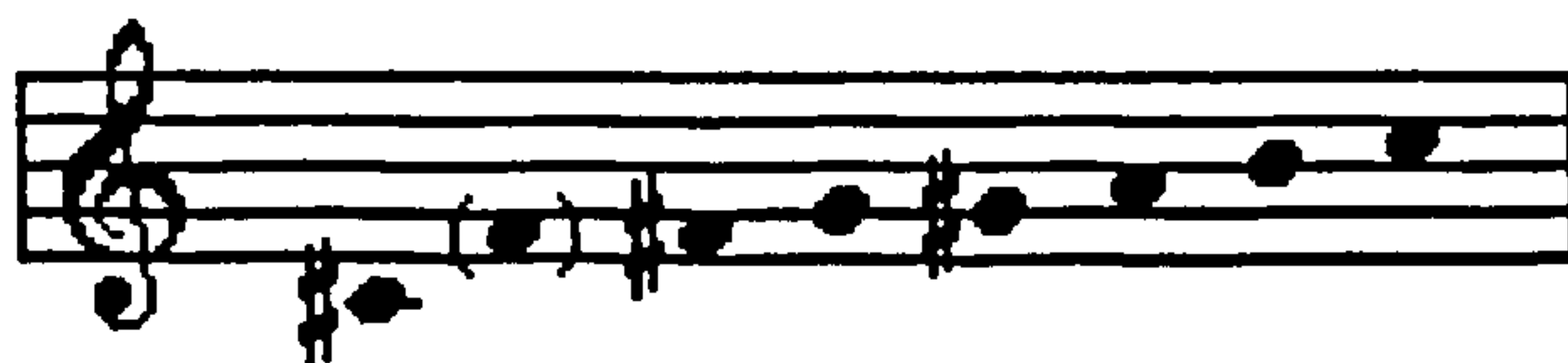
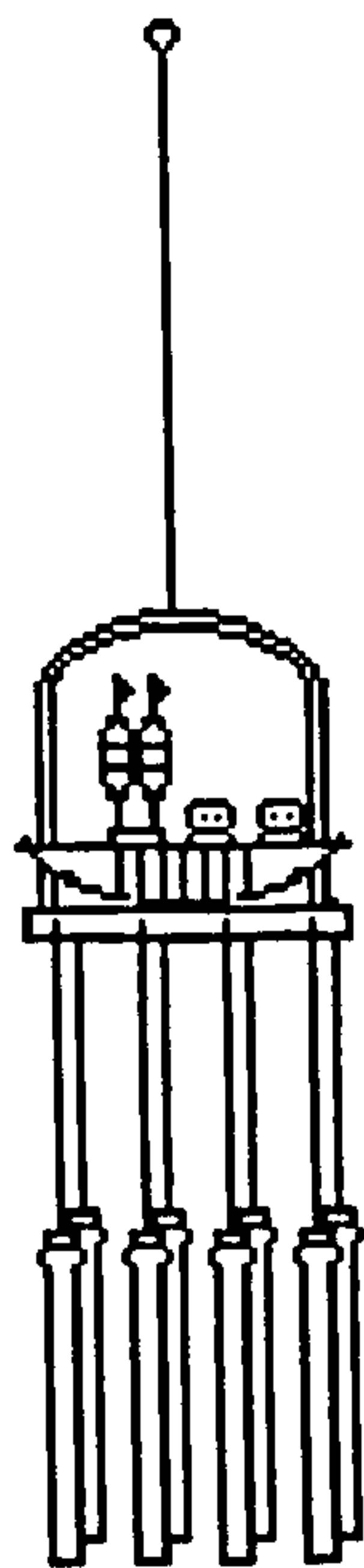


Fig. 6.3 Mode derived from Stick Mobile

From this mode, a 'pitch matrix' ('Matrix 1' see Fig. 6.4) was built to 'explode out' the number of chords. While most of the harmonic material of the piece comes from the eight dyads as presented by the mobile, matrix 1 was useful for the generation of rhythmic 'characters' which are discussed in section 6.4.

6.3.2 The Eight Winds

Harmonic derivation from the mobile continued by imagining the hanging rods to be moved by winds approaching from each side of the mobile. A 'wind' was allocated to each stick approaching from eight compass points. (See bottom half of Fig. 6.5. Here, the mobile is represented from a bird's eye view. The sticks of the mobile are arranged in two lines of four rows. In the diagram, each stick or rod of the mobile is represented by the two pitches apparent when it is struck:)



View of sticks
from above:



The Stick Mobile

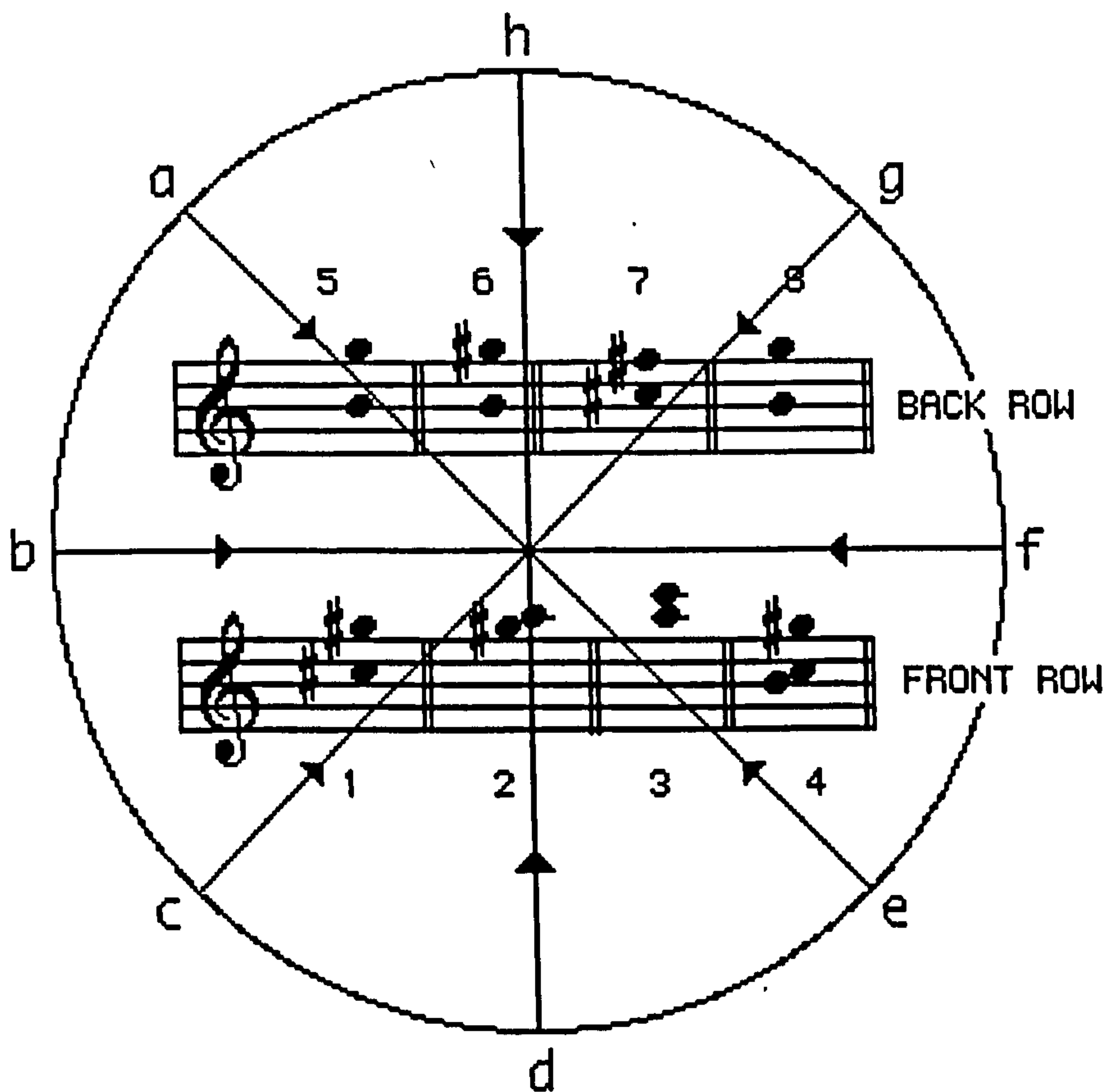


Fig. 6.5 The Stick Mobile and Eight Winds
(Lower diagram shows aerial view)

Taking wind *h* for example, dyad 6 would be made to knock against dyad 2, dyad 7 against 3, 5 against 1 and 8 against 4. From wind *a*, dyad 1 would stay silent, 5 would knock against 2, 6 against 3 and 7 against 4. Dyad 8 like dyad 1 would stay silent. Winds *b* and *f* would produce a different

audible during steady churning of the stick motor

附錄六

Handwritten musical score for 8 staves, numbered 1 to 8. The score is written in treble clef with a key signature of one sharp (F#). The notation includes various musical symbols such as notes, rests, and dynamic markings. A large bracket on the left side of the staves is labeled "1 2 3 4 5 6 7 8" and "1 2 3 4 5 6 7 8". A handwritten note at the top right reads: "(directly from the stick mobile app)".

Fig. 6.4 Matrix 1 and barring scheme generation
in Manches en joie ...manches de joie.

transposition

result in that 5 would strike 6 before 6 struck 7 etc. Winds *a*, *h*, *g* and *c*, *d*, and *e* produce simultaneous knocks; winds *b* and *f* produce successive knocks.

In each case, one rod would strike another. To preserve the distinction between striking and struck rods, the dyads for each wind were labelled *knock* for striking rod and *ring* for struck (as if one were striking a bell).

The chord progressions produced by the 'eight winds' were noted and played through at the piano. Each short chord progression suggested an emotional contour with its own inherent character (the working which shows the derivation of these is given in Plate 3):

- a*: build-up
- b*: bigger build-up
- c*: first resolution 1
- d*: resolution
- e*: build-up 1
- f*: build-up 2
- g*: resolution
- h*: first resolution 2

These 'cadential' considerations were used to set the 'eight winds' into motion in one group of four: *e-h-f-g*.

It is interesting to note here the compositional processes at work: having abstracted musical material from an object (the stick mobile), the material is then re-assessed in terms of how it affects the ear of the composer. This ordering of the results of the winds is abstract to the mobile, but abstracted from a human interpretation. Two, unrelated formalizing agents are being made to interact.

6.4 Rhythmic Working

6.4.1 Rhythmic Cells

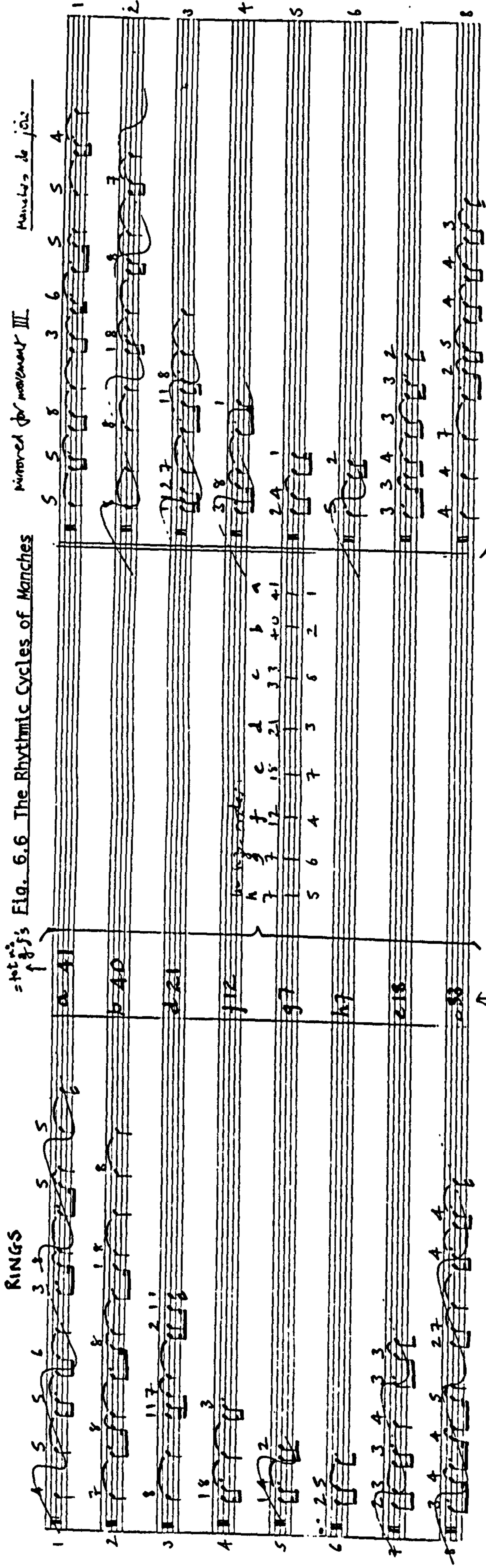
The pitches of the mode (Fig. 6.3) were numbered from 1 (F#) to 8 (C). Each number was then applied to its respective pitch in matrix 1 (see section 6.3.1). Reading the numbers across the matrix produced series that were then used to multiply a lowest common duration - a semiquaver. When a

RINGS

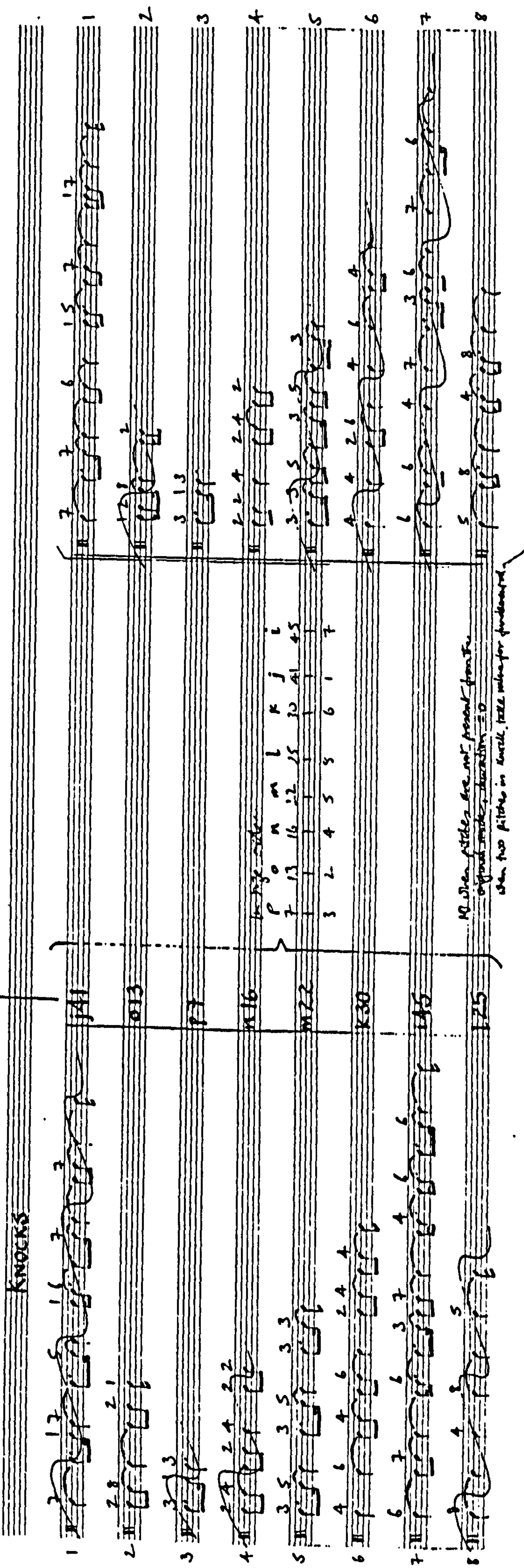
Fig. 6.6 The Rhythmic Cycles of Manches

Minored for movement III

Manches de jini



KNOCKS



pitch appeared in the matrix that did not exist in the mode, the pitch was ignored and no number allocated.

This working then produced $8 \times 2 = 16$ rhythmic cells with different lengths and different numbers of separate durations. As the third movement was already based formally on a mirror-image of the first, it was decided to reverse all the rhythmic cells to produce cells to work with for the last movement. Thirty-two cells seemed like too much for two movements because it was intended that, consciously or not, the audience should be able to *recognise* the recurrence of such cells as they were repeated or layered one over the other in the movement. To 'clear the air of rhythm' but preserve the diversity of component lengths in the sets of the rhythmic cells produced, the cells for each movement (I and III) were arranged in order of length and then alternate cells in each of the four groups of eight erased. If a cell for one of the groups not in retrograde was erased, then its retrograde was preserved. If a cell not in retrograde was preserved, then its retrograde was erased. In this way, only one form of each rhythmic cell remained - forward or retrograde. In Fig. 6.6, the 'mirror' rhythms that are crossed out are those that were erased. Two rhythmic cycles govern each section of *Manches*.

The eight rhythms derived from the 'ring' pitches are called R1-8, the eight from the 'knock' pitches, K1-8.

6.4.2 Isorhythm

Having generated rhythmic cells for the first movement, these are articulated using the medieval Ars Nova technique of isorhythm². To set up a polyrhythmic interest, the lengths of pitch cycles (*colors*) to which rhythmic cells (*talea*) are allocated do not match the number of durations in the rhythmic cell. This simple process can be represented by two wheels of different diameter, turning against each other. The figure below shows the cycles used to generate the clarinet line in the opening section e of the piece.

² See 'Novelties of the Ars Nova: isorhythm' in Seay (1965) pp133-137.

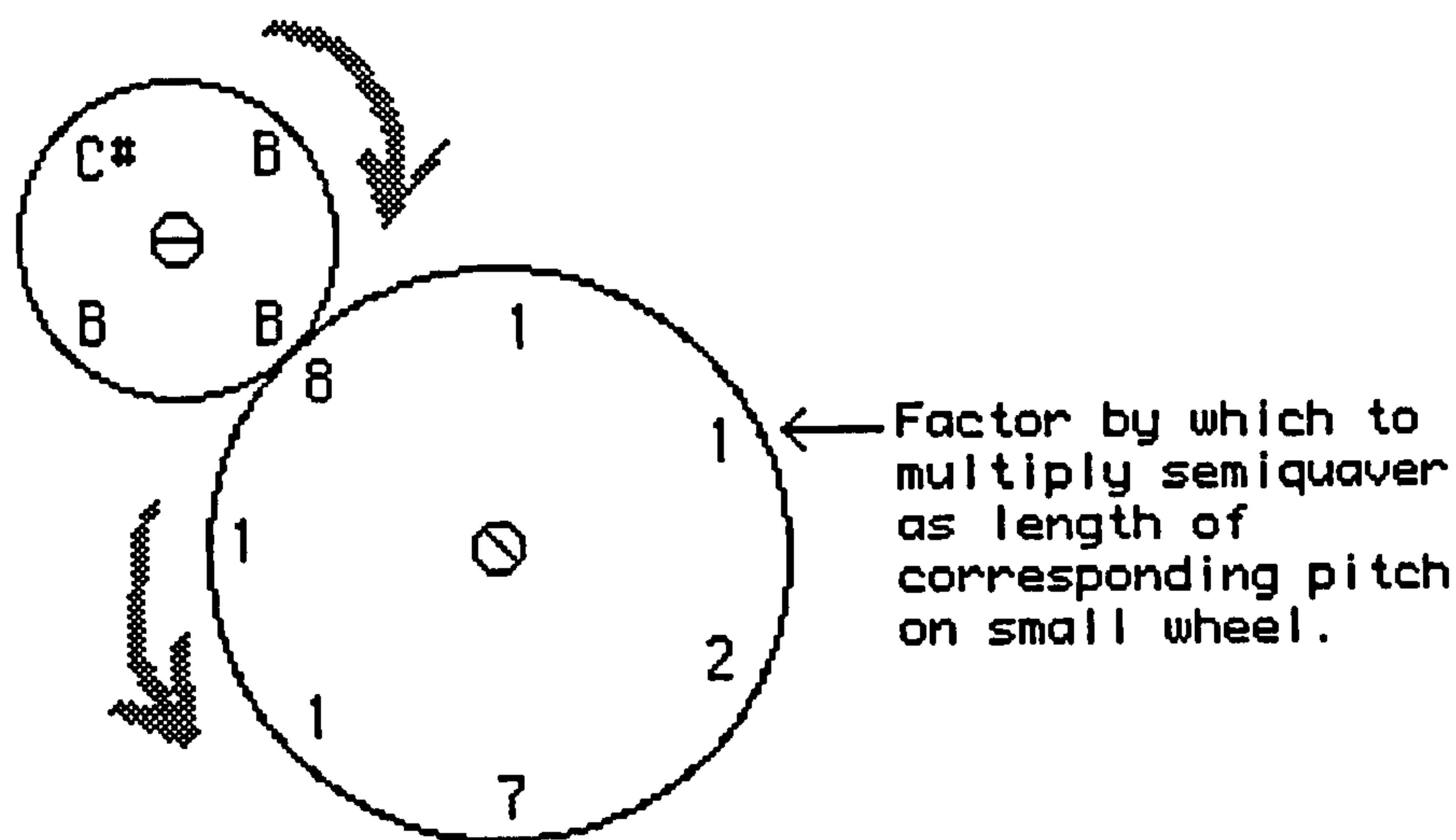


Fig. 6.7 Isorhythmic line-generation in Manches

6.5 Form II

6.5.1 Form

The early music of the percussionist /rock drummer³ Stewart Copeland was an influence for a while. His harmonic and contrapuntal senses are not as strong as is rhythmic ones. As he composes, events are treated less as successions in a melody, or progressions, and more as 'fixed drums' to be triggered in 'vertically-conceived'⁴ patterns. Chords in his music tend to remain static, articulation driven by a 'flashing' of their notes.⁵ As a result, a characteristic feature of his work is the 'terracing' of music by the application of long-range transpositions to repeated blocks

³ Copeland prefers to refer to himself as a 'Rhythmartist'; 'rhythmism' he defines as being the study of rhythms that weave the fabric of life (sleeve notes to recording of Copeland's *The Rhythmartist* A&M AMA5084, (1985).

⁴ The player of a woodwind instrument conceives of melody perhaps as a horizontal line. Copeland sees musical events from the stand-point of a kit drummer faced with separate drums each of which are struck with a vertical action. The 'action of hitting' for Copeland seems to taint his conception of line, so that his music suggests a succession of vertical, iterative events (on the score paper these would be 'seen from above' as is a harmony) rather than as one continuous entity. An idea of this approach can be struck by imagining a pianist playing a melody on his or her instrument with a pair of snare drum sticks. In this way we see there can be a wholly different approach to the conception of melody. Copeland conceives of melody as rhythm.

⁵ The reader interested in hearing a clear example of this should listen to the Copeland's 'Green Fingers -Ten Thumbs' for solo (electronic) piano from *The Equalizer & Other Cliff-hangers* IRS Records, MIRF 1029, (1987).

of material. As the harmony in *Manches* was so 'fixed', and because it was intended that the piece should be strong rhythmically, it was decided to use long-term transpositions in forming the material to preserve clarity.

Copeland's 'Dietz: just come right in here Denise' from the score to Oliver Stone's film *Talk Radio* was used to suggest proportions for the layout and block transposition of generated material.⁶ 'Dietz...' has a cyclic form: ABCABCAB, brute transpositions occurring at points following certain numbers of 16-bar phrases. The relative proportions of these sections were borrowed and applied to the dynamic contour prepared for the first movement.

6.5.2 Barring Scheme

A barring scheme was derived to dictate subsection lengths and provide a framework on which to compose - a mold in which to pour material. Numbers allocated to pitches in the mode were ordered according to the dyad progressions in matrix 1 (see Plate2) to derive a list of factors with which to multiply the common unit of a crotchet:

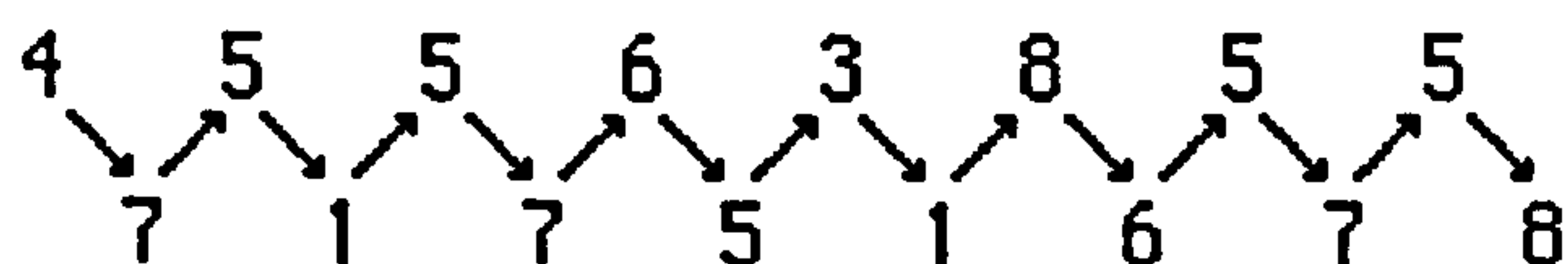


Fig. 6.8 Barring scheme for first movement of *Manches*

Thus the first bar would be in 4/4, the second in 7/4 etc. To make up sections lengths, this barring scheme is sometimes repeated. It has a very active structural function in that accents implied in the various meters are enforced and enhanced in the writing. The positions of accents, phrasing marks and other changes described below vary according to the length of the bar they are in.

I find this way of working very satisfying. It is like completing a puzzle. A sense of 'inevitability' is set up in the compositional process and the piece almost composes itself. A pre-prepared form dictates to a certain extent what follows.

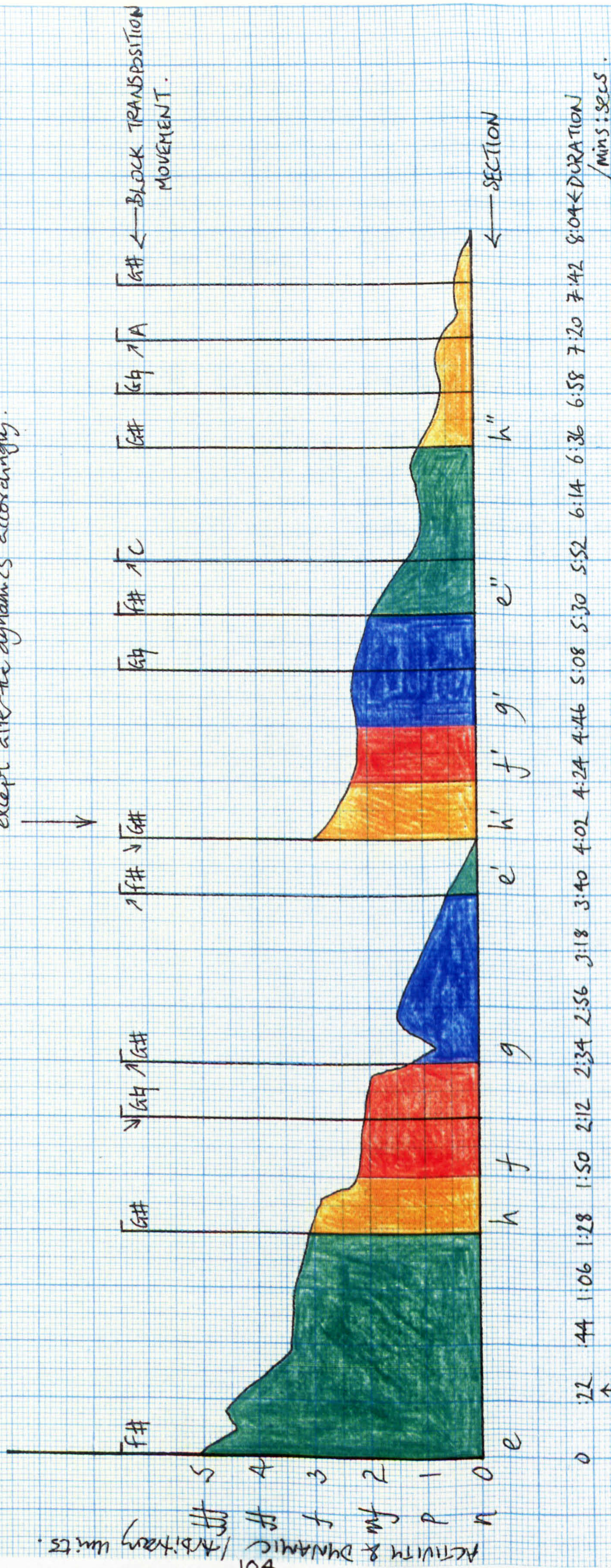
⁶ Despite the use of this 'ready made' as a large-scale mold, the two pieces bare no resemblance!

Manches... I.

Fig. 6.9

Final outline.

Make this an almost exact repetition of h, except alter the dynamics accordingly.



$$\frac{127}{4} = 22 \text{ seconds}$$

The constantly changing meter and the way meter was used to affect material laid over it produces an instability of phrase length. To contrast with this, section *f* of the first movement repeats an 8/4 bar, ('eight' being chosen as it represents the number of sticks in the mobile and the number of separate pitches in the mode).

6.6 Recorded and Electronic Sounds

The mobile speaks for itself through digital recordings of it triggered during the piece by the pianist⁷. Various sound manipulation techniques were used to generate a variety of separate sounds to be triggered or 'flashed' rather like a multi-faceted reflecting surface being turned in front of a light source.

Cross synthesis⁸ of different mobile articulations: knocks, steady churnings etc, simple mixing of unprocessed recordings, 'raw' presentation of recorded sound and treatments involving the cutting, copying, splicing together and looping of interesting and contrasting parts of the recorded sounds from the mobile are presented in the electronic part.

The sounds are arranged into a 'percussion section' over the length of a MIDI keyboard, note was taken of the pitch of the apparent fundamental of each processed sound assigned, the sounds are triggered in orders related to their perceived pitch. In this way, the collected processed recordings were used like a tuned instrument. This was important in that so far the piece was being woven with pitch considerations in mind (the matrix, eight dyads etc).

The idea of sticks spinning at high speed still stuck in my mind and because the mobile suggested only a harmonically sparse sound resource, an analogue synthesizer was brought in to enrich the content of the aurally-derived 'spectro-harmonic resource'. The analogue synthesizer is programmed

⁷ Recorded sounds are triggered in the piece from an Akai S900 'sampler' played by the pianist and notated in the score as 'S900'.

⁸ Using SVP (Super Phase Vocoder) on the CDP (Composers' Desktop Project).

to produce a xylophonic backdrop of sound triggered in sustained arpeggios by the WX7 MIDI wind controller. The analogue synthesizer's⁹ sound is modulated by a low-frequency pulse wave, and a low-pass filter applied to it is varied manually by the performer in section *h*.¹⁰

6.7 Orchestration

During an open workshop with *Metanoia*, notes were taken as to the types of musical writing effective with them. In the workshop a single synthesizer voice was being triggered by the WX7, but its sound did not vary and the ear quickly tired of it. In *Manches en bois ...manches de joie* the WX7 has four changes of voice made to overcome this, all of which are related. Section *h* also involves real-time filtering.

'Dynamic' writing seemed to work effectively for the ensemble, involving quick 'bursts' of sound of varying length and dynamic. I find the frequent 'switching round' of changing pairs or groups of three instruments can be a very effective way of writing with chamber ensembles.

The choice of drum set for the percussionist was made as a result of seeing *Metanoia* in their workshop jump up and groove (see section 5.2.3) as they reached a rock-like section in one particular piece. The material seemed to commit them more to their playing. The music at this point in their workshop seemed to 'come alive' as the whole group of players visibly became alert. There were a few smiles on faces, and the ensemble seemed to be enjoying themselves. Rather than compose in a rock style, the aim in *Manches* was to see to what extent the playing style of an idiom that had this effect on performer and audience, could be applied to material generated in a way alien to that idiom. Some important lessons came from this approach and are discussed in the conclusion below (section 6.10).

⁹ A Roland MKS-80.

¹⁰ Due to limitations in availability of equipment, while the live version of *Manches* in the tape of recorded examples accompanying this writing uses the synthesizer programmed as described, the 'Studio' version recording uses a Roland Juno-6 synthesizer with LFO set to triangle wave. (No pulse wave shape is available on the LFO of the Juno).

To lead in to new lines in a part or new sections of music, entries are sometimes ornamented with scalar figures based on the mode derived from the stick mobile (Fig. 6.3).

6.8 The Four Sections

Manches en bois ...manches de joie runs through the harmonic progressions *e, h, f* and *g* cycling *e-h-f-g-e'-h'-f'-g'-e''-h''* to resemble the ABCABCAB described in section 6.5.1 above. On each recurrence, the material is transformed slightly.

6.8.1 Section e

Based on K2 and R2 rhythmic cycles.

In bar 18, processed recordings of the stick mobile are triggered as if they were 'echoes' to the clarinet's isorhythmic phrases of seven-note length. These echoes are shifted forward from the tails of the clarinet phrases however by changing durations of rest based on the durations of the K5 rhythmic cycle:



Fig. 6.10 The K5 Rhythmic Cycle (See Plate 4 for other cycles)

while this multiplies the lowest common denominator of a quaver. Rhythmic cycles in *Manches* then affect both placement and content of material.

When travelling over-ground on an underground train, I was interested in looking through two parallel sets of railings as the train itself ran parallel to them. Interference patterns are set up -like those seen when a pair of combs are superimposed and moved. *Manches* mimics this often, by superimposing two regular but different cycles. Points of 'constructive' interference between the two patterns are emphasised in the music via ornamentation from accents, doublings and other devices. In this, section *e* for example, the drummer accents the beginning of every bar whose length

in turn keeps changing. The drummer's pattern and the barring pattern interfere with each other.

6.8.2 Section e'

Also based on K2 and R2 rhythmic cycles.

As soloists in the movement, 'cellist and percussionist each have a section devoted to cadenza. Section e' is the 'cello's cadenza which is based on the material of section e which in turn does not use the 'cello at all (apart from one or two occasions in which the instrument reinforces gestures). In e' the 'cello tries to do the work of all the other instruments at once (as they performed in e). The 'cello's dynamics at the end of the section rise above the stipulates of the overall dynamic plan for the piece to prevent the music 'slumping' at this moment. The end of the section might be seen as an attempt by the 'cello to 'pull' all the other instruments in to the next section - h'.

6.8.3 Section h

Based on K5 and R3 rhythmic cycles.

Section h involved a process by which quaver rests were imposed in locations denoted by successive durations from the R3 or K5 rhythmic cycles (see Plate 4). Counting through the cycles began afresh with each successive barline. Sometimes, a rhythmic cycle was too long to fit into the mold of its bar in which case it is cut in mid-gesture. This 'virtual' processing seemed interesting, as although the effect of a member in the series of a cycle could not be heard, the effect was nevertheless discernible by the value's absence in the successive bar. Some processing in *Manches* is therefore implicit, bars acting as restrictive 'windows' on material. This can be 'felt' more than seen from the kit part in the 'h' sections. Similarly, the end of bar 34 is what cuts off the trumpet's K5 accent cycle (accents per 3,5,3,5,3 and 3 semiquavers).

The recorded sounds triggered in this section follow three practices: adding a pedal to double the clarinet's held notes (see bar 40 for example) accompanying the WX7 with a repeated cell and doubling trumpet accents eg at bar 37.

The phrasing marks in the 'cello line lie in such a way as to link groups of short notes to their following long one. This contrasts with the same line's treatment in *h''* where phrasing marks outline successive rhythmic cycles.

6.8.4 Section *h'*

Also based on K5 and R3 rhythmic cycles.

Here the recorded sounds are triggered in order of apparent pitch, from high register to low, as 'answers' to 'throbs' from the WX7's line.

The pedal pitches of the bass clarinet and WX7 in this section were chosen to add symmetrical chords to the 'cello's ostinato. The sides of the symmetry are formed as 'satellite' pitches above or below 'knots' of three-note clusters in the 'cello ostinato:



Fig. 6.11 Arrangement of Bass Clarinet and WX7 Pedals to the 'Cello's ostinato in Section *h'*

For the construction of this section's drum part, a repeating but changing 'rising' figure in the drum set part was desired similar to the clarinet's gesture in section e. The figure would not have to start with the same, low-pitched drum each time. Drums were arranged according to register and numbered:



Fig. 6.12 Numbering of Drums according to register¹¹

Two determinants were required: a starting drum to cycle through the rise with (done using the rhythmic cycles for this section: R3 and K5 [see Fig. 6.6]), and secondly, a duration for which to cycle through the rise. R3 and K5 are also interleaved to produce a rhythmic cell for use here:

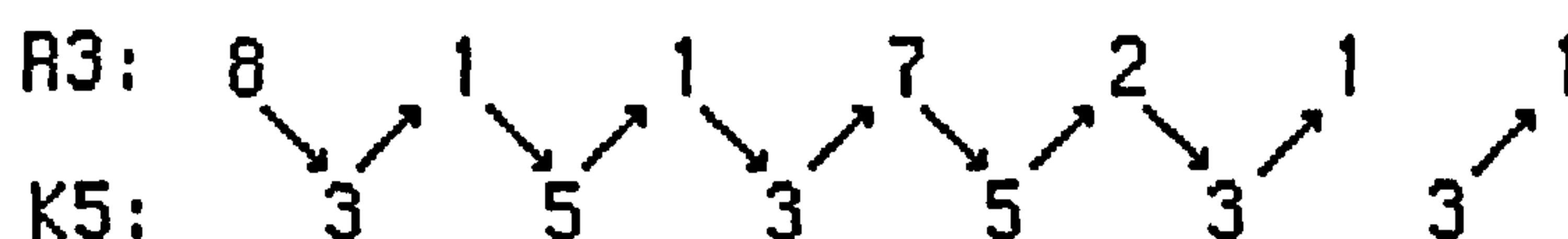


Fig. 6.13 Interleaving of R3 & K5 Rhythmic Cycles

Hi-hat articulations in this section also follow R3 and K5, but in an unrelated way.

The trumpet part in this section works in multiples of $\frac{2}{3}$ of a crotchet that occur every 3, 5, 3, 5, 3, 3 (=K5) $\frac{2}{3}$ beats; *per* 3, 5, 3, 5, 3, 3 bars.

Points of transposition in this section are prefixed by crash cymbal strokes offset by successive durations of the 'knock' cycle K5. In this way, the cymbal crash on its first occurrence is displaced by a factor of 3, on its second occurrence by a factor of 5, 3rd by 3, fourth by 5, 5th by 3 and 6th by 3. (K5 cycle).

6.8.5 Section f

Based on K6 and R4 rhythmic cycles.

The drum 'fill' suggestion in bars 48 & 49 of *f* is based on the 4, 6, 4, 6, 2, 4, 4 cycle in semiquavers. (This excludes

¹¹ cf 'Drum Kit' in Performance Instructions of accompanying score of *Manches en bois ...manches de joie*.

the three preliminary high-hat pedal strokes which were introduced to lend the passage the character of a traditional drum 'fill' idiomatic to kit writing.)

6.8.6 Section *g*

Based on K7 and R6 rhythmic cycles.

The 'cello's line here was made in triplet durations as a lowest common denominator working over two lines simultaneously. At the first bar of *g* for example:

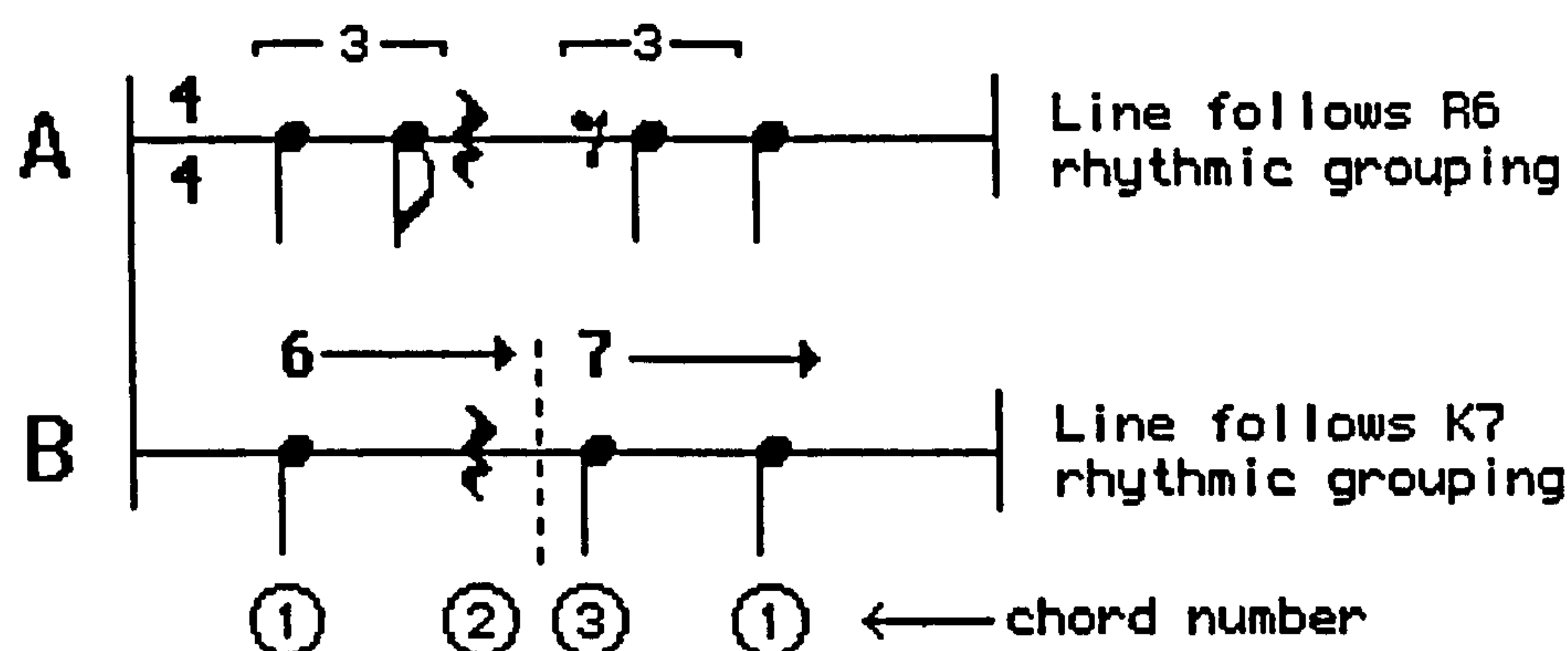


Fig. 6.14 Two-layer Rhythmic Generation of 'Cello part in Section *g*

Pitches were then assigned, line A taking notes either from the top or the bottom of the dyads from chords 1, 2 or 3 (chosen freely), that cycle through per crotchet. Phrasing marks group together the notes of the result.

The resulting four-bar phrase is then repeated. The 'cello's harmonic tempo is much faster than that of the other instruments (all instruments using the same harmonic material). This 'speed of action' relates to the 'cello's status as soloist in this movement.

In this section the 'cello and percussion work in 2 x 4/2-bar phrases. The snare drum follows R6, the bass drum the K7 rhythmic cycle in triplets with an extra: ♩ ♩ ♩  on tomtom, - a rhythmic feature of the mambo. Percussive 'strikes' from the other instruments follow 'knock' durations from the number series that generated the barring scheme, and use the *g* chords transposed. Which chord to use is a function of the cycling harmonic rhythm.

The clarinet moves *back* 1/6th of a crotchet x 6, 7, 6, 3, 7, 4, 6 or 6, in order, starting on G# at such a point that its final pitch will be one step below the trumpet's successive pitches. The clarinet returns each time to the G# so as to set up this important anchor pitch upon which the section is centred.

A diminuendo and crescendo follow the opening of the *g* section (see plan of section dynamics against time in Plate 5). This is emphasized with a change of instruments over the section and by staggering their entries (ie Piano and WX7 do not play between the second half of bar 60 and the beginning fo bar 63).

The WX7 uses a minim as a basic working unit holding its arpeggio for 2 (in bar 59), 5 (in bar 63), 2, 5 (and so on) minims.

6.8.7 Section *g*'

Also based on K7 and R6 rhythmic cycles.

Here the drum kit has a cadenza based on the material of *d*. Like the 'cello before it, the drummer acts as if he were trying to fulfil the jobs of all the other players in section *g* before, at once. The clarinet's tuplet 'ascent' pattern of section *g* is toyed with by the kit according to the numbering system:

>Hi. Tom	5
Snare Drum	4
Medium Tom	3
>Low Tom	2
Floor Tom	1

...by which instruments 2 and 5 alternate places when this ascent pattern repeats, as the numbers 2 and 5 form one of the number cycles of the *g* sections.

6.9 Diffusion

Diffusion in *Manches* is devised largely to enhance the gestures produced as a result of working with pitch, rhythm and form-generating systems. Over bars 1-2 of the piece for example, bass clarinet, snare and 'cello are made to seem to appear from a long distance by decreasing the reverberation time applied to the signal from their microphones from a 'small hall' to a 'room' setting, and raising amplification of the dry signal with the gesture.

In section *g* (see bar 101) as clarinet, WX7 and trumpet produce pulsating lines, the level of amplification per instrument is varied inversely with the amount of 'plate' reverberation added to them to make the sounds seem as if they are appearing and disappearing down metallic rabbit holes.

Diffusion being such a subjective practice, diffusion instructions in *Manches* are kept to a minimum so that the diffusionist is free to vary effects freely according to venue from the basic requirements of the score. The word 'metallic' above might therefore suggest that equalisation be adjusted to lend the amplified sound a metallic 'edge'.

6.10 Conclusions

Manches seems to have two generative forces: an internal, organic, developing force based on the pitch and rhythm cells that interreact and generate material outwards; and an external, contextualising one pressing inwards that tries to make the music familiar in terms of typical jazz articulations imposed on trumpet material (eg 'bends'), drum set fills and hi-hat articulations etc.

In *Manches en bois ...manches de joie*, once patterns have been set up, the process of composition becomes one of 'making the most' of co-incidences that occur between cycles and of emphasising the resultant shapes of lines. This process is very much freer than the processes devised to generate lines and cast forms in the early stages of composition.

I believe the work fulfils my aim in its conveying of an essence of 'driving forward'. (For one moment, I considered re-titling the piece *Rove*.) As cells repeat and patterns become evident, a sense of expectation is set up - one 'knows' what is going to happen next. Sometimes, the barring scheme 'trips the material up', but the cells keep coming back and this drives the music forwards.

During rehearsals, it was found to be difficult to get the players to 'groove'. In the simple 4/4 meter of rock music this should be easy as one knows where accents are going to fall. Playing 'groovily' in music of this metric complexity requires a commitment to becoming familiar with the music until the material is played instinctively.

The 'cello cadenza of section e' works well for me by the contrast set up between the 'manic' playing of the stringed instrument against the sparse, casual, almost careless 'singing' in the other parts here that 'cap' significant points in the cello's part with little 'glows' of sound colour. This technique is exploited in all the pieces which follow in the accompanying folio; in these, language and techniques used in the electronic parts are developed much further.

Paradoxically, the structure and harmony of *Manches en bois ...manches de joie* may have little to do with inherent spectral properties of the stick mobile, but then this was never the intention: they are more the result of an articulation of some substructures and properties perceived in the mobile by an external and independent energy, in the same way that the wind might interact with it.

Chapter 7

Repeal

Concerto for Piano and Synthetic¹ Sounds

7.1 Introduction and Origins

Repeal is based on a simple, short, one-movement solo piano sonata entitled '*Sonate*' composed in 1987².

The intention with *Repeal* was to explode the *Sonate* into a work whose electronic sound world was derived from references that the original piece threw up and to play with the equilibrium between imposed abstract, and abstracted order. Whereas in *Manches*, order is derived from imposed (abstract) compositional systems, in *Repeal*, inherent orders also became apparent from the sound resources collected and as the result of the physical processing and development of sound resource signals. It is from this path that an interest in phonoscopy as a developmental process in composition arose.

The first stage of this translation, involved analysing the *Sonate* to produce a *graphic* interpretation of the layered, pianistic gestures involved. From this graphic chart, gestures were distilled and grouped according to character.

¹ For this composer, 'synthetic' sounds are electronically generated or electronically processed sounds.

² This precursor piece was based on an octatonic mode with 'seventh' chords built up from alternate pitches of the mode. Modes and chords were transposed in matrices about the cycle of fifths. Durations had been generated using techniques similar to those used in *Manches* (q.v.) whereby pitches in a mode are numbered and these used to generate rhythmic cells. The intention with that piece was to produce something that would allude to traditional tonality, sound modal and non-metric.

7.2 Sound Resources

7.2.1 Source Recordings

The main source of recordings was a rusty six foot grand piano whose case was knocked, strings plucked and touched in various ways to produce string harmonics, 'prepared' in the Cageian sense and played, had pencils and various other objects dropped into it and its pedals used percussively to generate various resonances. Shorter, more simple sounds were also reserved for reinforcing attacks and for mixing to add grain to textures.

In addition to these, piano sounds pre-recorded into a synthesizer³ were treated in various ways including ring modulation and frequency modulation.

7.3 Processing

Some of the recorded sounds were developed using simple 'cut and paste' techniques in ways suggested by the sound's own shape ie. by extrapolation. For example, a recording of a sharp knuckle-knock to the casing of the piano with string dampers up was used to produce a swooping pendulum⁴. This was done by making a copy of the sound which is inverted, reversed and pasted onto the start of the original recording.

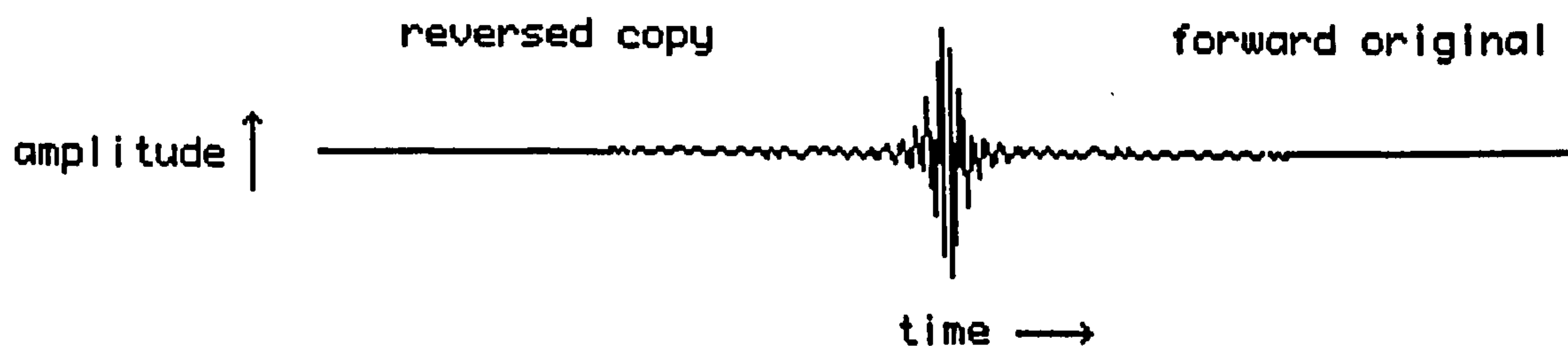


Fig. 7.1 Splicing together backward and forward versions of the piano case knock

It was only once this shape had been produced, that the suggestion of 'pendulum' was inferred. Pendulums have as a feature of their inherent morphology the characteristic of repetition and movement from left to right. These properties were then applied to the sound. It is looped to repeat and

³ A Kawai K1r.

⁴ The allusion to clocks becomes important in sections A and I.

subjected to a slowly-oscillating pan. Rather than synchronising this pan to the overall shape of the amplitude (ie having the sound at centre synchronized with peak amplitude), it was decided to keep the left to right movement unsynchronised. Thus, a property of the pendulum's morphology becomes freed. An expectation is broken and we have surrealism.⁵ This pendulum is multiplied and used prominently in bars 116-118 of the piece and elsewhere.

In processing or not processing the sounds collected, I worked intuitively, using the principles expounded in sections 5.2.3 (iii) and 5.2.7 ⁶.

Some of the results of this processing produced multiplexes that behaved in complicated ways according to how they were performed from MIDI triggers. They formed in themselves 'invented' musical instruments each with a recognisable 'character' and resultant morphology.

There next came about a process of allocation of created 'instrument' to gestural character from the graphic interpretation described in section 7.1. Sometimes individually created electronic 'instruments' were sufficient, sometimes it was necessary to layer and/or alter two or more of the 'instruments' produced. The 'ponts destructifs' (see Appendix) heard in the tape part of section D use a large number of these 'instruments' layered together to produce a rich, evolving sound.

7.4 Sound Theatre and Overview

The idea of *Repeal* was to present a piano 'doing battle' with an alter ego of itself: in concert, the acoustic instrument represents itself, while its 'alter ego' is represented through the sounds extracted from it.

⁵ See last paragraph section 3.1.5. Another interpretation of the phenomenon produced here might be that, without being aware of it, the listener is being thrown *around* the pendulum so that its position and amplitude are no longer related.

⁶ By for example relating filter cutoff points to envelopes in turn controlled by MIDI velocities to produce multiplexes (as defined by Wishart, 1985 pp53-4); using MIDI aftertouch to pitch bend a sound very slightly; applying vibrati that appear gradually; filtering, looping, layering and mixing.

Sections of *Repeal* are based on pitch material exposed in corresponding sections of the original *Sonate* for piano solo from which the piece was grown. This was done either liberally (as in section A which was recorded in the studio as a free improvisation), or using the interactive composition programme 'M' developed by David Zicarelli and Joel Chadabe. 'M' allows sets or ranges of pitches, duration, iterative density, tonal digression and tendency towards random patterns of accent and articulation to be entered into a performance algorithm. The composer then 'sets off' this 'composition engine' which can vary its own parameters in defined ways. 'States' of the engine can also be altered freely in real time by the composer⁷. The isorhythmic technique used in *Manches* (section 6.4.2) returns in *Repeal* but through 'M', the properties of the 'wheels' (again, cf 6.4.2) could be made to change as pitch material is generated. Sections B, D and the fugue H are all generated from programmes in 'M'.

'M' opened more doors. The sound of a piano playing these toccatas of pitch streams was sometimes exciting in its inexorability and mechanicity. The relationship between machine and human control is an interesting one that *Repeal* explores: human interpretation of material that has been generated mechanically through a programme designed to improvise like a human; and mechanical interpretation of material that has been composed directly by a human. The aim in *Repeal* is to play games between emotion and mechanicity.

7.4.1 Section A Stars, motif and Bass chant

To emphasize the intrinsic relationship between the two main sound sources (piano and tape), it was important to see the sound 'teased out' of the acoustic instrument in front of the audience. This happens in the opening of the piece. The pianist plays F# in bottom register which in turn 'sets off' the sound of a low string scrape transposed down many times and sounding very quietly. The acoustic F# covers the entry of the tape. The ghost appears. An important principle in

⁷ For a complete discussion of the workings of the interactive composition software 'M', (Zicarelli, 1987). Since the time of writing, 'M' has been superseded by the more complex and more open-ended programmes 'PatchWork' and 'Max' both conceived at IRCAM, and both of which were used in the composition of *Conquête de l'espace*, see chapter 12.

this example of masking (occluding an entry -see section 4.4.3 (iii) and (iv)) is that two sounds can be linked for the audience when one occludes the entry of another if the two sounds are at the same apparent pitch. I use this technique quite often in my composition.

The same preoccupations in *Manches* - of making the un-fittable fit - return in *Repeal* in terms, for example, of restructuring material generated from 'M' so that it fits 'under the hand' of the pianist without spoiling the inherent texture of the writing. Again in *Manches* this can be compared to the cadenzas in which one instrument tries to take on the work of many simultaneously. *Repeal* is technically demanding. Inevitably, certain passages were re-arranged to make them playable and work was spent checking realistic tempi with the pianist. Certain passages (for example section D) should really be played *Prestissimo*. The tempo of the 'tape' part has necessarily to be fixed unless it is to be triggered live which inevitably involves more equipment on stage for live processing of sound. Also, once programmed, certain multiplexes are time-bound. This might cause problems for the pianist who wishes to play certain sections more slowly. Spontaneity is stifled. Two tape parts exist for the piece, one that pushes tempi to possible limits, the other more sedate. This latter version is the one included on the DAT of the composition.

Repeal is about a fight not to become a machine. Much is made of the wide contrasts between free-flowing liquid rhythms and the mechanicity (of section D for example).

7.4.2 Section B Transition

In this section the idea is that a voice from the tape part 'chases' a piano part that 'runs' about frenetically. This is a chase across registers. In the 'game', if the tape part succeeds in 'slamming' its sound in the same register at which the piano is playing, the piano is 'killed'. Thus the transition begins with tape and piano sounds in distant registers. The tape part climbs ominously up (bar 57) but the game is interrupted by section C.

7.4.3 Section C Plated, 'flattening' chords

Here, the piano chords are doubled in the tape part with damped piano string harmonics which colour the sound of the piano in a way that is 'piano', but not quite piano. The tape part extends the colouristic possibilities of the piano. Different articulations in the acoustic part are doubled with various 'prepared' piano articulations from the tape part, each of which is also subjected to different types of reverberation in the 'post-production' stage. A looped 'two stroke engine' sound is also derived from the prepared piano articulations and a numerical series is used to specify strategic points where this sound is triggered; it builds from bar 59 until we fall into section D. The material of section C returns in sections G and J where it is developed in different ways.

7.4.4 Section D 'Chasing' the transition

The transition game (section 7.4.2) resumes. The tape part climbs ever higher and as it gets close to the piano's playing register, the piano's line begins to dodge at each impact from the tape part until the tape part 'finds its mark' at the start of bar 92 which is the beginning of section E.

7.4.5 Section E 'Death' of transition, cascade of exploding, fluorescing crystals

This section is the result of the piano's line having been flattened (or smashed) by the *déstructeurs du pont* (transition or 'bridge' destroyers) of the tape part. The intention was to produce the sonic equivalent of a crystal that explodes with sparks and dry fluorescing fragments. These are generated from violent transpositions to very high register or recordings of thin metal bars being dropped onto the top register of piano strings and thickened with synthesized sounds again based on recordings of piano strings being struck, but with felt hammers. The passage explores abstract (acousmatic) contrasts between very dry high-pitched vibrating sounds. The entry of the final, continuous sound in this stream is masked with a 'sparking' sound at the beginning of bar 96.

7.4.6 Section F Helical cadenza

The construction of the piano cadenza is partly based on the short cadenza of Chopin's *Prelude in C# Minor* (Op. 45 No. 25 [see Fig. 7.2]). The movement of the chords in this work is particularly interesting. *Repeal* explores the idea further. The voices in the Chopin are parallel and, for a while, follow a repeating four-step chromatic pattern illustrated by Fig. 7.3:

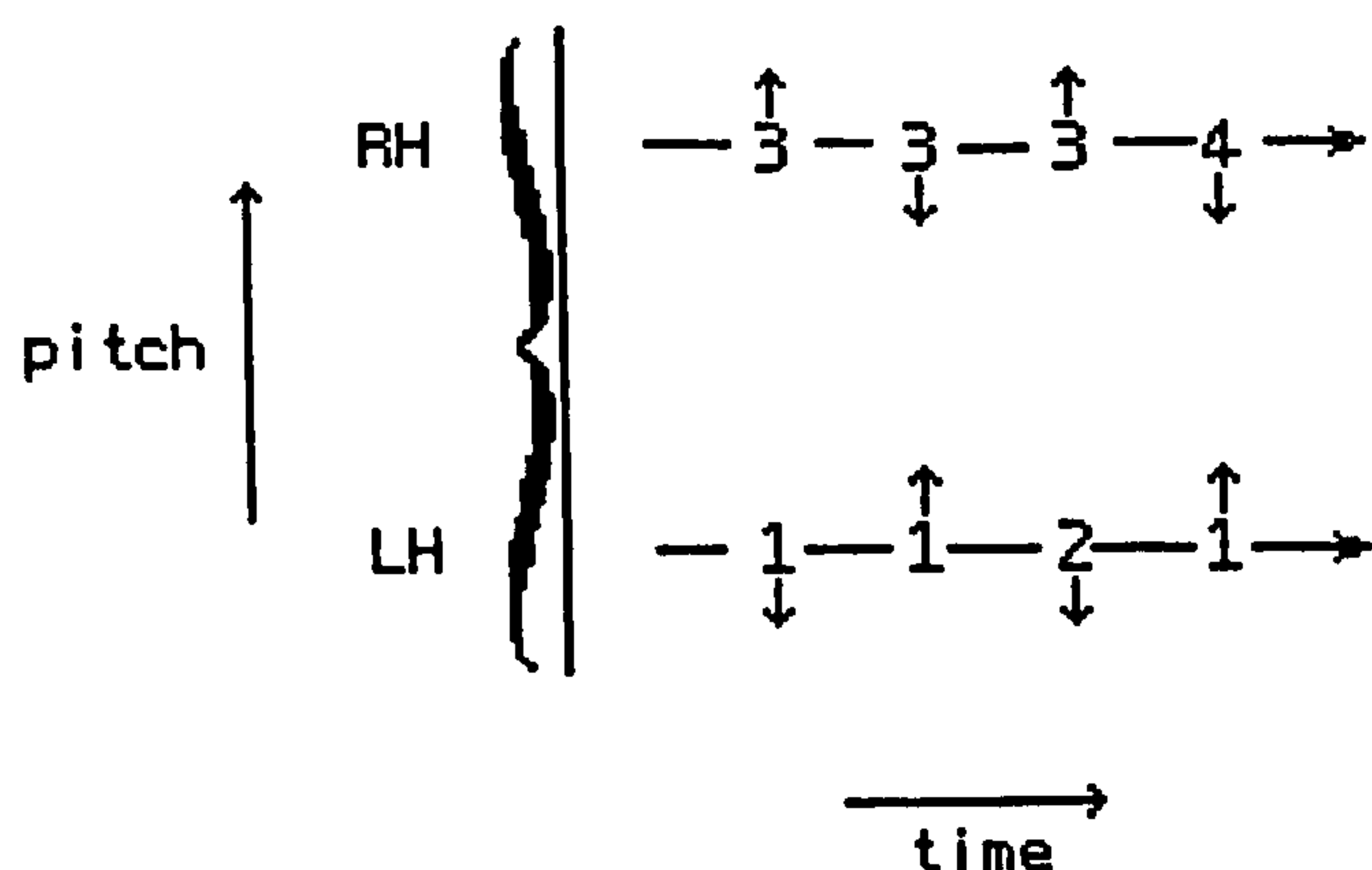


Fig. 7.3 Basic pattern of movement across the chromatic scale in Chopin's *Prelude in C# Minor* (Op. 45 No. 25).

Each figure in the diagram above represents the number of semitones moved in the scale. Arrows show direction of travel.

The intention in *Repeal* was to use the same steps but on the two modes of the original *Sonate*. Because the modes used here involve the occasional leap, voices in the result calculated cross periodically. The result was considered effective and forms a helical alternation of the two modes that fuse as their characteristic resonances interweave. In *Repeal* there is no doubling in the passage, all four voices are independent. In the first chord, voices one and three take the first and third pitches of mode 1, voices two and four take the first and second pitches of mode 2. In chord two, the voices switch modes and take the next pitch in the mode. Voices one & three, and two & four in their pairs keep alternating modes with each successive chord. The effect is quite audible and visually might look something like this:

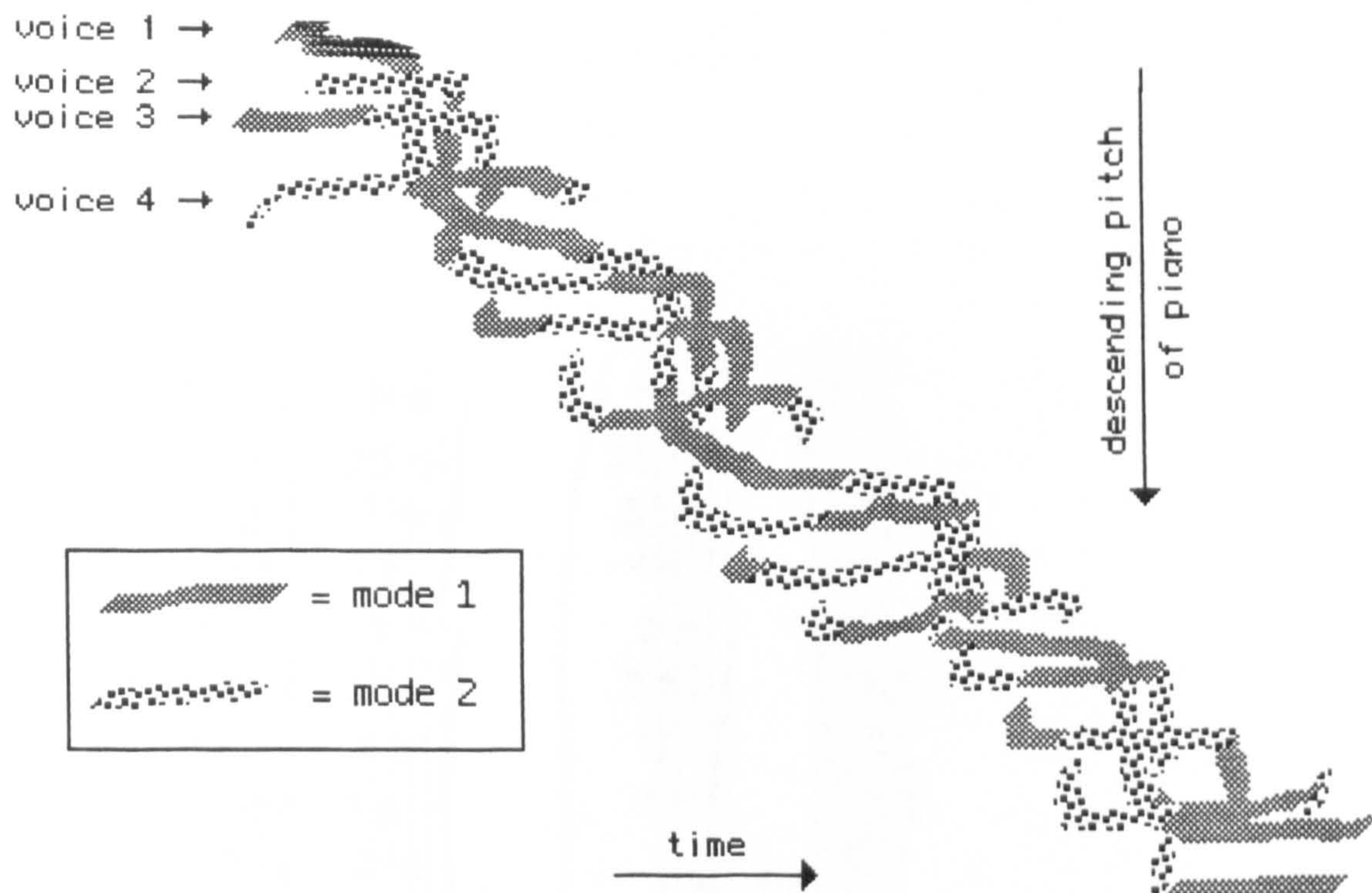


Fig 7.4 Four-voice helical alternation of two modes in the cadenza of *Repeal*

The result is twisting, falling sound from the piano that the tape extends by association to the voices of children intended to sound as if falling down bottomless caverns.

The system in use in the above mechanism is very simple, but the ear soon tires of the 'perfect' despatch of a mechanism. Occasionally a note in the mode is missed out in one of the voices to produce imperfections deliberately. These second order changes give the music life. Mathematical and logical models used to generate music for me, often have to be broken in order to make the result musical. Musical and mathematical/logical beauty are independent of each other.

7.4.7 Section G Development of the plated, 'flattening' chords with bass chant

This passage brings together various 'characters' from preceding sections to produce new gestural counterpoint and explore new contrasts between the source materials.

Cadenza

p *leggierissimo*

80

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Fig. 7.2 Cadenza from Chopin's Prelude in C# Minor (Op.45 No.25)

7.4.8 Section H Respite - fugal interlude + mechanical breaths

The fugue was generated using 'M' (see 7.4); voices in the piano are introduced one at a time and fill the whole range of the instrument. The pianist has to leap around the keyboard to some extent to keep the lines together. Again, the aim here was to find original piano textures. Each of the voices transpose periodically and independently, the material is based on preceding sections. It is interesting that, based on new manipulations of the same pitch material, shades of previous sections are sometimes hinted at through combinations of intervals buried in the texture. As 'M' generates material partly randomly, my aim is that the listener should never be quite certain whether a 'hint' of a previous section is deliberate or chance. The principle at work here is to get audiences to 'see faces in clouds'.

After the fugue, a sense of repose having been elicited, the tape part 'breathes in sleep'. The intention was to stop a sense of time passing here. The passage is very long and slow moving, and in the context of the work, the audience would feel more relaxed than in 'busy' previous sections (see sections 4.4.3 (ii) and 5.2.1 (ii) [second occurrence] on 'contextualising cues'). The tape part plays stereophonic 'mechanical breaths' treated to sound as if they are approaching the listener and expanding at the same time. Much effort went into designing the spatial characteristics of these sounds which can be heard to stream slowly past the audience and vanish behind them.

The premier performance used a multiple-speaker set-up, with a stereo pair both in front of and behind the audience. 'Tweeters' were also wired high up in the auditorium. Because high-frequency content in the sound decreases as it progresses, this resulted at the premier in an effect which one spectator described as 'feeling as if a giant, veil were floating slowly down over the heads of the audience'.

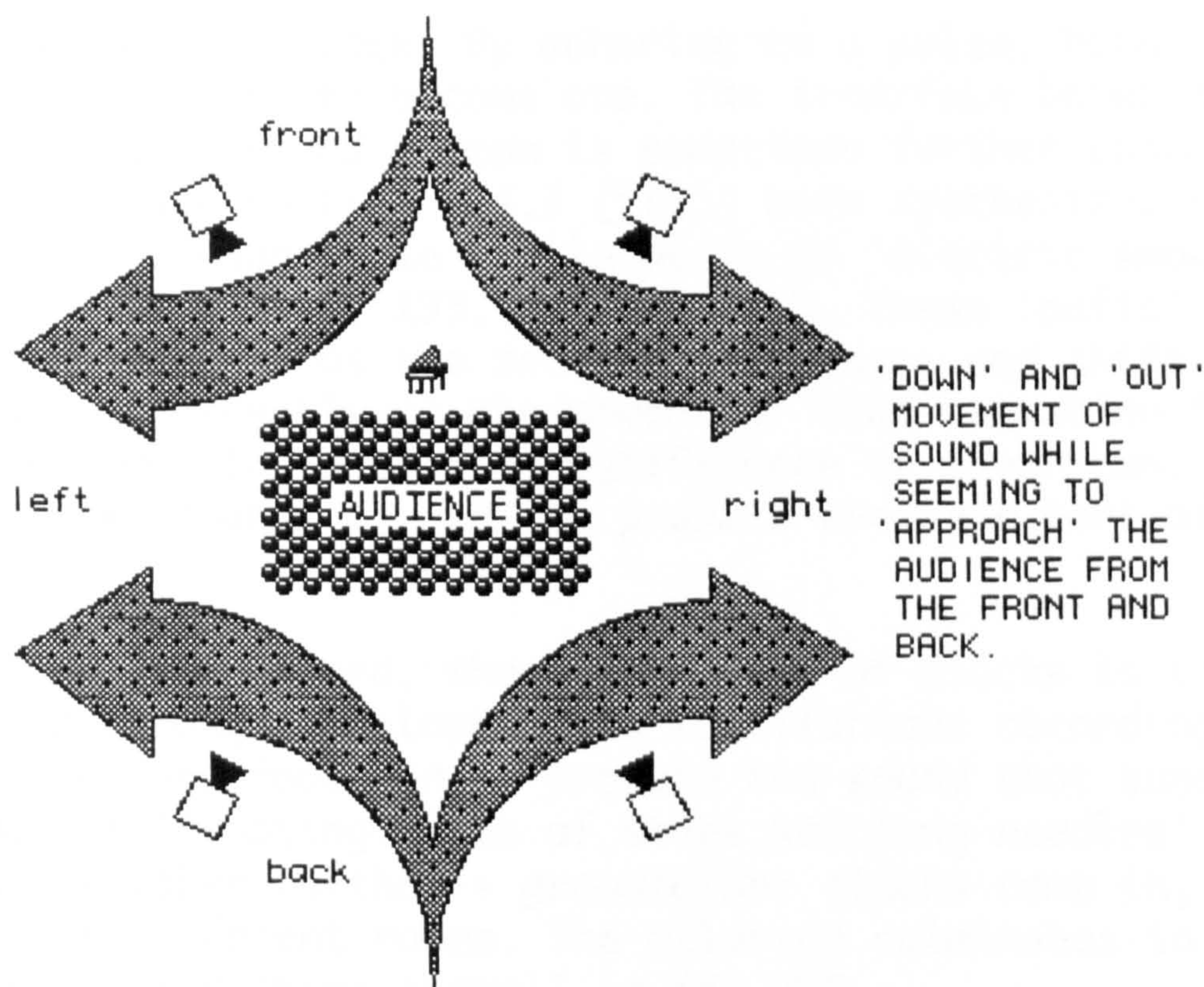


Fig. 7.5 Subtle spatialization of 'mechanical breaths' of *Repeal* in a four-speaker, two-channel set-up (suspended 'tweeters' not shown).

7.4.9 Section I Motif and Clocks

The aural image of 'clocks' plays an important part in *Repeal*. Some of the sounds recorded from the acoustic piano when looped produced ticking sounds. Also, when programming synthesizer voices, some when transposed up very high brought previously sub-audio waves within the audible range producing interesting 'ticking' sounds - listen for example to the faster, high-pitched ticks from bar 23 to the end of section A.

A train of aural images fell into place, from piano to piano-like, to synthetic hybrid, to synthetic with tick to clocks.

Recordings in the sound resource also included piano hammers striking strings. When transposed up very high, these also took on the sound of single clock ticks. This similarity is exploited as a phonoscopic formative agent in this section. The pianist plays series of dyads to a pulse up to the top end of the keyboard whereupon the tape part takes over, taking the same sound stream up out of the piano's range and

the piano becomes clock. By adhering to a pulse, both piano and tape part seem to become one. The interface between the sources in this sound stream is sometimes further concealed by masking (see section 4.4.3 (iii)) with synthesized sounds programmed to sound like little puffs of 'electric smoke' (see bars 185, 188-9, 193, 197 and 201). These 'puffs' become independent as the section progresses and shift away from falling directly on the moment of transformation from piano to tape, to take on a significance of their own. These are the same sounds as used to produce the tape part of section E.

Having been introduced, the aural image of clocks is then exploited through development as multifarious recordings of real clocks are faded in to produce the sound that suggests an image of 'floating nests of steel knitting needles'. Things are taken further - grandfather clocks come in, ticks pulsing at different rates. The allusion culminates in the appearance of a 'time signal' in bar 205.

The appearance of the powerful 'swirling wind' sound after this point comes about from a strange reasoning process that involved me 'stepping outside' the normal compositional train. Stretching associations perhaps ridiculously from clock sound to time signal was formation by association and not a 'traditional' development of the sound 'from itself' through the abstract manipulation of its stream. The inner voice of the traditional theorists appeared as onlookers to my compositional process and made felt their displeasure. The wind reflects their anger at my audacity and their 'clearing of the air' as the piano returns with section J to recapitulate from a harmonization of the sound of a clock's chiming the hour (bars 206-207).

In bar 185 and at similar subsequent points, the pianist is instructed to play 'off the top of the keyboard' - to play theatrically to the continuation of the sound stream from piano into the realm of clocks. Notes are played in thin air. The intent with this visual effect for performance was deadly serious and served to 'kill' the effect that watching the pianist would have in destroying the myth that tape and piano were one. (One can tell when piano stops and tape continues alone from being able to see when the pianist stops playing in the line of dyads.) The effectiveness of this ploy depended on the pianist being able to 'play' the

scene completely 'dead-pan' and to believe in it absolutely himself.⁸

7.4.10 Section J Recapitulation and killing another side of the piano's 'self'

After a more ornamented and more contiguous recapitulation, the piano 'kills' a side of itself. This is represented in the tape part by playing the final chord of bar 216 through the hall reverberation setting of a digital delay line. The resonance and reverberation from this sound is extracted, reversed and played in the tape part in bar 217 to sound as if the tail of the sound from bar 216 were taking on a life of its own and 'coming back' to strike the piano. As this reversed reverberation reaches its climax, the pianist plays a *rinsforzando* dyad in bottom register and this is the only sound that remains at the end of the piece.

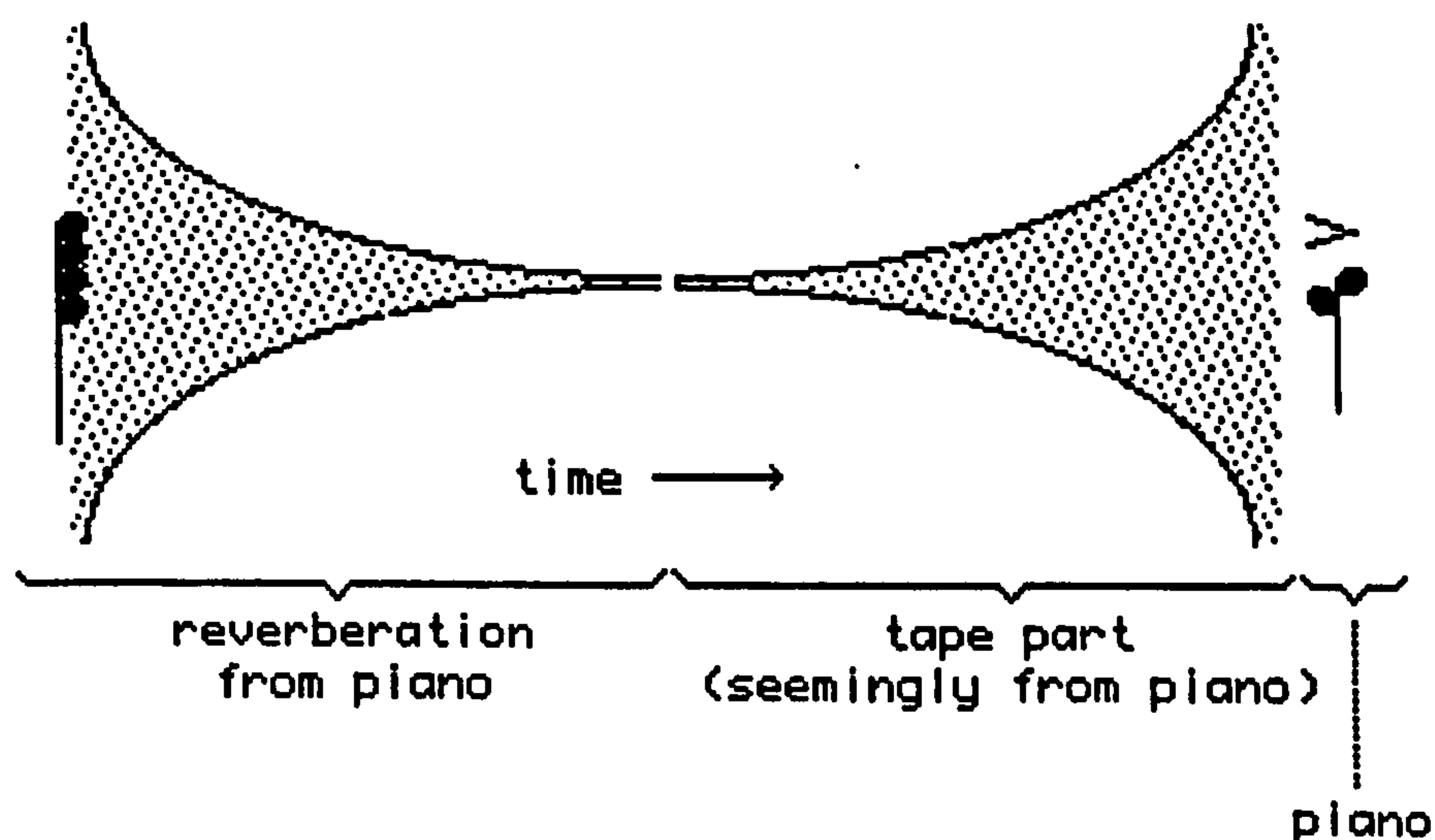


Fig. 7.6 'Returning' reverb. at the end of *Repeal*

⁸ A similar use of humour occurs in section J of *Conquête de l'espace* at bar 205 (see section 10.6.8.). Again, this is used as a means of making the fantastic seem credible.

7.5 Conclusion

Formative agents in the composition of *Repeal* may sound chaotic at first, This is due to the fact that so many structuring forces are at work on the source material whose nature (phonoscopic class) and morphology (abstract aspects - this itself a phonoscope from which we can appreciate sound) demand articulation in different ways. Essences react to structure the composition.

Chapter 8

Suite from *List of Contents*

8.1 Introduction

The *Suite from 'List of Contents'* is a work for solo tape the material of which originated as music, *atmospheres*¹ and shorter sound effects composed for a twenty-minute student film.² This process of composition with film as prescriber of ideas, approaches and to a large extent dictator of temporal factors in the music threw up some interesting questions: in what ways, for example, does film incite musical structures and can any of these formative agents be adopted by the composer not composing to picture? How does sonic art composed to enhance the significance of visual object referents stand up when those accompanying visual objects are removed? Can any hard and fast rules be derived for 'mapping' sonic art for film to the virtual screen³ of the concert hall as the contexts for interpretation change?

Suite from 'List of Contents' aims to provide some answers to these questions.

This chapter begins by describing scenes from the original film -*List of Contents* showing how approaches led to music produced that found its way to the *Suite*. Next the production of the *Suite* itself is examined comparing contexts of cinema and concert hall. Finally, those approaches to composing for film that might be useful when composing directly for the concert hall are deduced for later application and re-evaluation.

¹ A sound 'atmosphere' in film terminology is one that gives a character to a visual environment. Sound atmospheres can convey this character through music or through 'sound effects'. 'Playing' with sound atmospheres as contextualizing agents to a film or in a pure electroacoustic work can be very interesting.

² *List of Contents* directed by Robin Mahoney at the London International Film School. In research, I had intended to use a film against which to thread and layer an electroacoustic piece.

³ The 'virtual screen' here refers to that in the theatre of the mind of the auditor upon which aural images are projected by inference. (See section 3.4.3.)

8.2 Film as Inciter: *List of Contents*

List of Contents (1990) is a short film by Robin Mahoney produced while the director was a student at the London International Film School. The film tells the story of an elderly music teacher called Victor who crosses continually in and out of a dream state and has problems telling the difference between what is real and what is imaginary. He finds he has much more control over things in his imagination and uses this to 'escape' reality. To make his 'dreams' come true, however, he has to rely on real objects or actions, for example placing a real or imaginary stylus on a real or imaginary record or the motion of pressing his thumb to his forehead and twisting it - which action he later replaces with the pressing of a stolen remote control unit to change his dreams. Sometimes those around him have problems understanding what he is doing or referring to.

Through a twisting and surreal narrative, the film's moral suggests that we might play down the value of material possessions. What becomes interesting from the film is the comparison between narrative perspectives: from the point of view of a bystander in the film, from Victor's point of view and from our own perspective as spectators. The music produced to accompany these scenes is at once diegetic and non-diegetic and aim to alter these perspectives.

The film cuts between nine scenes each of which inspired the sound designs composed to enhance them.

8.2.1 The Demolition Site

The film opens with the surreal spectacle of Victor in medieval monk's garb, face covered in white face paint, picking his way through a demolition site as he heads towards a telephone box in the middle of it. The site is surrounded like an arena with walls of broken concrete and exposed iron girders that frame the sky.

There was no incidental sound accompanying the scene which is a dream. To enhance the sense of 'out-of-timedness' and emphasize the significance of Victor's clothes to his dream, I layered together recordings of my own voice singing the

hymn from the middle ages *Te Lucis*⁴ harmonized in organum. To confuse this interpretation, a 'pin-ball machine' effect with many sound mutations of a recording of the word "lost" was produced by pitch shifting, comb filtering and time stretching the recording before triggering it rather like the bells of a pinball machine and layering the result over the hymn. The word "lost" appears repeatedly in the film. In the script, Victor mulls over it as its significance evades him. To reflect this in the accompanying score, the mutations of the word "lost" were derived with differing degrees of recognisability from the original so that in some the spectral formants (and thus the ease with which the word can be understood) are just intact, while in others they are completely beyond recognition. Thus through the set of mutated sounds the meaning of the word "lost" is itself 'lost'.

Three other elements are layered into the scene: a recording of Victor citing a description of his record player to the police (taken from a later scene in the film):

"Black. Brushed matt black, burnished steel and black ash.

...Pink Triangle PT2. Name: Audio Quad 63."

Secondly, a sound similar to that of a steel girder being struck is used. This was to 'give voice' to the visual index of the iron girders present in the background of the scene⁵. This sound is derived from a recording of a damaged tubular bell. The bell recorded was suspended with wire whose loose ends touched the metal of the bell and added 'dirtiness' to its sound. This sound was deliberately chosen to be ambiguous between the sound of a girder being struck and the peal of a church bell, which associates with Victor's dress.

Finally, the whole sound 'atmosphere' is preceded by the attack of a trombone transposed down and subjected to a chorusing delay. Except for the hymn, all these elements can be heard together between 30 and 50 seconds into the *Suite*.

⁴ The Latin text of this hymn was relevant to the story of the film. The hymn or 'Hour' can be found in *Cantors. A selection of Gregorian Chant* edited by Mary Berry. OUP, (1979) p24. Pitch material from the hymn is used throughout the score to order transpositions of other electronic sounds in the music.

⁵ See section 2.4.7.

Variations of this material occurred in scenes in the film that return to the demolition site.

8.2.2 Invisible Turntable

Victor's record player is a significant object in the film. Sound is used without visual referent in scenes in which he imagines he is switching on his turn-table and putting on a record to hear some music.

In composition, an old 1960s Bush valve record player was taken into the studio and close-miked. Recordings were made of its sprung mechanical switch being turned, its speaker humming and loud turn-table revolving from a perishing drive belt. These sounds can be heard between 4'36" and 5'00" in the *Suite*. As the record player was so significant in the story of the film, one of the 'starting' and 'ending' sounds associated with it begins and ends both film and the *Suite*. -These are the sounds of a stylus going down on a vinyl record, and the stylus at the end of a record bumping against the tail of the groove. It is as if the whole soundtrack or score were being played from a record itself, extra-diegetic rather than non-diegetic⁶ in the sense that Victor's dreams are as unreal for us as they are real for him.

8.2.3 Dean's Flat

I was asked to produce the sound atmosphere to accompany Victor when he visits the flat of a shady hi-fi repair man called Dean. The flat is strewn with odd pieces of electronic apparatus which I had to 'bring alive' with electronic sounds. This was done mostly using very simple, frequency-modulated sounds. A section of this is heard at 2'32" in the *Suite*.

⁶ See sections 2.3.6 and 2.3.2.

8.2.4 The Remote Control

From Dean's flat, Victor steals the remote control unit described above. This he uses as a material key to trigger immaterial events in his imagination. To emphasize that the remote control's effect is imaginary, the sound it gives off was made to seem obviously human in origin - in the same way that we can tell children are not playing with real guns because they make the gunfire sounds themselves. An abstract vocal sound was used, a sort of glottal "tchawhap!". Victor activates this sound during several scenes. Care was taken over processing these two vocal sounds to preserve the sense of their human origin.

8.2.5 Player Panic

For a scene in which Victor returns home and tries to get some music into his ears. He panics after the mains lead from his old record player breaks and he has to revert to a walkman. Sounds of the recorded Bush record player were used in this scene, spatialized and delayed slightly to produce a world of 'inner turn-table' sounds that surround him. This can be heard from 5'00 - 6'23 in the *Suite*.

8.2.6 Police Station - The Site

At the police station where traditionally confusions are rationalised and facts recorded, Victor is forced to try to make sense of his world when he is incapable of doing so. He is there to report that his record player has gone missing. As a symbol for rationalisation, the policeman's words: "if in your own time you could tell us exactly what it is that you've lost..." are used in other scenes of the film occurring before and after this one. They exist in various degrees of transformation. Like the treatment of the word "lost", sometimes the policemen's words are recognisable, sometimes they are not. I enjoy playing with the contextually-dependent border between perception and comprehension (see from 1'30 in the *Suite*). The 'Player Panic' scene (section 8.2.5) uses elaborate transformations of the policeman's words to reflect the significance of their meaning in worsening Victor's confusion.

8.2.7 The Four Elements

On returning to his demolition site dream, personifications of the four elements: Earth, Air, Fire and Water appear to tease Victor. Each of these is underscored with its own sound effect: a spade digging into the earth for Earth, a recording of the wind for Wind, of fire for Fire and river rapids for Water. These are heard in rapid succession at 50" in the *Suite*. Here, it is very much the editing of the film that determines the placement and so rhythm of the events as the scene is being 'mickey moused'⁷.

8.2.8 The Bridge and Victor gets his Own

In a symbolic gesture to 'throw away' all the problems that he associates with pollution of the imagination and its control by material objects and their physical limitations, Victor takes his record player and walkman to the canal to throw them into the water. He then has second thoughts, points the remote control at the objects floating in the water and with it, causes his record player to fly out of the water and back to his side. The film ends as Victor returns to his demolition site dream and one by one makes the elements that tease him disappear. For the first part of the scene the vocal effects produced for the remote control are used in conjunction with processed sounds set aside for the element water (this serves for underscoring splash effects as Victor 'zaps' his property from the canal). The demolition site is treated in the same way as described in 8.2.1.

The film finishes with Victor falling asleep in his own dream. Sounds generated by processing recordings of machine sounds are used to underscore the movement of Victor's head as it nods forwards. The sounds for these final scenes of the film make up the last section of the *Suite* (from 6'23 to the end of the piece). As the sound stream that appears at 8'30 descends to rest at 9'00, the pitches of the *Te Lucis* can just be made out with its repeated notes removed. This was a satisfying moment as the sound used - rapid, block transpositions of a recording of a stylus that has reached

⁷ 'Mickey mousing' is a pejorative term coined in Hollywood for the practice of making a film score continually echo twists in the action or mood of the film.

the end of its record - was a complex periodic sound⁸. Thus, the melody was used to generate a result that is perceived gesturally, but not melodically. It is not until 9'00 that the sound's origin is revealed by its presentation in the untransformed state.

8.3 From Silver Screen to Virtual Screen

Suite from 'List of Contents' is presented as a concert piece. Transferring music from its alliance with film to a 'nakedness' in the concert hall, it is interesting to note resultant phonoscopic changes. It is these that dictated the form and content of the *Suite*.

8.3.1 The 'pure' electroacoustic context

The *Te Lucis* for example is not included in the *Suite* because its vocal sounds and their delivery remaining unaltered, the stream of sound does not integrate well with the rest of the material available. The ear in the electroacoustic context tires easily of the inert sound stream. The film requires the sound not to change. Likewise, the film includes electronic mock-ups of orchestral music to sound from the turn-table that, once again, are not effective in the electroacoustic context. Other passages however work well in isolation.

Those sound streams and gestures that were effective on their own, were brought together outside the film, and the film's story used as a starting point to prescribe the order of the presented sections and the abstract form of the piece although changes in the order of sonic events were finally effected to give shape and contrast to the piece.

⁸ I was keen to obscure pitch references slightly in this sound when it was looped and transposed up by several octaves. For this reason, several contiguous revolutions of the record, each naturally different, were recorded and the whole looped. Recording more than one revolutions in this way, puts more complexity into the periodic wave and obscures its pitch more when transposed high up.

8.3.2 Re-ordering and Re-layering

The *Suite* re-orders to some extent material used in the film from its original, chronological occurrence. Sections were arranged to give coherence and contrast to passages. Sometimes it was necessary to overlap sections so as to preserve momentum. Where this was thought necessary, the amount of overlap could be dictated by congruences that might show themselves between landmark events in the two passages being overlapped so as to emphasize the new synchronies. At other times, abrupt changes of section were found to be effective.

8.3.3 Filmic rhythm and form mapped into the concert hall

Film can be used as a temporal template by synchronising sound to visual events as edited together, or as they occur naturally in a single and un-edited 'take'. In this way here, film is used to translate natural temporal morphologies from visual phenomena literally into sound.

One example of this that combines edited and continuous sound *tracking*, occurs just before 7'37 in the *Suite*. This passage is used in the film to track the motion in a dream of a rucksack being thrown from the four elements to Victor. He opens the sack to find it filled with pieces of packing material with his remote control unit at the bottom of it. The changing momentum of the rucksack's fall and the fountain patterns that the packing material makes as he throws it in handfuls in the air, had an interesting inherent rhythm to them that are transferred in the synchronised sound. Only once the sound is heard in isolation are the time-dependent qualities of the sonic gesture noticed. In most audio-visual contexts, the significance of *visual* stimuli will predominate⁹. Without a visual object template (eg. real or imaginary film), the sole sources of morphology are psychologically-derived,

⁹ The idea that vision always predominates over sound is a popular misconception. Human reliance on one or other of the senses at a time is dependant on the context set up in the material being presented. For example: the potential collision of two objects may be predicted by observing their paths with our eyes, but it is the sound of the collision that best reveals how the structure of the objects has been affected by the collision.

physiologically-derived or inherent from the man-machine interface.

8.3.4 Transcribing essences: visual->aural

When composing to film, the visual referent may influence the choice of sound used to accompany it. The packing material in the film *List of Contents* is expanded polystyrene which if one could hear being manipulated would 'squeak' and sound 'papery'. These are exactly the sound qualities of the recording of the stylus at the end of its record after this sound has been transposed up a few octaves. This sound resource is used to accompany and perhaps 'give voice'¹⁰ to the 'packing material fountains' occurs in the *Suite* at 7'37.

In the concert hall, fresh associations can be suggested and exploited from the sound objects themselves. The recording of the Bush record player's on/off switch comes into its own as something that 'cleans the slate' (4'36 in the *Suite* for example where the section is interrupted and begins again with a recapitulation of the opening 'stylus down' gesture at 5'00.)

8.3.5 Openings for narration

In the film, the identity of collated sound materials for a scene had to be preserved to some extent when that scene was cut back to, to make them recognisable and so serve the narrative. This practice becomes less important in the concert hall where there is no such change in visual context. Here, we may return more easily to a section of sound material that has been transformed significantly since its previous occurrence. The concert hall allows for a freer and more continuous musical development. Without film, one is no longer enslaved to a mono-diegetic narrative.

In this way, at 13" in the *Suite* the 'bell' motif is transformed through spatialization, delay and mixing with a reversed version of itself to produce a sound that seems to be turning 'inside-out'. At 31", the bell motif is made to sound as if it is being 'smudged forward' through subjection

¹⁰ Cf section 2.4.7.

to 'pre-delays' that 'roll' its attack like an Italian 'r'. Similarly, the whole passage composed for the 'Player Panic' scene (section 8.2.5) is time-stretched and mixed with other versions of itself that have been processed with an assortment of delays to thicken and spatialize the material to produce long, rich and continuously-evolving streams of sound (listen to 2'50 into the *Suite*).

8.3.6 Surrealism as bridge

The advantage of the original story of the film *List of Contents* as a narrative on and from which to compose, was that it was itself surreal - an approach which continues to be useful regardless of the medium with which one is working (see section 3.1.5), and through which one can make sense of, and indeed relish, the incongruence of objects and contexts.

8.3.7 Materialisation

When using a language that relies on associating images whether derived from visual or aural context, the fancy of transporting *real* visual objects or object relations into the concert hall forum itself, can arise. *Repeal* succumbs to this when the player is asked to play 'off the edge' of the keyboard; similarly, *Conquête de l'espace* does this by prescribing a unique position for the woodblock in relation to the other percussion (see sections 7.4.9 and 10.6.1 respectively.) *List of Contents* does without materialisation simply through re-interpretation as a concert piece by the re-processing of certain sections to time-stretch them, subject them to colouring delays, re-thinking the order of sections and testing these in real-time and in order to produce effective transitions, aligning and layering pre-mixed passages to produce an independent work.

8.3.8 Conclusion

When comparing the film's score to the concert work, the latter can almost be interpreted as a 'dream reflection' on themes from the film. When meta-diegetic¹¹ sound is brought from cinema to concert hall, the phonoscopes used to interpret it may change as the music self-refers¹². Material needs to be examined in its context, and usually what is going to be effective in terms of pure music, is apparent intuitively to the composer.

Referring to a real or imagined filmic narrative when composing is a fruitful approach to a phonoscopic mode of composition.

¹¹ A single sound stream may be considered 'meta-diegetic' when it behaves both diegetically and non-diegetically whether simultaneously or contiguously. See sections 2.3.2 and 2.3.6.

¹² As the music 'self-refers': by this I mean that without film, all the music has to refer to is itself.

Chapter 9

Corporation (uneasy reflections on *Camping*)

9.1 Camping

In 1991, I was offered another opportunity to compose a score, sound effects and sound atmospheres for a short film made by a student¹ at the London International Film School (LIFS). The results of the work were quite successful, but the applied nature of film composition and the very tight schedules imposed on production limit the degree and freedom with which one can develop electroacoustic material. The sound objects from which the film composition was developed produced an interesting sound world of action and interaction that were open to deeper exploration. Set in the future, the film is about a man who dreams of leaving his corporation-controlled existence to go camping on his own in his old car. The Corporation is anxious that they have lost control of this man's actions.

A concert version of the music continuing from where material for the film left off was produced for clarinet, church organ and processed sounds recorded onto tape.

In the film, themes and characters are presented which serve the concert version as programmatic subjects. Central to these are the sound effects and atmospheres of the future world in which the film is set, the machines used by the 'Corporation' around which the life of the characters seems to be organised and the plotting voices of the Corporation's executives.

9.2 Sound Resources

The film precursor of *Corporation*, entitled *Camping* served as a testing ground for reactions between sound objects developed by computer processing.

¹ Robin Mahoney. *Camping* was his graduation film from LIFS.

Excluding electronically-processed recordings of sound from the acoustic instruments being used that serve to extend the timbral range of the instrument, the sound objects used in *Corporation* can be grouped for the purposes of this discussion into three categories: *atmospheres*, which are of long duration, designed to occupy large spaces and serve as a background to closer, shorter and generally more ephemeral sound; '*sound effects*' based on sounds worked on to give voice to the machines in *Camping* which are used in the story to trigger events remotely and to allow executives in the Corporation to communicate at a distance ('communication matrix'). These sounds are shorter in duration, liable to free manipulation and transformation and make up the fore- and mid- ground of the electronic part of the piece. Finally, *utterances* treated as 'sound effects' except that these all derive from recordings of human speech.

The processing and development of these sound objects will be considered group by group.

9.2.1 Meta-instruments

As a 'glue' with which to cement relationships heard in sound in *Corporation*, the electronic part also includes separate recordings of church organ and clarinet. Through this resource, transformations can be made between live acoustic instruments and the tape part. The sound of an acoustic instrument can be cross-faded with its recording in the tape part which is then used as a basis from which other sounds can be derived or uncovered. These recordings are one of the electronic part's 'feelers' to the 'outside' acoustic world.

The approach here can be compared to section 7.4 which describes the electronic 'alter-ego' designed for the piano in *Repeal*. In *Corporation*, the electronic extensions of the acoustic instruments are very much 'at one' with their sources. While in *Repeal*, the sound of the piano can be used to act against electronic sound derived from it, in *Corporation* electronic gestures serve to extend the gestures inferred by the acoustic instruments. The two work together. For example, the organ pedal in bar 189 (second movement) is doubled at the octave above by electronic sounds based on recordings of organ notes, which play outside the organ pedal's range.

9.2.2 Atmospheres

Four atmospheres composed for the original film as sonic 'backdrops' to certain scenes were adopted for the concert development of the score:

- (i) Cityscape
- (ii) Mr Id's fan atmosphere
- (iii) The wilderness
- (iv) Dr Egg's laboratory

The *cityscape* is a recording of rush-hour traffic stretched in duration to last several times its normal length. After experimenting with different time factors, one was found that while resulting in a strange background sound evoking a city, also sounded puzzling and alien. The director of the film had wanted to imbue an otherwise contemporary-looking scene with a sense of a future industrial world and a simple time-stretch served the purpose.

Mr Id's fan atmosphere 'gives voice' in the film to a pair of huge black ventilation fans some two meters in diameter set into the wall of this character's Gothic office. The atmosphere was built up from layers of distant machine sounds, mixed with looped noise and subjected to a slow, sinusoidally-varying low-pass filter.

The wilderness atmosphere was amusing to produce. The computer is used to trigger an incongruous collection of recordings of the cries of wild animals randomly to a backdrop of wind.² In turn, the point on the landscape from which these cries emanate is varied for each animal species. Positioning on the stereo field is a straightforward matter. Depth-of-field (distance from the listener) is given to a source by applying different volumes to the sound sources and filtering out the upper frequencies of those sounds that need to seem more distant.³

² The Zicarelli programme 'M' discussed in the section on *Repeal* was used to control these elements. Once the rate of an animal's cry has been set, the composer cannot tell which animal will cry next.

³ The same reverb. setting ('far') is used for all the animals though.

Animal cries used include pigs, dogs, crows, pumas, gorillas and wolves. The effect on the picture was designed to be subtle. The atmosphere accompanies shots of an old car arriving in an endless wilderness of pebbles and towering, distant electricity pylons. No animals are visible. Most of the animal's cries are placed distantly in the sonic landscape since none can be seen in the picture. By calling attention to these as off-screen diegetic sound, the scene takes on a disquieting effect. The distant pylons are given voice using a low humming sound produced using frequency modulation of electronically-derived sounds. In the concert version, this atmosphere is faded in around bar 220.

9.2.3 Sound 'Effects'

There are nine of these:

(i) Eject

Recording of a floppy disc being ejected from a computer's disc drive.

(ii) Eject (dilated)

As for (i), but stretched to last several times its normal length. This opens up the sound to allow spectro-morphological⁴ detail to become more apparent.

Time-stretching as a process actively 'pushes' sounds from the indexical (see section 1.3.4) to the acousmatic phonoscope.

(iii) "Historic..."

A voice saying "Historic reaction times" pitch-shifted down without altering duration, and filtered to sound like a machine speaking. One of the syllables (the first 's') is lengthened slightly to offset natural speech rhythm to further 'mechanise' the voice. This sound object does not belong to the 'utterance' set, as it is not conceived to be understood as *language*, ie the meaning of the words "Historic reaction times" as such -there is no 'intention' behind the words because the machines which speak them do not have 'intent', they are merely triggered to activate stored sound. This recording was produced originally as a

⁴ Re.: Denis Smalley's article 'Spectro-morphology and the Structuring Processes' in *The Language of Electroacoustic Music* Ed. Simon Emmerson. Macmillan (1986).

sound effect in the film to accompany a speaking portable computer.

(iv) Communication Matrix

Produced as machine voice for the original film:

"Communication matrix - connected. Whom do you wish to contact?" These snatches of sound are interleaved with recordings of telephone connection sound and other machine noises to convey the impression of machines connecting one terminal to another.

(v) Printer on

Recording of a computer printer being switched on and priming itself.

(vi) Trigger I

Mixtures of machine and frequency modulation of electronically-derived sounds to produce a series of machine noises that lead up to the remotely-controlled explosion of a car.

(vii) Trigger II

As for (vi), but including the voices of speaking machines.

(viii) Monitor off

Snippets of sound from the resources above combined to produce the sound of a noisy TV monitor being switched off.

(ix) Lift

Sound for a huge lift being activated.⁵

9.2.4 Utterance

Four lines are extracted from the film's recording of the actor's voices:

(i) "But that will enable him to use his entire imagination."

(ii) "He'll do it for us Mr Id"

(iii) "Sorry, the number you have is not available"

⁵ This sound was produced with processed recordings of my own voice, mixed with frequency modulated sounds synthesized from scratch.

(iv) "The virus of individualism"

These extracts of speech are chosen not initially for their interest through a listening focussed on a qualitative appreciation of timbre, but because they are *loaded* with significance⁶ for some of the film's themes: greed, supression, opression, the threat of the machine taking over the livelihoods of people and being used to invade their privacy.

9.2.5 The Relations between Families of Sound Material

When working with sound, I am aware of a hierarchy that forms between sound elements. This hierarchy is dependant on the degree of complexity and changeability within a sound as well as on its length.

In *Corporation*, the hierarchy runs from the 'backdrops' of the sound 'atmospheres' (section 9.2.2), via the meta-instruments created (section 9.2.1), on to *multiplex 'instruments'*⁷ and finally to single electronic resonances that are used simply to ornament points in a gesture. Composition is produced by arranging 'perspectives' of change with reference to this scale to produce a theatre of sound. (This relates to the 'theatre of sound' experimented with in *Manches* and described in section 6.2.)

⁶ For this word, one could also read 'subjects' or ultimately 'emotions'.

⁷ Electronic 'multiplex' (Wishart 1985 pp53-55) instruments can be thought of as electronic 'instruments' built by programming a sound or groups of sound to alter in real-time in response to MIDI controllers varied during performance. Once an intimacy has been developed with the instrument, improvisation in composition can begin and gestures incorporated into the larger work. Electronic multiplex instruments differ from acoustic ones in that they may be *piece-specific* and disposable, and the composer-performer has only the time of composition in which to 'master' it. Accordingly, such instruments are often designed to serve only a single function in the piece. They are built for the piece and not vice versa.

9.3 Pitch Organisation

9.3.1 Resources

In *Corporation*, chord structures, certain spectra, modes, series, progressions, voice-leading and melody are all based on two free improvisations. (See Fig. 9.1 Improv.1 and Improv 2.) These form the harmonic backbone of the piece. Four other resources are used: a seven-note motif derived from a quotation of the tune repeated by the ice-cream van at the very end of Steve Sekely's film of John Wyndham's *The Day of the Triffids*⁸ (1963); two ornamented notes that were heard from the intercom. radio of a coach in France; a third, free improvisation based on a progression of five chords composed to suggest terror and a free organ cluster that passes fleetingly in the last bar of the piece. (See Fig. 9.2.)

These secondary pitch resources are used to generate pitch matrices (Fig. 9.3) from which further melodic lines and harmonic progressions are derived. The secondary pitch collections are employed because they are permeated with significances relevant to the themes of the composition. Some might call these themes 'extra-musical'. (See section 1.2.3). The relevant significances of these are discussed below.

Corporation attempts to convey certain emotions. Naming these here would destroy the purpose of the piece whose messages become evident through listening. A first way of generating these has been by free improvisation at the piano to produce harmonic progressions that set up and vary the emotional tensions engendered by exploiting traditional polarities inherent in the tonal system and the harmonic spectrum. Sitting at one's instrument, inner resonances can

⁸ The significance of this quote for me is the vividness of the fixed scene in which the sound is heard in Sekely's film. The camera zooms back to show a huge landscape in which the now tiny ice cream van, intrepid and childish, is surrounded by a forest of menacing triffids that, for the moment, ignore it. I am hoping that, subconsciously, those who have seen the film may relate the two situations between the context of my own piece and the film's. Those who have not seen the film may see the film later and make the association in reverse; and those that never see the film, are left to interpret the quotation in its own terms - the pitches of the motif outline a Balinese mode which in the context of the film lends the scene an 'otherwhereness'.

be heard in the mind's ear and noted onto the manuscript in a sort of emotional dictation.

New forms of pitch set can be distilled from the emotional connotations (harmonies) which have been drawn, and while doing this, I enjoy tracking the changes in emotional 'side-effects' that certain pitch manipulations in the composition cause.

It is interesting to note when doing this, the effect that manipulations to a sound or a harmony originally conceived to function relative to one family of phonoscopes, has on another family of phonoscopes. More generally, one can ask how manipulation by the rules of one phonoscope can be a valid grammar for another. The answer depends entirely on the referents in play.

9.3.2 Spectral Analysis by Ear

A mode for general use in the piece is derived from the first three bars of the first Improvisation 1. The root of the chord in bar 3 here, is interpreted as if it were a fundamental with other pitches from the first three bars listed above it seen as 'overtones in a spectrum' (see 'mode from first three bars', on same sheet in Appendix). The resultant chord is knocked on its side and treated as a mode. It is important to note that for the purposes of the pitch composition, the ordering of the succession of pitches is significant. Unlike traditional chord structures, this crude spectrum, half relating to traditional harmonic working and half to an interpretation of 'chord as colour' could be respected as a succession of added resonances. The B-fundamental opens the piece.

9.3.3 Series

A series is also derived from the improvisation by removing duplicates from the mode based on the first improvisation's first three bars, and treating the result as a resource from which to work.

Pitch Resource

Derived by reading downwards & across from 3
bars of improvisation 1 and using pitch sets as alliterated ink.

19/9/92

Hard disc part

Duration sequence: 6, 8, 10, 3, 7, 9, 8, 6, 10, 7, 3, 9, 1, 2, 4, 5, 11

U. plays the line with returns on each note.

Final chord of parallel (oto)
route (if used).

Alternative:

Wake music, starting on

to major

ped.

Real enters (staggered)

Can be looped in cycle

Period part:

© Springer 1992 Transcription

Red in diminution

Read the dark down. High pitch, low higher energy.

Fig. 9.2

CORPORATION
(Uneasy reflections on *Camping*)

Pitch Resource (cont.)

The image shows a handwritten musical score on ten staves. The title 'CORPORATION' is written in large, bold, capital letters, with '(Uneasy reflections on Camping)' in smaller text below it. The subtitle 'Pitch Resource (cont.)' is written in a cursive script. The score is written in a single system, with various musical notations including notes, rests, and dynamic markings. The first staff begins with a treble clef and a key signature of one sharp (F#). The notation includes a variety of note values, including eighth and sixteenth notes, and rests. There are several dynamic markings, such as 'p' (piano), 'f' (forte), and 'mp' (mezzo-piano). The score is divided into sections by vertical lines, and some sections are labeled with 'Repeat 2, then 1'. The handwriting is fluid and expressive, with some notes and rests written in a shorthand style. The overall impression is that of a working draft or a composer's sketch.

Fig. 9.3

CORPORATION

(Uneasy reflections on *Camping*)

Pitch Resource (Cont.)

Tenor matrix

→ 1st priority

Camping matrix

↑ 2nd priority
↓

Titled matrix

(PRIME)

optional

INVERSE

①

②

③

9.4 Overview

The piece is in three movements, the first two of which end in clouds of autonomous resonance from the tape part, as if the ends of the movements had evaporated. The form each movement takes is episodic.

The movements are built as follows:

Movement /section no.	Section	Forces	Bar no.s (inclusive)
<u>Movement I</u>			
i.	thrilled	Cl. solo	1-13
ii.	liquid	Cl., Org. & Tape	14-23
iii.	jerky	Cl. followed by Org. & Tape	24-34
iv.	crazy machines	Tape	34-39
v.	rising homophonic section leading to high Cl. melismas	Cl., Org. & Tape	39-52
vi.	voice ignitions	Cl. & Tape	52-62
vii.	'communication matrix' effects. (Recapitulation with development, of 'liquid')	Org. & Tape	63-71
viii.	con brio	Cl., Org. & Tape	72-87
<u>Movement II</u>			
i.	Mr Id's theme (In organ)	Cl. & Org.	88-103
ii.	monotonously	Cl., Org. & Tape	104-108
iii.	'the virus of individualism'	Cl., Org. & Tape (alternating)	108-121
iv.	three-crotchet pedal motif ⁹ followed by various transformations of voice text from the film.	Tape (with single Org. echo interjection bar 139)	119-145
v.	crazy funfair	Cl., Org. & Tape	145-153
vi.	desolato	Cl. & Tape	153-181
<u>Movement III</u>			
i.	thrilled, solo (Recapitulation of opening of work)	Cl. & Tape with Org. entering later.	182-194

⁹ This motif is a quotation from 'Meeting in St Sophia' from John Barry's score to the feature film *From Russia with Love* (1963).

ii.	clicking machines	Tape	194-206
iii.	crash tech. /perpetuum mobile	Org. & Tape	207-217
iv.	build to climax, climax at bar 220	Cl., Org. & resonance from Tape.	217-227
v.	bisbigliando	Cl. solo	228-231
vi.	very light	Cl. & Org.	232

9.4.1 Movement I

The clarinet opens leaping across three octaves of the pitch 'B'. until the organ pedal enters to 'pick up' the pitch. At this point the clarinet begins a series of melismas that lead in to the busy 'jerky' section. The launching of this section is given momentum by sounding the machine voice's words: "sequence activated". This works in two ways: the sequence about to be heard (a new metric division in the piece) is activated as the words are spoken. There is also a parallel emphasis on the syllable 'ac-' which is synchronised to the start of the section. It is almost as if the electronic part were having an influence on the acoustic player. This reverses the natural (and perhaps expected) rôles of the parts of the piece and serves to disorientate and blur distinctions between the acoustic instrument parts in an attempt to give life and independence to the 'dead' electronic part.

The clarinet's line in this passage uses a technique for generating rhythmically-spontaneous melody that has been found to be effective. A performance is improvised into the computer, playing any pitches that happen to fall under the hand, but building gestures that are as far as possible, characteristic of the indiosynchrocies of the instrument being written for. This produces a 'live' rhythm required for the section of composition. Once recorded, the pitches of the recorded line are replaced with pitches from matrices and other pitch resources, as far as possible without altering the pre-recorded rhythms. This changes the shape of the musical line, sometimes taking it away from gestures inherent in the human-instrument physiology. (Bars 50-63 of the Clarinet part, for example, were composed in this way.) Sometimes, beautiful lines are produced, sometimes lines result that do not fall easily 'under the hands' of the player. Where this happens, there has to be some 'give and take' via octave displacement, choosing

alternative pitch resource or standing firm and asking for hard practice from the player, which is usually rewarding. As the clarinet is such an agile instrument, no major problems were encountered when working this technique, and hearing players break boundaries can add excitement.

If degrees of quantization are appropriately applied, a notation can be produced that preserves the sense of groove¹⁰ in the original improvisation.

In bar 29, the organ enters with a pattern that seems to repeat, but in fact changes on every recurrence¹¹. The pitch 'B' returns in bar 35 from manual and pedal in the organ as a section with 'machine sounds' begins. 'Played' by the electronics, this is a virtuosic interplay of mechanical sounds looping polyrhythmically to overwhelm the audience. Simultaneously, the 'printer' sound object is triggered, but transposed down very low. The object has an internal morphology that, if allowed to continue, dictates the subsequent course of the composition with the broad 'brushstrokes' of a 'mountain range' of sound. Here I could 'let go' of the form, and allow the section to 'compose itself'. It climaxes with the crotchet and quaver motif in the electronic part at the start of bar 39.

This figure seems incomplete. The first two quavers are followed by a crotchet. Why then not the second two? All parts enter corresponding to the spot where this 'missing crotchet' might or should be. Expository pitch material has been used, and material from a secondary source can be taken. The sound of the printer is frightening. This emotion corresponds to that emotion 'composed-in' to the 'terror' chords written when producing pitch resources (section 9.3.1). Why then not use these at this moment? The passage is transposed to 'sit' into the tonality of the harmonic context set up by the previous section. The clarinet's 'C' (concert pitch) is shifted a little (1/4-tone sharp) to offset the harmony slightly, giving it 'edge' to lend the overall sound a 'crookedness' and crudity.

¹⁰ See section 5.2.3.

¹¹ I have found this principle of organic change particularly interesting when looking at Andy Warhol's art. One becomes fascinated by the tiny differences one is forced to appreciate when confronted with dozens of the seemingly identically reproduced images.

At bar 42, the landscape changes. The clarinet is given very long lines that alter perspective with pulses that accelerate until they become continuous, continuous sound in turn being re-divided by more melismas. In solidifying from fragments and then re-fragmenting, the clarinet line can be thought of as being treated as matter changing states.

Meanwhile (starting at bar 52), in the 'background' hollow metallic resonances reminiscent of human voices are ignited by the clarinet like large, distant objects seen behind it as its line moves. The electronic sound comprises vertically aligned synthetic representations of human voice with the attack of a bell. Both sounds associate with subjects close to the church organ in the mind of the listener: church choirs and church bells. The sounds mix readily with each other welded together simultaneously in the music by morphology, synchronicity and association.

From bars 57-62, the clarinet falls to rest and is made to fuse with the sound from the electronics by the simple and often-used technique in the music from this folio of matching apparent pitch either from acoustic instrument to electronics or vice versa. At the end of bar 62, the organ begins the line from the second improvisation in the pedals. This long, low sound is contrasted at the same time with quick changing interjections from the set of machine-like sounds. Colour changes in the organ pedals are terraced as pitches are added or changed and overtones (by organ stop) added either singly or in tiny groups.

In bar 84, an interlude briefly develops the machine sounds recorded. This is done by programming-in multifarious short loops into appropriate notches of the sound so that they twist in the air with polyrhythmic complexity.

9.4.2 Movement II

The second movement comprises six sections. The first develops pitch material already exposed; the third section develops the word 'virus' using a technique developed in the earlier piece *Suite from 'List of Contents'* on the word 'lost'.

Using the computer, a recording of the word is duplicated and each copy treated and processed in a different way¹². The word is repeated in the music becoming transformed differently on each utterance.¹³

The passage in *Corporation* evolves much more slowly as the mutations of the sound are perused through, different phonemes in the word 'virus' being dealt with separately to points at which the sense of the word disappears and one is left with sound for sound's sake. One of the last transformations of the word results in a sound in which three contiguous pitches become discernible. To 'push' the sound into the pitch phonoscope at this point, the organ is brought in with a transparent voicing built on a combination of its largest and smallest pipes¹⁴. By the processes described then, different phonoscopes are passed through to alter perception with what fuses to become a single line.

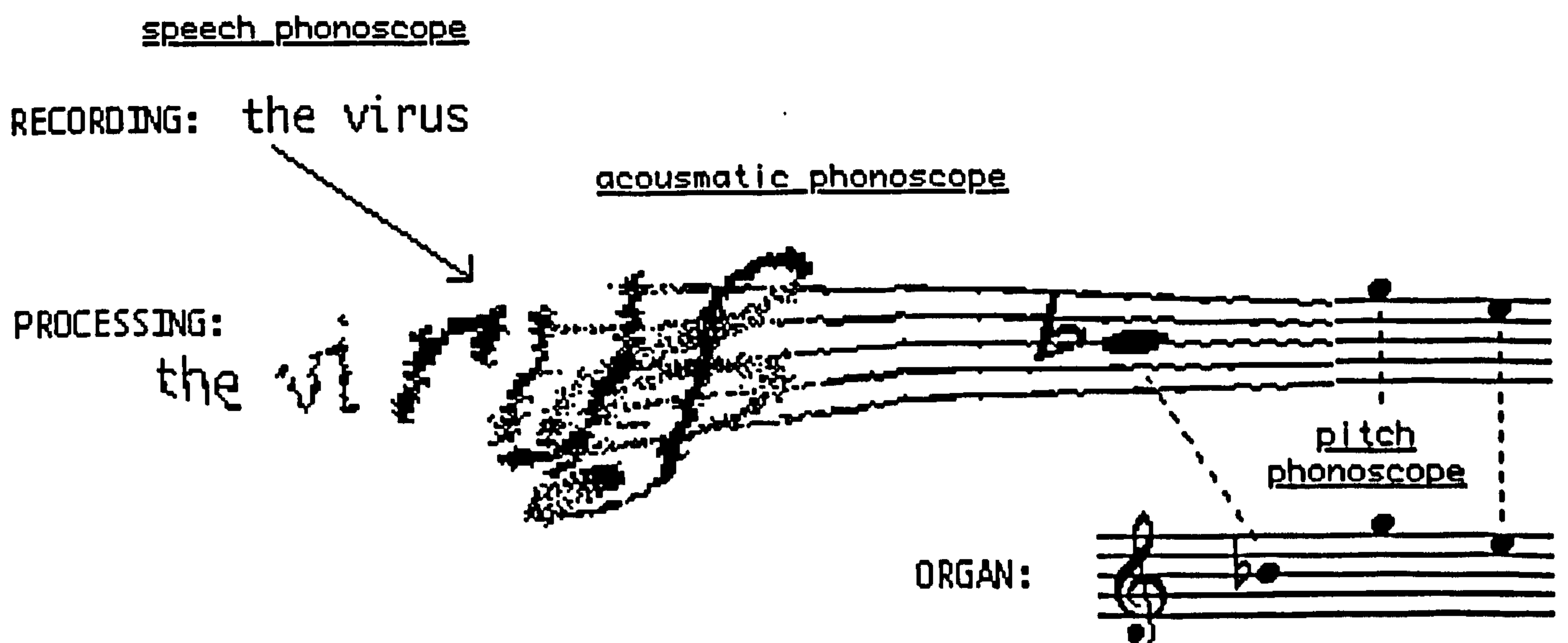


Fig. 9.4 Polyphoscopy, from speech to pitch phonoscopes in Movement II of Corporation

¹² This is the same approach taken in *Suite from 'List of Contents'* where 'mutations' of a recording of the word "lost" are produced. See section 8.2.1.

¹³ The origin of this musical device was first suggested when playing Olivier Messiaen's *Première communion de la Vierge*, no. XI from *Vingt regards sur l'enfant Jésus* (Editions Durand, 1944) wherein Messiaen presents a gamut of different harmonizations of the note 'D' (bars 43-51). The passage is very intense as the composer has imposed such limits on himself but still seems to 'tear' at the lines binding development to a single pitch.

¹⁴ A voicing which I am assured by Edward Kemp-Luck FRCO of the Sweelinck Conservatorium is "highly unorthodox".

This is not abstract processing. Sound is altered in ways that change the way it is perceived, according to the way systems of perception themselves are structured. This is the basis of phonoscopic composition.

In bars 109-111 the first statement of the words "the virus of individualism" has an interesting rhythmic characteristic which is then transferred from the words directly to the acoustic instruments without recourse to transformation in bars 112 and 115-116. The object being perceived remains single in the mind of the auditor, but the music suggests different ways of perceiving that object with respect to phonoscope. In this way, the music is not what is being perceived, but the object (or point of reference) that exists virtually in the mind of the auditor.

The principle of persistence of vision in cinema that allows streams of still pictures to be viewed as a single, continuous event, has its sonic parallel here. What is being heard is not explicit in the musical signal, but induced in the mind's ear. The music serves to evoke, and then to suggest change. Essentially, it *itself* is not what is understood.

Chord structures in the organ become increasingly dense and resolve unexpectedly to a unison 'E'. A three-quaver repeated 'E' figure in the tape part is left in bar 121. It is un-clear what is going to happen next. In bar 129 an interlude of subsidiary development begins based on voice recordings from the telephone or from voices of the characters in the film. A telephone operator's voice says "sorry, the number you have is not available". The voice seems to have been dismembered from its utterer. Despite sounding human, it comes from a machine for controlling, directing and monitoring, a machine that dictates availability.

Various transformations of utterance continue, ending with a portamento imposed on the syllable "-ire" of the word "entire". The portamento exists in the original recording as uttered by the speaker (the actor Harold Innocent), but is emphasized using a time stretching function. The heard gesture is significant as a tie-in to the next section. A strong connotation implied from the combination of organ and clarinet is the fairground organ. It was intended that

Corporation would include a section suggesting a crazy fun-fair (bars 146-153).

Falling in pitch on the syllable "-tire" suggests a downward-sliding movement that is in turn reminiscent of the movement of many 'rides' at the fun-fair. The gesture is enough to trigger off the section. The lines of bars 146-153 can be divided into two layers. Clarinet plus tape and organ on its own. Harmonic material in the organ part is based on Improvisation 1. In the upper parts the clarinet and tape parts interplay: the clarinet with a rising figure, the tape part with a similar falling one. The tape part uses recordings of acoustic clarinet but takes these further down to 'impossibly low' registers. The scene is reminiscent of a fun fair in that an organ accompanies rising and falling gestures at break-neck speed.

There are implicit meanings at work here also. The fun-fair is being used as a metaphor for the spending of great resources into purposeless ways of life.

In bar 153 we cut¹⁵ to the tape re-working various machine gestures and snippets of utterance accompanied by a rhythmically augmented line played in subtones from the clarinet. These continue to the end of the movement.

9.4.3 Movement III

The final movement begins with a recapitulation of the opening of the piece, but accompanied this time by the syllable "his-" extracted from the recording of the word "historic". The sound of the syllable is chosen for its resemblance to the action of the embouchure of the clarinet or the air being forced through an organ pipe - a blowing attack to instil vibration. The syllable emphasises the association between instrument impulse and the words used in the piece - another cross-phonoscope shunt¹⁶.

After a burst of clicking machines is triggered in bar 194 and allowed to flourish, in bar 207 the drive towards the end of the piece begins. A series of machine sounds is set off. To enforce a feeling of forward motion and driving, of

¹⁵ The filmic reference here is not unintentional.

¹⁶ See section 3.4.4.

inevitability, a toccata-like figure begins in the organ (perpetuum mobile) and is continually interrupted by the start of the phrase "sequence activated". I intended that as a result, the 'sequence' is felt either never to have been activated, or else to be activated but 'going wrong'. Interruptions (rests) in the sequence of semiquavers are positioned by counting semiquavers while following a sequence of numbers derived by turning pitches from 'Improvisation 1' (see Appendix: first page of *Corporation* pitch resource) into those numbers. Duplicated pitches are ignored. This produces phrase lengths in the organ's right-hand part of 6, 8, 10, 3, 7, 9, 8, 6, 10, 7, 3, 9, 1, 2, 4, 5 and 11 semiquavers each.

Bar 217 is the start of a culmination, with unison 'G's on organ crescendo-ing from *niente* to *fortissimo* and back, during which the clarinet delivers ecstatic figures of disbelief like a fretting human. The final climax occurs at bar 220. The clarinet hits a high which breaks down into nothing. At bar 228, the clarinet is 'dead'; a *bisbigliando* serving to make it move in a limited way as a dead leaf might move lamely on the ground, to-and-fro in the wind. At bar 232. the 'lights go off' with a quick, sweeping organ gesture at '*ppp*'.

9.5 Phonoscopy

9.5.1 Setting up Relationships between Working Materials

For me, immediately one starts drawing 'lines' with sound using the sorts of sound resources that *Corporation* uses, different phonoscopes become apparent through which expression can be wrought. The interesting work, of finding ways in which these resources *relate*, and using these relations to structure the music for the purposes of conveying subliminal messages can begin. Relating different means of expression incites varied emotional reactions. Consider bars 114 to 121 where the significance of the words "the virus of individualism" is dwelled upon, chords in the organ part get progressively more dense, there are the quick figures in the organ part (eg the pedal semiquavers in bar 116) which disturb the context of the longer durations that surround them in the organ's own sound world. As intense dissonance is reached at the end of bar 117, there is a

swooping in the tape part at the bottom of whose gesture everything 'resolves' into the 'open field' of the section from bar 123.

Similarly, from bar 160 to the end of the second movement, the word 'virus' 'infects' itself through various processing techniques as its meaning is corrupted. The quiet clarinet line underneath seems very isolated following the contextualising density of the previous ('fairground') section (bars 146-153), the word 'individualism', intending to imply 'a man alone' is thus conveyed in the piece through context. There is also the moment (bars 161-162) in which the clarinet's soft climb is stopped brutally by an interjection from the tape part constructed with the utterance "He'll do it for us Mr Id".

Another example: around bar 220 in which the 'wilderness' atmosphere described is faded in as a background, its significance works on different levels. Several phonoscopes are being exploited simultaneously. In acousmatic terms, the wind sound mixes well with the seemingly-related 'searing' sound from the organ as it is doubled with an electronically-generated organ sound from the tape part. (Both sounds are produced by 'wind'). Being 'wind', the 'wilderness atmosphere' has connotations or associated properties of being able to 'clear the air', not only because wind blows away pollution, (pollution here in turn perhaps implying a metaphor for the corporate pollution of society), but also because it connotes moorlands like Dartmoor in which no sign of civilisation can be seen for miles). Connoting moorland and contrasting it with the claustrophobia associated with city atmospheres heightens the significance of each 'pole' (section 3.2.6).

Other phonoscopic games are being played simultaneously in this section. Music is an ideal art for bombarding an audience with several messages simultaneously, and as the subconscious can interpret more than one line of messages simultaneously, each line itself communicating via a different phonoscope or a different set of metaphorical relationships, 'essences' - those indefinable qualities of existence - can be conveyed lucidly. The clarinet line from bar 217 to 220 imitates the pitch and rhythmic contours of the voice of an increasingly excited person. This is a response to the dense sound coming from tape and organ parts. - The music could be said to be making commentaries

on itself. I use this as a structuring feature in my music¹⁷. Meanwhile, these fragments of clarinet line are based on the pitch contours of one of the 'secondary pitch collections' described above, whose importance comes from the significance of their *origin* rather than the significance of any synaesthetically-perceived connotation. The line comes from the bleeps of the intercom. of a coach's radio heard by the composer on a trip to France. The important origin here is the fact that these are the notes from a radio.

Corporation involves strong images of machines and explores subliminally the relations between voices from machines and voices from humans as represented in the film *Camping*, the images which this film sets up and the relation of these images to our reality. The question on my mind perhaps was whether a voice from a machine *could* be interpreted as being 'from a sentient being' at all since machines do not have a life of their own to communicate *from*. My question was: 'what is speaking?', the machine or the man? Like the recording of the operator's voice on the telephone, the pitches of the blips from the coach radio serve as aural objects to signify these aural images with which I compose.

At bar 220 the phonoscope through which the clarinet's line is being controlled (by the composer) changes, returning to the pitch phonoscope in bar 222 as the clarinet descends following the 'Triffid' motif (qv, and see second page of pitch resource sheets for *Corporation* in Appendix)¹⁸.

9.6 From Film to Concert hall

At the stage of concert composition, the above pure, processed and hybrid sounds can be reinterpreted as effective *gestures*¹⁹ for electroacoustic composition. Changing the performance context from film to concert hall changes the phonoscopes through which we refer to interpret the sounds. Without the visual context, some aspects of the film's sound and musical accompaniment function as before, some do not, some function in different ways and others

¹⁷ Cf for example bar 205 in *Repeal* discussed in section 7.4.9.

¹⁸ In actual fact, the clarinet from bar 217 to 220 never leaves the pitch phonoscope in that its pitch contours borrow from resources already laid out). The line can be interpreted (communicates) in several different ways at once.

¹⁹ See Smalley in Emmerson (1986).

almost function, and rely on changes to be made for them to 'speak'.

9.7 Conclusion

As may be evident, much of the material is derived and driven by parallels in extra-musical association. For me, composition is a balance between intention and result. There are times when the material drives *itself* (bars 195-206 for example). At other times, poietic ideas return or take over (end of bar 145-153 for example). In the end, what governs the controlling generator of the music is effective *pacing*. This can only be assessed as the composer 'sits back' and listens to the piece detachedly, critically assessing whether one passage is effective or not, and whether the passage leads onwards in a satisfactory way.

Contrast and surprise, acousmatic effectiveness, the narrative of messages to be conveyed - each plays its part.

Chapter 10

Conquête de l'espace

10.1 Introduction

10.1.1 The Context of the Tapestry

Conquête de l'espace (Conquest of Space) is a piece based on a tapestry by the French artist Jean Lurçat (see Plate 2). Scored for bassoon, percussion, harp, Yamaha TG77, live electronics and tape it was composed at IRCAM in Paris in 1993 and premiered by the *Ensemble Intercontemporain* conducted by the composer.

The tapestry is from a set of ten, all hand-sewn tapestries collectively called *Le chant du monde* (The Song of the World)¹. The tapestries are huge, the smallest measuring 4.5 x 2.6 metres, the largest 4.37 x 13.16 meters -larger than the surface area of the side of one and a half London double-decker buses.

Using intricate designs of vivid, graded colour on black background, the tapestries depict Man's perception of his own existence in relation to life, death, the universe and the metaphysical aspects of the spheres. Lurçat's style is very characteristic. (A colour print of *Conquête de l'espace*, is given in the plate overleaf).

The tapestry shows a man in a bubble-like satellite. He holds a bow *en garde* as the bubble penetrates the ozone. It approaches the heavens which take up the main part of the tapestry with explosions of colour from planets, some with visible trajectories, luminous gas clouds, stars, comets, suns and moons.

Lurçat's commentary reads:

The space vehicle is the central theme of this next hanging. Man moves out through sidereal space to face the problem of the future. Here again are breaks in rhythm and counter melodies. There are no perfect curves or shapes.

¹ The author has already 'set' three other of the tapestries in this series.

Movements are interrupted unexpectedly. Meanwhile, the Earth is in cross section made of transitions from fish, leaf, insect to flame etc.²

10.2 Approach to Interpretation

Static visual art differs from filmic art as musical inspiration in that the art presents no temporal mold. In this case, a narrative interpretation of the visual reference must work from the basis of the experience of the onlooker.

In *Conquête* then, the aim was to work with a set of separate interpretations or 'contemplations' of the tapestry which are presented sequentially in the music. These are discussed individually in section 10.6.

10.2.1 Translation of Visual Objects into Aural Images

The relationship between visual object and the associated aural image of chosen sounds and multiplexes³ merits discussion. What for example is the 'sound' of a star as viewed from Earth?

The implicit parallel between image and sound is called upon subconsciously. From Earth, stars are small and bright, and so can sound be. 'Small' perhaps translates to 'quiet and of short duration', bright to 'high-pitched or of high-frequency content'. Stars are pin-point. The precision of their positioning translates to a clear-cut sound of sharp attack so that its starting point in time is as easily perceivable aurally as is its position in space by the eye. The sound of the star then might resemble the quiet stroke of a glockenspiel.

This example suggests some arbitrary parallels between the worlds of light and sound:

² Translation by Philip Evans from *Jean Lurçat le chant du monde Angers*, Siraudeau, Angers, France (1980) p13.

³ 'Multiplex': see chapter 9, footnote 6.



Plate 2

Jean Lurçat: *Conquête de l'espace* (1960)
Tapestry, 4.40m x 10.35m
Tabard Workshop, Aubusson

luminosity $\equiv$ proportion of high-frequency content

space $\equiv$ time

size $\equiv$ volume as a function of wavelength

and for example, a low-amplitude rumble (by consequence of its long wavelength) can be associated easily with size.

definition of edges, or contrast	$\equiv$	sharpness of attack-transient of amplitude envelope.
-------------------------------------	----------	--

These relationships while quite arbitrary are defined by experience. Earthquakes for example are huge and cover large areas. They rumble. Thus large wavelength can be associated with large sizes and spaces.⁴ The more precisely one attempts to define these relationships, the more one passes into the subjectivity of synesthesia. Different auditors will ascribe different colours to different timbres or harmonies.

10.3 Pitch Organisation

The harmonic organisation of *Conquête* is derived from two sources -

(i) Recurring Contexts

The first is the pool of melodies, modes, pitch series and harmonic progressions that came from two previous pieces that also set tapestries in *Le chant du monde*: *Le grand charnier* (The Mass Grave) and *L'homme en gloire dans la Paix* (Man in Glory in Peace). These are given in Fig 10.1.

4 See reference to Janzen's 'formal congruence', section 3.3.4 (v) an indexical sign (section 1.3.4). See also section on experimental animated film in chapter 5 of Prendergast (1977) pp184-197 that presents sympathies explored between sound and abstract images.

(ii) *Iana*

The second is a pitch resource derived from spectral analyses of recordings of various acoustic instrument sounds used in *Conquête*. This was done using *Iana*, a programme which applies Terhardt's algorithm⁵ for pitch extraction to sound files. *Iana* is used to analyse a section of sound of just a few milliseconds in length. It performs a fast Fourier transform analysis, finds peak frequencies in the sound, eliminating those below the human perception threshold and outputs a list of the sound's component frequencies, their amplitudes and 'weight'. The 'weight' of a component frequency is a measure of its psychoacoustic presence. 'Weights' are given as percentages (100% = maximum apparent volume, 0% = inaudible). From these output tables, the frequencies that seem to make up a sound can be extracted from that sound and used to produce 'chords'. Each note in the chord has its own dynamic related to the given 'weight'. As semitones involve relatively large divisions of the octave, frequency tables output from *Iana* are more effectively converted to pitches to the nearest quarter-tone or even eighth-tone as a compromise between ease of interpretation for the players and fidelity to the original frequency of the component harmonic.

The interesting aspect of using spectrally-derived chords is that when performed, their pitches seem to react and 'fuse' together to produce a sound that almost seems to 'glow'. When this sound is synchronised with the originally-analysed sound, the two sounds seem to 'melt' together.

Conquête de l'espace uses this 'fusion' principle so that it is sometimes difficult to tell what is tape part and what is acoustic instrument. What sounds were analysed and how these analyses were applied to the piece is explained in section 10.4.2 (v) and (vi).

When acoustic instrumentalists sound the results of spectral analyses, fusion in the resultant sound relies on absolutely accurate intonation from the players. To make *Conquête* performable outside of IRCAM, pitch resolution is limited to the quarter-tone, and the majority of these are reserved for the tape part.

⁵ See Terhardt, 1982.

Fig. 10.1 Shadow of pitch resource on Conquête de l'espace from l'Homme en gloire dans la paix.

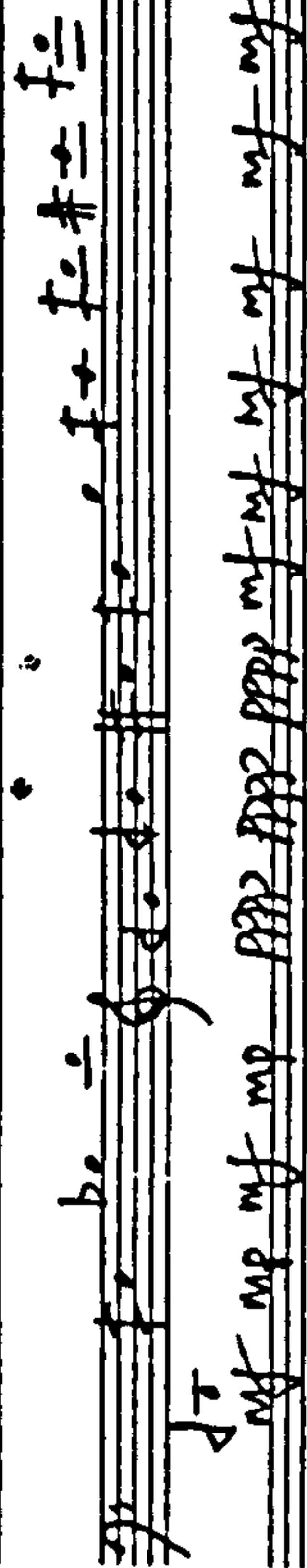
FIG 1 ANALYSIS OF AURAL INFORMATION SENT ASSIGNED TO HIGH NOTATION.

Crithes of each spectra sounding simultaneously.

Mode derived from spectra

Random stroke

@ 2.13 seconds:



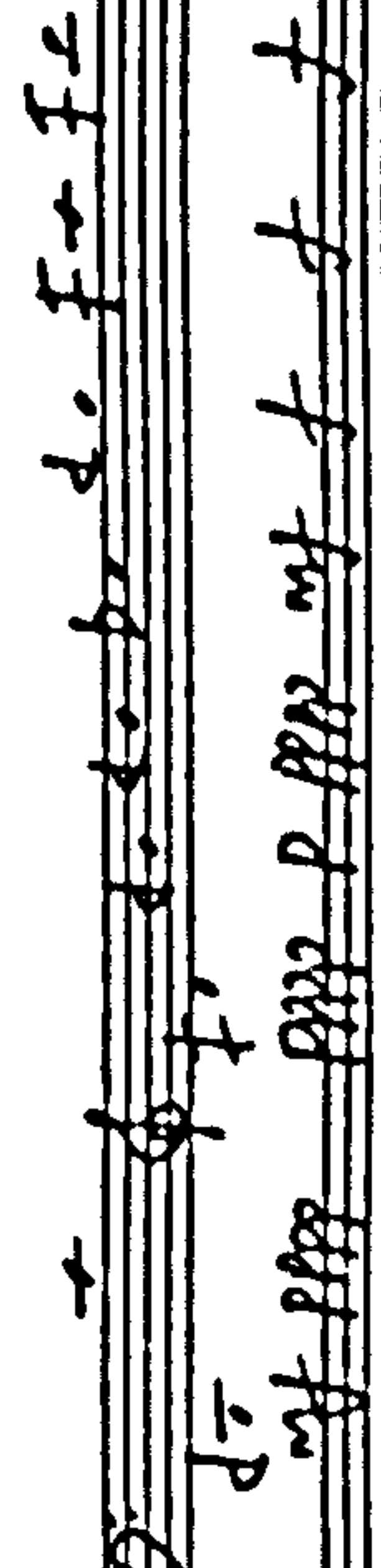
@ 4.77 seconds:



@ 7.15 seconds:



@ 10 seconds:



@ 27 seconds:



Fig. 10.2

Conquête de l'espace

Spectral /modal resource.

Reducing mode

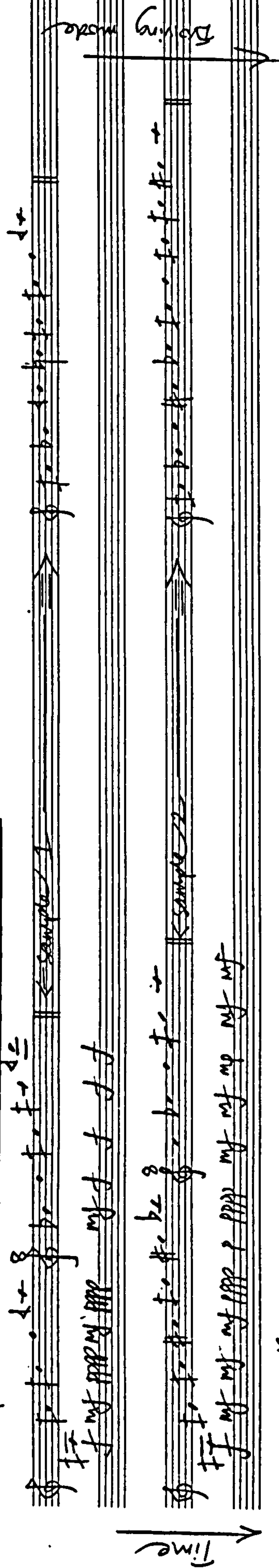
Fig. 10.3

Conquête de l'espace

Spectral /modal resource. (low)

FFF ANALYSES OF SOURCES INTERFERENT SOUND CONVERTED TO PITCH NOTATION
Pitches of each spectra sounding simultaneously.
3 voices
multiphonics portamento
Samples taken at consecutive time intervals.

Notes derived from spectra.



Harmonic (mf on f3) time stretched x7. Analysis made 4 seconds into stretched version.



Crabbe (F#) time stretched x12. Analysis made 11.8 seconds into stretched version.



Conversion of dynamics to
pitch velocities.

ppp	ppp	pp	p	mp	mf	f
1	4	8	16	32	64	127

The sounds analysed were a crotale dilated (or 'time-stretched') to twelve-times its original length, three different bassoon multiphonics, a tam-tam analysed at five points in its sonic evolution and the sound of a harp harmonic stretched to twelve times its original length.

Dilating a sound before listening to it makes it easier to choose harmonically interesting points in the sound to be analysed. Generally, the attacks of sounds which produce analyses containing too many resultant frequencies were avoided.

Using a frequency-pitch conversion table that I had printed using the programme *PatchWork* that lists frequencies to the nearest quarter-tone⁶, *Iana* analyses were converted into chords that *Conquête* uses either as working chords to harmonise other sounds, or as modes to produce melodies from. The *Iana*-derived pitch resources from the various acoustic recordings are given in Figures 10.2 and 10.3.

10.4 Sound Materials

Starting materials for production of the tape part came from recordings of the acoustic instruments themselves and from FM synthesis of electronic sound.

10.4.1 Sound Resources

(i) Recordings

From the bassoon, two or three harmonics and multiphonics were recorded based on C# and F# fundamentals, loud, freely-performed key clicks, assorted slap tongues and tongue rams, some portamentos and 'ordinary' bassoon notes sounded at various dynamics.

From the harp, string harmonics on C# and F# were recorded together with glissandi on one of the modes described in section 10.3 (i) and fast bursts of freely played, quasi-random pitch.

⁶ This table has been so useful to this and subsequent composition that a copy of it is included in the appendix for readers to use.

From the percussion, eight woodblock strikes were recorded each at a different dynamic; a single, long, close-miked *mezzoforte* tam-tam stroke was recorded through a roving microphone that moves from the edge of the plate to its centre and then back to a point about two thirds away from the centre as the tam-tam is vibrating. In this way, the sound of the tam-tam seems to change as it continues.

(ii) Synthesis

The author possesses a large library of patches for FM synthesis of electronically-derived sounds⁷. From this library, patches were chosen that had interesting gestures that seemed to relate to different movements in space that could be interpreted from the tapestry. These formed an abstract sound group. A second group of sounds was chosen which resembled some of the acoustic instrument sounds. These were used occasionally to double acoustic instrument sound or pre-recorded and processed acoustic instrument sound used in the tape part. Finally, a third group was selected and where necessary altered to represent objects in the tapestry that did not produce their own inherent sound. For example single, 'tinkling' sounds were chosen to represent stars. (Section 10.2.1).

10.4.2 Sound Processing

The process of selecting small areas of recorded acoustic articulations and making these repeat within the sound sometimes forward, sometimes backwards for example to produce symmetrical sounds (cf the processing techniques in *Repeal* section 7.3) was used. This technique allows gestures to be altered and developed according to their own internal rules, but beyond ways that a player might be able to take them. Development by a different phonoscope could therefore be said to be in play - we are not hearing what a harpist might play, we are hearing what a computer develops, the articulations possible as a computer extends the actions of a harpist.

⁷ For the Yamaha DX and TX series for which algorithms can be transferred approximately to the later and more sophisticated TG and SY range of six-operator synthesizers.

When different transpositions of these sounds are superimposed (at transpositions related to the harmonic resources already chosen for the piece), a complex, almost 'fibrous' sound mass can be made to explode into life (listen to the gesture in the tape part between bars 61 and 66 for example).

Recordings of simple harp harmonics were caused to loop to extend their resonant tail and subtle, computer-controlled vibrato added to animate the sound. These sounds are used for example in the tape part to double chords from the harp in bars 19 and 20.

Some dilation (time-stretching) was also used on a set of recordings of harp harmonics to produce longer, 'polished' gestures that could, where required, also be transposed into the high register without the length of the original sound being affected unduly.

Some of the acoustic sounds recorded were stretched in duration or 'dilated' using SVP (the *Super Vocodeur de Phase* programme) only available at the time of composition at IRCAM. SVP works by analysing a sound and then making a software filter behave in such a way that were an impulse⁸ passed through it, the resultant sound would be identical to the analysed sound. This is called 'resynthesis'. Once this has been done, the parameters of the filter can be altered... To make a resynthesized sound last longer than its original for example, the filter is simply made to vary in time more slowly. Similarly, the filter can be made to exaggerate the changes that occur as a sound progresses. Filters can also be made to take on the properties of more than one reference sound to produce cross syntheses etc.

The quality of the stretched sounds used in the tape part of *Conquête de l'espace* is different from those of the other pieces in the folio as the latter use a dilation process that works by duplicating tiny gradations of the source sound in time⁹. This has a tendency to produce 'grainy' results. Time dilation by spectral analysis and resynthesis

⁸ An 'impulse' is an instant of sound like a click that if itself analysed produces all audible frequencies at identical amplitudes. Impulses are used in computer-generated sound to make filters resonate without bias.

⁹ The word "lost" in *Suite from List of Contents* was sometimes partly treated in this way.

that I was able to do at IRCAM produced much smoother and more 'polished' results.

Sound dilation is an interesting way of showing the detail in a rapidly-evolving timbre. It can be compared to looking at something under a magnifying glass or a microscope.

(i) Convolution

Convolutions between tam-tam strokes and bassoon articulations, and between the recording of the tam-tam and the locomotive were made (the latter sound stream can be heard in the tape part of the 'ascent' section starting in bar 122). The physics of convolution is described in the footnotes of section 10.6.6.

(ii) Live-processing

A PCM¹⁰ synthesizer¹¹ was used to process recordings of struck metals, live. Synthesizer patches transforming recordings of a tam-tam, a triangle, struck steel, bronze and aluminium plates and vessels were used. These sounds can be heard for example between bars 77 and 89. Usually, the sounds employed here were transposed down several octaves and their attack times increased so that they reveal themselves slowly.

(iii) Spectral Multiplication

This technique was developed as an experiment in this piece. Spectra can be multiplied by harmonizing an acoustic sound with a chord derived from a spectral analysis of itself.

For example, 'giant crotales' are produced in the tape part by mixing together recordings of discrete crotale strikes, each transposed and attenuated according to the results of spectral analysis of a crotale. The result was a surprisingly subtle, consonant enriching of the overall sound of the crotale much less a chordal dissonance.

¹⁰ PCM: 'pulse code modulation'. Synthesizer manufacturers have taken on this term which simply means that a sound (acoustically or electronically derived) is stored in the synthesizer in digital form and can be changed by standard modulation techniques: amplitude enveloping, dynamic filtering, transposition, modulation by LFO and pitch envelopes etc.

¹¹ Yamaha TG77.

(iv) Spectral Interpolation

In a similar way, one sound could be harmonized according to the instantaneous spectrum of another. This produces a spectral interpolation which is used, for example, in *Conquête* starting at bar 228 in which a chord using the sound of the same transposed harp articulation, is based on the spectral analysis of a bassoon multiphonic.

10.4.3 The Sounds begin to suggest reactions with each other

After processing, I saw the resultant sound collection as falling into one of five categories joined by a system of relationships: 'acoustic', 'acoustic extensions', 'synthetic', 'other mimetic' and 'hybrid'.

Acoustic sounds are those produced by the acoustic instruments on stage.

Acoustic extensions are derived from processed recordings of the acoustic instruments, or 'pure' synthesis (processing of sound produced by a digital oscillator) programmed to mimic or highlight certain aspects of the acoustic instrument's sound. Acoustic extensions serve to enhance and extend the timbral characteristics of the acoustic instruments used.

Synthetic sounds take an abstract aspect of the tapestry as their starting point (for example the brightness and sharpness of the rays of a particular sun) and translate these into a synaesthetically-equivalent sound. How this interpretation is made is subjective.

'Other mimetic' sounds involve recordings of sound from the real world whose aural images have relevance to an aspect of the visual art. Examples of these are the sound of a steam locomotive starting off. The aural imagery significant here is the sense of power of the steam engine that the sound conveys, the pride and nostalgia that people working in the railways have for their locomotives and the fact that this is a man-made machine. Another sound is a recording of blue-tit song mechanized by looping parts of the sound as it continues. This produces the aural image of a lifelike

but nonetheless mechanical bird used in a section from bar 21 (see section 10.6.1).

Sometimes the source group from which a sound comes in the piece is difficult to identify. Cross-fading from one group to another, or balancing *between* two groups can set up 'metaphor games' which invoke, articulate and convey meanings.

The system of relationships set up between these groups in the piece are summarised in the diagram below.

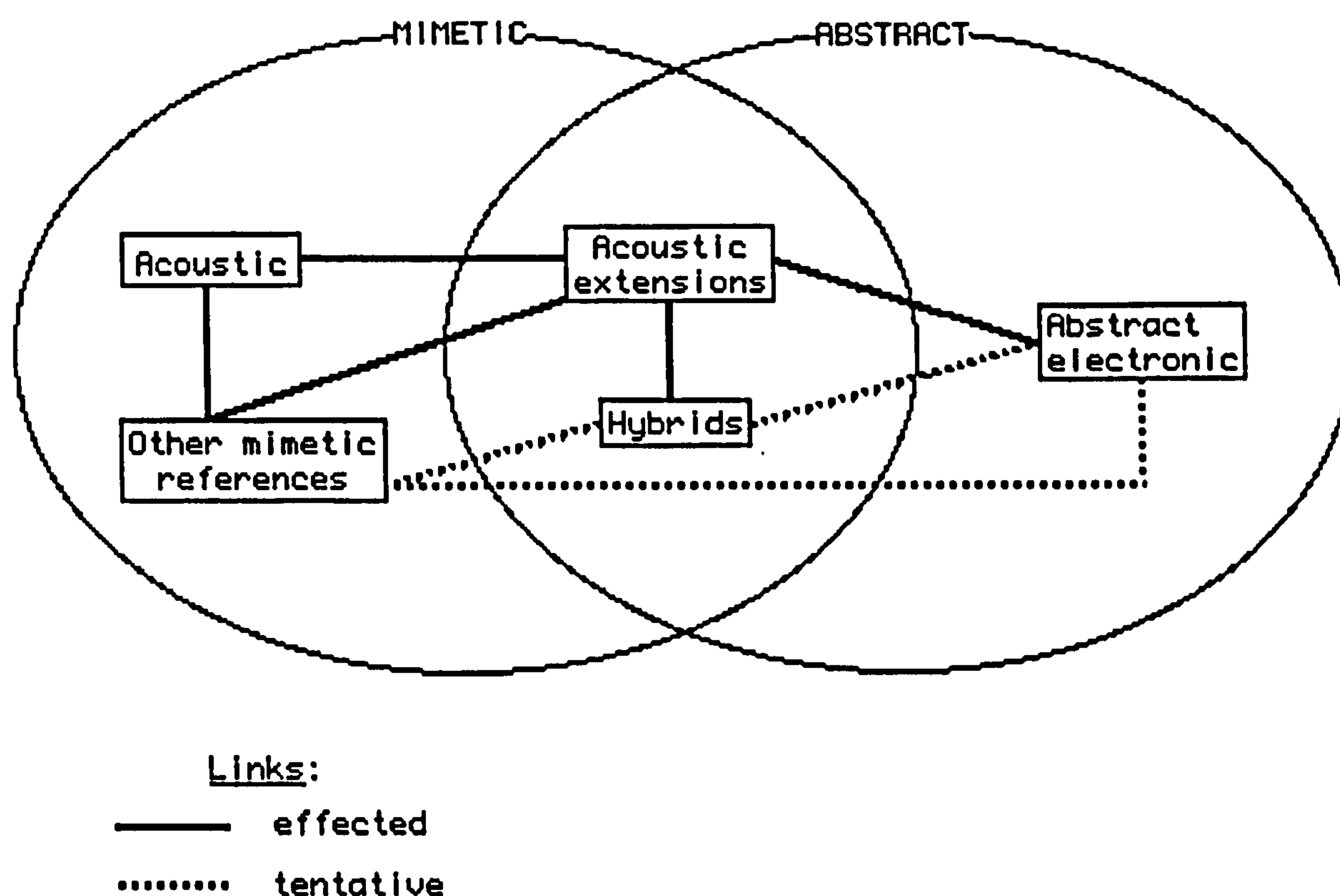


Fig. 10.4 Arrangement of Sound Sources in the mimetic-abstract continuum exploited in *Conquête de l'espace*

Links between sound types that are similar - through whatever phonoscope - are deliberately set up, and the effect of these links on context identified and allowed to influence subsequent compositional decisions. The 'tentative' links shown in the figure above often happen by chance as the musical material is woven and interrelationships between sounds set themselves up in different ways.

10.5 Phonoscopes

Conquête concerns itself less with sound objects *per se*, as with the psychological relationships between them. Filmically, sounds are being used to underscore their own aural images on the virtual screen (section 8.1). Fig 10.4 illustrates in what way sounds are interpreted as being both mimetic and 'abstract'. In section A of the piece for example, the treated sound of blue tit's song can be interpreted as a slightly 'mechanicized' bird, or as a gentle abstract 'squeal' that doubles the attack of certain events in the section.

10.5.1 Tying Across Phonoscopes

When sounds react, phonoscopes change according to the compositional context of the experiential moment. For example, a certain sound may be triggered at a certain point because of its mimetic significance to the context of the moment as this relates to something being inferred from the tapestry. After triggering, the sound can be re-appraised from an acousmatic (abstract) aesthetic stand-point¹² -there may be perceivable 'peak moments' in the energy lines of the sound that can be reinforced or emphasised by synchronising this with other, shorter sounds. Next, the mimetic context may be changed as may the harmonic context. All these are phonoscopes. In phonoscopic composition, adjustments made for one mode of listening may affect another mode of listening in a different way. Phonoscopic composition then becomes a process of *balancing meanings*.

Inherently, a phonoscopic piece will not reveal all to its listener in one listening. The piece needs to be heard repeatedly, and from different attitudes if deeper connotations are to become appreciated.¹³

10.5.2 A Phonoscopic map for *Conquête de l'espace* ?

If one were to try to list the phonoscopes being used as the piece progresses, the list would be infinite. It is more useful perhaps to consider first the identities and

¹² See section 1.2.3.

¹³ See sections 3.4.4, 3.4.5, 3.5.3 and 3.6.

characters of the resource sounds used and processed, as grouped say in a 'web' diagram before composition, and then to consider the phonoscopic relations that appear *between* these as they interact. Interpreting possible phonoscopes from such a map:

(i) can never be complete for the individual producing it, nor can it be the same for any two individuals although of course similarities arise, and

(ii) may at first appear 'empty', containing such mundane objects as in Cocteau's 'drawer' (see quotation before chapter 1 from *Les enfants sauvages*). From initial identities, characters, gestures and qualities, a polyphony of thought paths can be drawn using the imagination. Objects are *nodes*¹⁴ between phonoscopes (sections 1.2.1, 2.1.2 and 2.1.4).

The outlines of the phonoscopic maps (as represented by possible inter-relations of sound objects) depend on the composer who is using the resource. His description of that map bound by chronological time is the piece. How that representation is interpreted depends on the auditor (section 1.1) and this for me is the 'music'.

10.6 Notes on the Score

10.6.1 Start and Section A

The piece opens (bars 1-11) with a large, acoustic gesture that gives an *overall* impression - a summation of the imposing hanging. A subtle flange is gradually brought in to give the harp's sound a slowly-appearing physical aura and to give depth to the sound while a synthesized, quasi-human voice triggered by SONAR (see section 10.7) in bar 6 opens into a backdrop of sound.

I had intended to take the *visual* style and characteristics of contrivance of French Renaissance *comédie pastorale* and translate them via aural images into a 'makeshift' representation of life on Earth in the presence of

¹⁴ Nodes, that are in themselves meaningless.

embodiments of the four elements: earth, air, fire and water. The section uses a technique developed in *Manches en bois ...manches de joie* (q.v.) in which a single instrument's line is ornamented at strategic places by the other instruments. These ornaments take the form of tiny doublings set to ring at the octave or fifth. In bar 14 for example, the bassoon producing the main thread is doubled by the harp playing in low register and by sounds from the tape part.

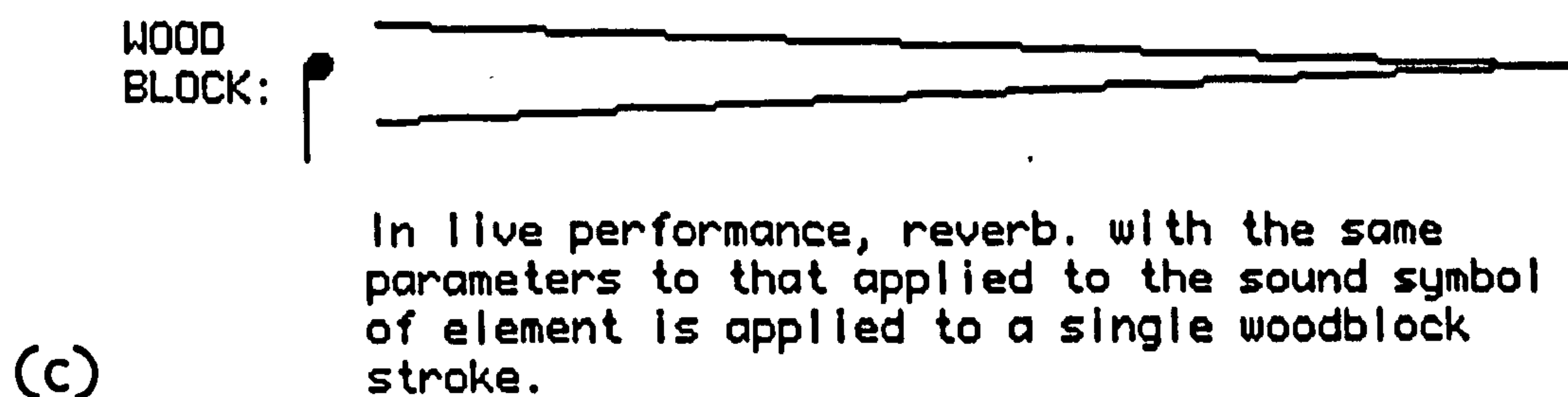
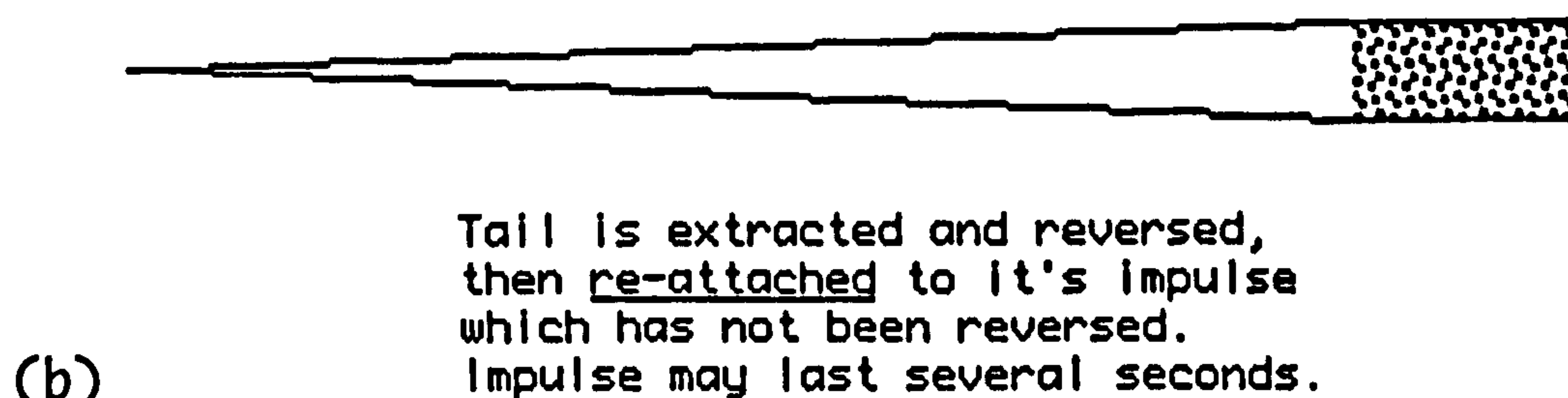
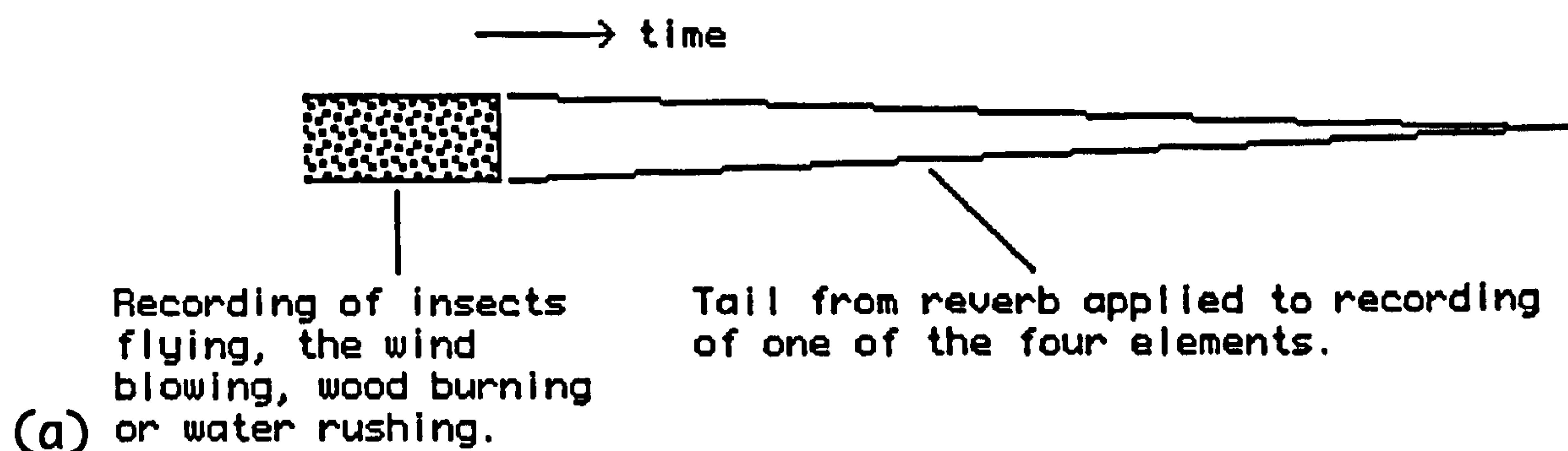
In bars 17-21 the harp takes the main line and is again ornamented with the tape part. At bar 21, the mechanised blue-tit's sound is mixed very quietly to add resonances to, and so punctuate, the starts and ends of the separate bassoon phrases.

At bar 27, the percussionist has moved to centre stage to play the first of four strokes of a woodblock set apart from the other percussion. The woodblock produces a very short sound with very little decay. It represents a point source. I was interested in the phenomenon by which point-sources, like stars, can be approached. The closer one gets to them, the larger they seem to grow until they envelope us and take over our environment. The woodblock in *Conquête* signifies this point source and the approach to the source is conveyed by an extension of the woodblock's sound in the piece until it becomes a sound 'atmosphere'. The way this is done is described below. Setting the woodblock away from the other percussion is not important to the sound, but is significant for the *music* as performed. In our world, the importance of an object can be conveyed by the amount of space that that object occupies (for example the size of one's car being a status symbol). Ideally, the woodblock should be placed in the middle of the audience. For practical purposes, the instrument was kept on stage but apart from the other percussion. The woodblock is significant to the music because of its symbolic value as representative of the 'point-source to world' phenomenon described.

I did not feel that this needed any explaining in the programme note. The displacement adds to the mystery of the piece. There is something to be understood. It opens the minds of the listeners to the mysteries of the spheres that the piece explores through representing them (cf section 3.1.1).

In *Conquête*, a long reverberation time is applied by the diffusionist to the sound from the miked woodblock.

It was intended that elements of the section being played: sounds representing Earth, Air, Fire and Water¹⁵ (all depicted and significant in the tapestry), appear from the sound of the woodblock. The effect is achieved by mixing live, naturally-decaying sound from the woodblock to a reversed recording of the reverberant 'tail' produced by sounding these four elemental symbols separately. Figure 10.5 below, explains the technique.



¹⁵ The sounds used to represent these elements are otherwise untreated and not disturbed by contexts which would alter their being interpreted as symbols of the four elements. In contrast, this preservation of a particular phonoscope is not displayed with the blue tit's sound of section A of the piece, which is treated and placed in such a way that it is open to interpretation from several different phonosscopes). In this way, the aural image of 'blue tit' is 'smudged' slightly.

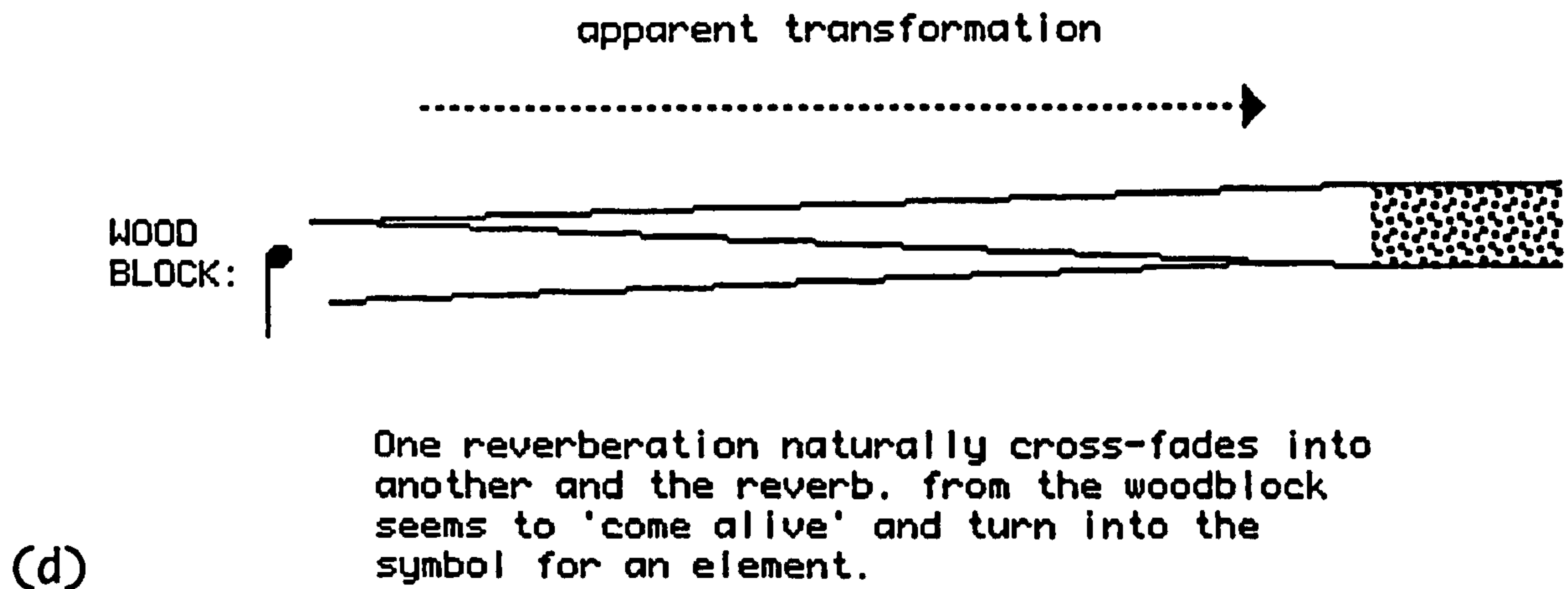


Fig. 10.5 Making continuous sounds appear from the reverberation. of a woodblock.

It was found that this technique worked best for smooth, continuous, non-grainy sounds like wind, the first of the elements appearing in *Conquête*. This is because reverberation tends again towards 'smudging' the texture of its impulses. Smooth sounds are by their nature already 'smudged' and so switching abruptly from reversed reverberation to impulse has little effect on how the impulse is revealed.

The woodblock is struck four times, each time the sound of its reverberation turning into an aural symbol for one of the four elements in the order: wind for Air, fire (for Fire), river rapids for Water and insects for Earth. Producing these transformations, made examples some of which resulted in more seamless transitions than others. The order of presentation decided upon in the piece presents the most convincing transformation first, and the least convincing (though still effective) one last, so that the listener's interpretation passes from one in which a transformation *per se* is being perceived, to one of possible realisation that separate symbols for elements are being revealed to the auditor from the same source, and that this is the apparent purpose of the succession of events. The wind example appears most convincingly from nowhere because, like the sound of the woodblock's reverberation, wind has a smooth, non-granular sound. With the appearance of the other elements, the effect gains in granular or textural interest

what it loses in illusion - for example the sound of fire composed as it is of separate crackling attacks.

10.6.2 Sections B and C

Section B is a dovetail into section C.¹⁶ From bars 61 to 73 there is the suggestion of a recapitulation and the material trails away in a cloud of loops (a technique developed and explored in *List of Contents* and *Corporation* q.v.) that is applied to recordings of harp harmonics.

The opening gesture from *Conquête de l'espace* is re-launched (bar 72). The melisma before this gesture (beginning of bar 72) is produced by 'teasing open' or 'unravelling' a note cluster for bassoon, harp and crotales to play in unison.

10.6.3 Section D

The section D represents an 'opening of awareness to the beauty and mystery of the skies'. The 'tape' part variously doubling acoustic attacks to colour them, sometimes setting off slowly-passing sonic representations of comets and gas clouds.

In bar 90, a moaning bell-like sound is triggered seemingly by the harp. The sound as it wails has connotations for the composer of the emotion of extreme desire. This metaphor is abstracted from the paralinguistic sound uttered by humans in despair, a non-verbal wailing as if to say "oh if only I could". Para-language is a rich field for reaping the stuff of meaning in phonoscopic composition, not so much for the diversity of meanings on offer, but for the inherent *means* by which these messages are conveyed. Lying outside the vernacular phonoscope, paralinguistic models are highly

¹⁶ During tutorials at IRCAM I discussed approaches to the tapestry with the English composer Brian Ferneyhough. He suggested an evolutionary interpretation - of Man developing and becoming intelligent, then seeking the ultimate, to find his Creator in the stars. This evolution on Earth, it was suggested, could be represented by a passage through the evolving styles of Western tonality from simple rhythms through monophony then organum to polyphony and the subsequent development, break-up and reformation of diatonic harmony. This idea became vestigial and all that remains is a passage initiated by an insistent pulse on octaban that is picked-up and countered by the harp in a corruption of mambo - a homage to the significant Latin tradition prevalent at City University at the time.

reactive to interpretation via alternative perceptual routes: the traditions for manipulation of pitch, acousmatics, mimesis, gestural interpretation and so on.

This section of the piece (bars 90-94) exploits this principle: on one level (one phonoscope) the bell-like sound wails quietly like a human in wonderment at the stars, moaning their desire to be able to reach them. The gesture is then *re-interpreted* on a purely morphological plane (phonoscope) and the rise and fall in apparent pitch tracked by the harp whose line of four-note chords loosely follows the contours of the accompanying electronic line.

10.6.4 Section E

Bars 94-107 show the onlooker 'lost in the stars' (while still on Earth). The overall sound is thin, the small climaxes of successive crescendos and diminuendos are capped with fingernail plucks on a high string, and these doubled with filtered harp harmonics in the pre-recorded part.

10.6.5 Section F

In bars 107-122, a militaristic interpretation of the stars is given. As a metaphor for the military, the percussion is used in a solo cadenza built around a line on field drum. Lines are 'thrown at' (crescendo towards) cymbal strikes in a parody of marching band music. The tape part adds resonances to strategic percussion strikes. The 'corniness' and simplicity in this choice of metaphor is deliberate for two reasons: firstly it is from very simple models that the complexities, diversity, patterns and beauty of nature are based¹⁷; secondly, this choice *itself* reflects and parodies the lack of any deep thought behind much military policy in the world. In this way, a compositional decision can be imbued on one level with the character of that which its result is partly aimed at representing.

¹⁷ Bartók (Lendvai, 1971) and Messiaen's works are an influence, rife as they are with biological and zoological parallels -the numbers of petals on certain flowers, length proportions displayed in the bodies of insects (eg golden section), the vein-arrangements of leaves, the sanctity and unchanging nature of the number 'three' as a symbol for the Holy Trinity, etc.

In the same section in *Conquête*, a bassoon line hobbles along, the harmonies it outlines based on a preconceived harmonic resource. The line alternates between quaver and demisemiquaver motion. A part of the parody, these try to convey the comedy of a clown walking across a stage and falling over every few steps. The 'steps' in between are given pitch as if the clown had an imaginary musical accompanist.

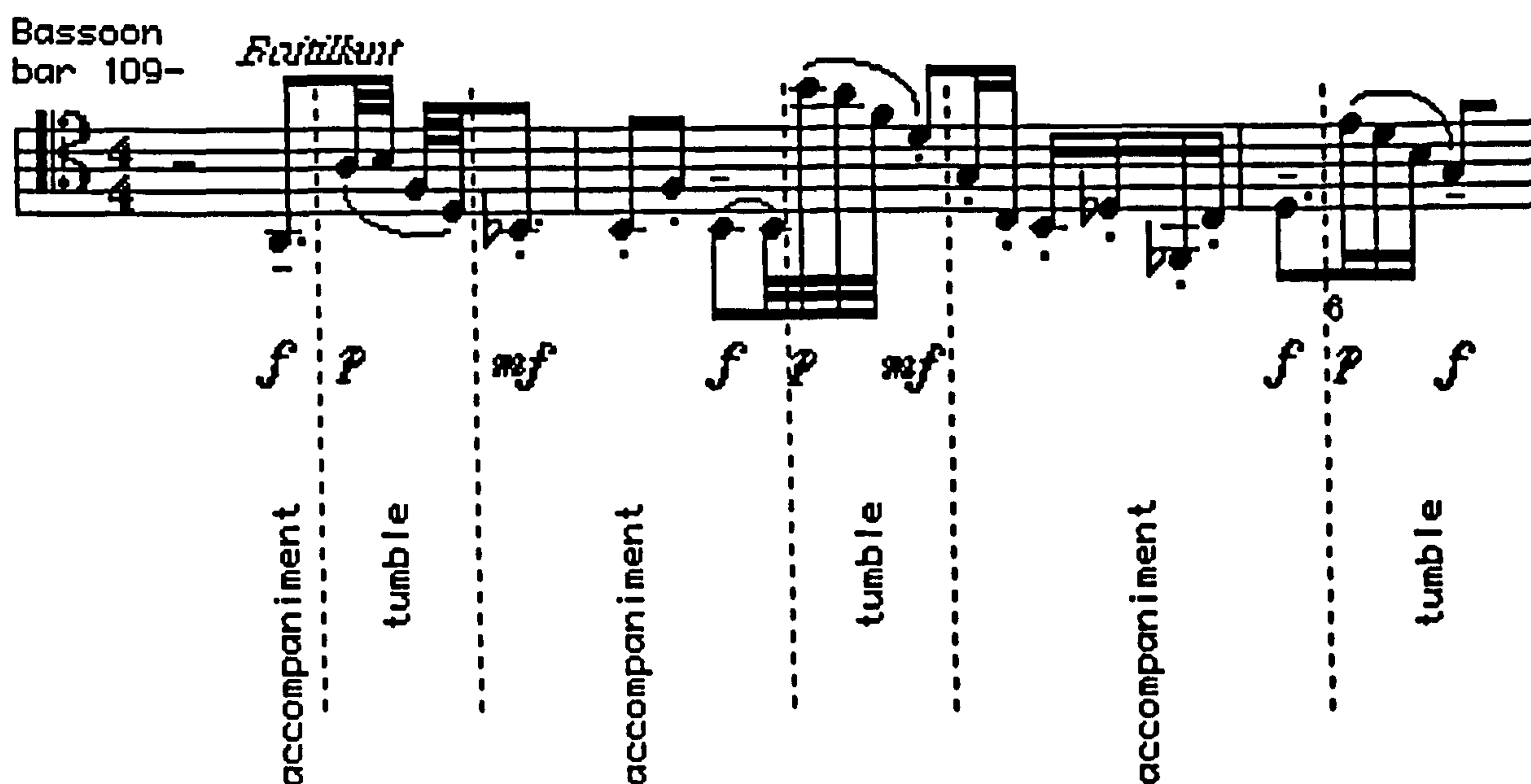


Fig. 10.6 Section F from *Conquête de l'espace*. ('Boitillant' means to 'hobble'.)

The harp in this section 'doubles' climaxes from the percussion with different coloured chords. Finally in bar 122, we 'take off'.

10.6.6 Section G-H

At IRCAM I was introduced to a project by one of the Bassoonists of the Ensemble Intercontemporain (Pascale Gallois) to list, rationalise and find a notation for every advanced instrumental performance technique for his instrument. He was an authority on the articulation of bassoon portamentos and could glide seamlessly from the bottom register of his instrument to the top using circular breathing. The effect is quite amazing and as Gallois was to perform the bassoon part of this piece, such a portamento was incorporated to represent an ascent into space. The line

is doubled in the pre-recorded part with thin sounds that glide very slowly upwards.

A 'conquest' of space is what the piece is about. The opening gesture of the piece chosen to give an overall impression of the tapestry is harkened to indirectly here. A spectral convolution¹⁸ between the recording of a locomotive starting off and accelerating, and the tamtam to be used for the performance was made and is triggered in bar 122.

10.6.7 Section I

Bars 181 to 203 recapitulate the chords of 'The Dove'¹⁹. The chords are played by synthesizer whose voices mix pedals with sounds having internal spatial qualities. The bassoon doubles the top lines of these chords or adds other resonances freely. Meanwhile, harp and timpani play improvisatory figures based on modes derived from the underlying chords structures.

From bar 204, a short sound included in the tape part is made from a convolution between recordings of a single, ordinary bassoon note and a military field drum stroke.

10.6.8 Section J

Section J (bars 205-229) changes to sound out a comic interpretation of the tapestry. The word 'comic' here is intended to refer to that essence of the tapestry that is 'cartoonic' in design. By their brightly-coloured glow, the stars and other cosmic elements of the weave have an almost 'toy-like' quality (see Plate 6) that extends through all of Lurçat's work. This 'toy'-like aspect is reflected in the section of music by a 'clockwork' quaver motion.

¹⁸ Convolution is a processing technique by which one sound is crossed with, or made to seem to 'sing through' another. A sound can be described in terms of the way in which a filter changes in time after an impulse (q.v.) has been sent through it. In convolution, a component sound is analysed and the analysis used to control a filter through which the second sound is then passed. The result (after some parameter adjustment) produces a hybrid sound. In practice, convolution is effected by multiplying the spectra of the component signals together. The effect is a type of cross-synthesis in which the frequencies that the sounds have in common are reinforced.

¹⁹ 'Chords of the Dove' pillaged from my *l'Homme en gloire dans la Paix* for orchestra (1987-8).

The music 'feels' naïve, but, in reflecting an appreciable aspect of the tapestry, this is the intention. A cartoon by definition restricts itself to outlines and block-colouring. Detail and the visual (or audio) results of translating the complexities of a personality, are added later or inferred.

In a reflection of the way in which the structure of atoms resembles that of whole solar systems, the end of *Conquête* attempts to defy scale by returning to the opening gesture of the piece - we are back where we started. For me, the pantheistic similarity between atomic and cosmic forms cannot be coincidental as space is transcended.

10.7 Control Systems

Figure 10.7 below shows the technical layout for *Conquête de l'espace*. The conductor also plays a SONAR²⁰ controller. This is a device that converts the movement of one's hand in air into control voltages that in turn can be converted to MIDI values. These are used to control various parameters during the piece. The conductor conducts with one hand while the other triggers and controls electronic events.

IRCAM/Opcode's *Max* program was used to convert MIDI values from the SONAR and map them to producing the changes desired. The functions of the SONAR vary through the piece. In the score, the SONAR part is labelled 'TG'. This is because for most of the time it plays a TG77 synthesizer.

²⁰ SONAR: 'SOund NAVigation Ranging'. SONARs are used traditionally as a method of locating underwater objects by transmitting an ultrasonic pulse and detecting the reflected pulse. The time taken for the pulse to travel to the object and return gives an indication of the depth of the object. This is also the method by which bats navigate. In *Conquête*, a small box emits the ultrasonic pulse which is reflected by a board to the performer's right. The performer interrupts the beam with his hand against which the pulse is reflected.

Percussion:

5 Timpani
Woodblock (isolated)
Cymbal
Chromatic crotales
Tam tam
Military snare
Octoban
Bass drum

Microphones

- 1 Wood block
- 2 Cymbal
- 3 Crotales (upper)
- 4 Crotales (lower)
- 5 Tam tam
- 6 Bassoon
- 7 Harp (upper)
- 8 Harp (lower)

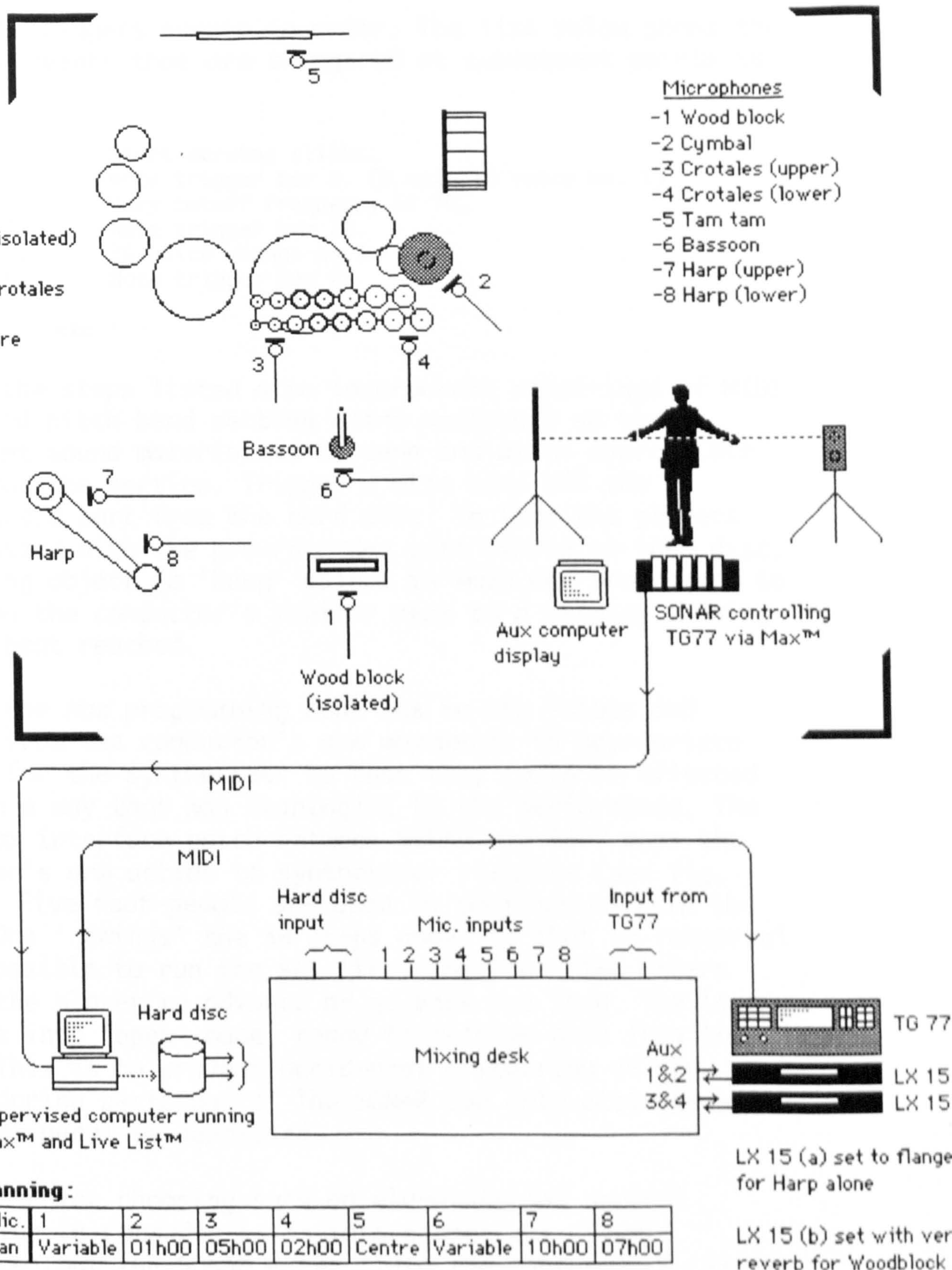


Fig. 10.7 Technical Layout for Conquête de l'espace.

The SONAR triggers events in order. The list below shows the first few events that are triggered at subsequent points in the piece.

1. Start warning clicks.
2. Note trigger bar 6. (& sets TG voice no. 1)
3. Vary cutoff frequency of TG.
4. Note trigger bar 22.
5. TG voice change no.2.
6. Note trigger bar 43.

... etc

In *Max*, the steps listed also incorporate resettings of MIDI volume and pitch bend setting where necessary so that subsequent sound material is in tune and at an appropriate volume for the section. Trigger 2 also sets off the pre-recorded part from the hard disc. To keep the players synchronized with the pre-recorded part stored on hard disc, a flashing object (a 'bang' object in *Max*) was programmed to appear on the conductor's monitor next to a display showing bar and beat reached.

Most of the *Max* programming done was to map values and changes from the conductor's arm movements to appropriate changes for the synthesizer so that they could be effected live, in a way that was meaningful to the performance. The basic *Max* interface patch between SONAR and TG77 maps the performer's arm action to synthesizer response (see fig. 10.8)²¹. Five foot-pedals are used in conjunction with the SONAR. One 'rewinds' the 30 steps above so that in rehearsal it is possible to run the set 'from the top'. Two others permit the player to advance or go back one step. The last puts *Max* into 'open' mode, ready to receive data from the SONAR. This is to prevent accidental triggering of the device during performance. The SONAR can only activate while this last pedal is depressed.

The reason for choosing such an elaborate and unusual controller in *Conquête* is to incorporate the visual reference that the SONAR makes, into the performance. It is strange from an auditor's point of view, to see a player move their hand in thin air and to hear a sound element

²¹ Presenting all the *Max* patches (about 38 of them) used in *Conquête de l'espace* was thought beyond the scope of the current writing.

change as the movement changes.²² Space is being 'conquered' in that moving through it 'harnesses' it and nothing else to produce a change.

10.8 Diffusion

In the diffusion space at IRCAM, a 'sound halo' for each acoustic instrument was built. The 'halos' reflect the position of the instruments on stage, but pull their amplified sound slightly up and apart via four speakers suspended over the stage between audience and musicians. Here, the live-produced sound is given its own area high, and in the middle of that occupied by the tape part. This 'sharing' of space, while limiting the acoustic sound to the centre, satisfies the requirements of amplification to ensure that pre-recorded and live sounds 'fuse' well.

²² My first idea was to have used a Theremin in the performance to bring a sense of nostalgia to the 'show'. 'Nostalgia' was a new phenomenon at IRCAM, a setting traditionally associated only with what is new in technology. The irony in play is very much a property of British humour. This is important to me as I find ways to reconcile the two very different types of humour that are part of my own cultural background. Needless to say, my French colleagues at IRCAM reacted to my desire to use a Theremin with incomprehension.

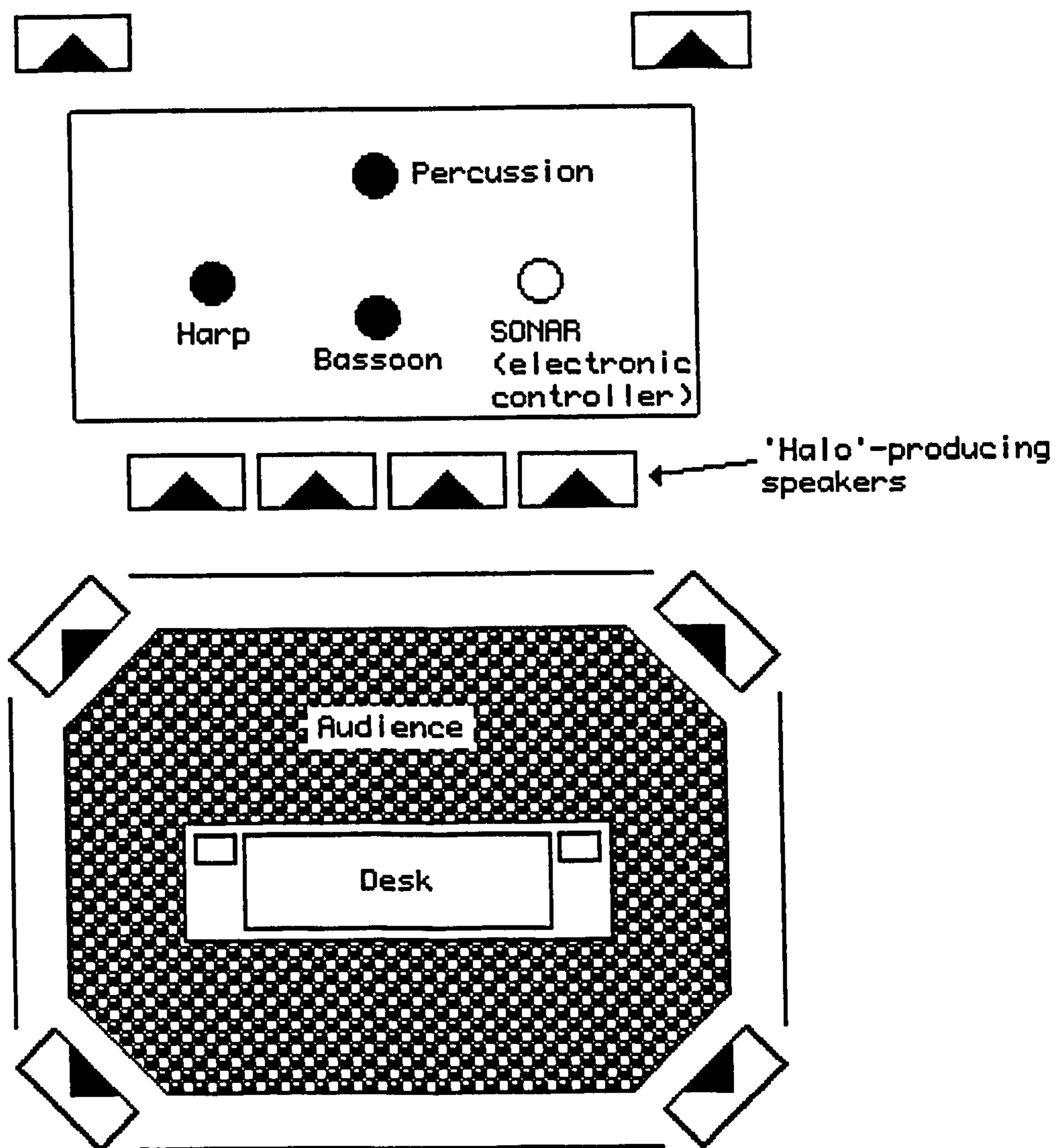


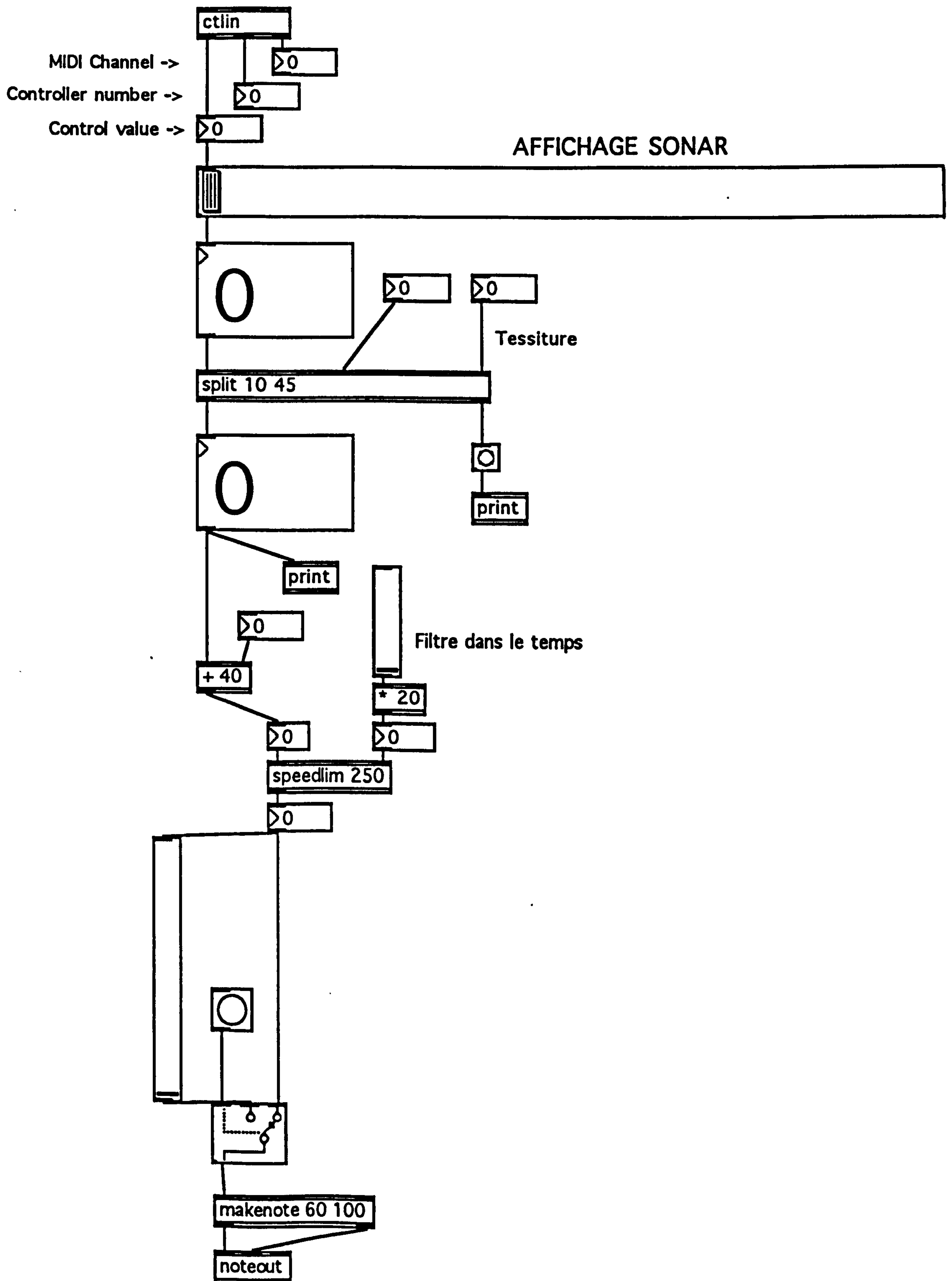
Fig. 10.9 Speaker layout for Conquête de l'espace, Espace de Projection, IRCAM 10/2/'94. All speakers suspended from ceiling.

No reverberation was added to sound from live microphones. For the concert, the *Espace de Projection* was set²³ for a reverberation time of some 1.8 seconds. Reverberation times shorter than those of the room in which they are played get lost and sound 'muddy'. In compiling the tape part, this negated the use of whole series of colouristic, environmental and plate delay effects. Only reverberation times of over 1.8 seconds were used where necessary to situate component sounds in spaces seemingly beyond the confines of the hall.

²³ The walls and ceiling of the Espace de Projection at IRCAM have panels inset that can be made to turn to present the audience with surfaces of different acoustic property. Thus the reverberation times of the room can be changed and the quality of the reverberations it produces altered for each piece played in it.

Fig. 10.8

Max™ SONAR-TG77 interface patch used in Conquête de l'espace.



10.9 Conclusions

Conquête builds on *Repeal* in that this time we have four 'meta-instruments' instead of just one, and it becomes interesting to play with ways that they can interact. There is a collision to be exploited between two harmonic worlds: one composer-derived, the other taken from the spectral qualities of some of the acoustic sounds used.

The practicalities of composing *Conquête de l'espace* gave me an empirical background from which to judge the value of a strong aesthetic approach at IRCAM.

10.9.1 Thoughts on the Spectralist Approach

At the time of writing, spectralism (the basing of the harmony of pieces on spectral analyses of the acoustic sounds [solo or grouped] used in them) is fashionable among composers of electroacoustic music in France.

There is a consensus at IRCAM that it would be advantageous to classify all possible sounds that can be made by all acoustic instruments: all notes at all dynamics, all pedal tones, harmonics and multiphonics where possible. The idea is that analyses of all these sounds could be stored for reference to by composers so avoiding the effort and expense of repeated recordings and analyses of acoustic sounds solo or in combination. The idea ignores the obvious 'treasure' of acoustic sound, that players and instruments have their own timbres that they produce - no two bassoons for example sound exactly alike. We must not underestimate the discerning abilities of the ear and the influence of this human processing on our understanding. I feel such a categorisation would be a waste of time better spent in researching real-time analysis and transformation algorithms.

I have observed in many spectral pieces problems of *pacing*. This is due to the composer's insistence on basing the *temporal* aspects of spectral harmonic evolution in a piece on those suggested by the sounds analysed. Extra-musical models while good starting grounds, do not necessarily produce effective *musical* results. Paradoxically however, we should not lose sight of the productive practice of relinquishing some control to a self-governing system.²⁴

As highlighted in section 3.4.3, what is required is a continuous and intuitive reappraisal of material generated in the context of the ongoing composition.

An accompanying problem one has to be aware of when using subdivisions of the semitone with a MIDI-based composition and auditioning platform, is that each halving of this interval also halves the number of MIDI channels one has available. A way round this rather than allocating two MIDI channels, one each for one of two copies of the electronic voice (the second of which is detuned up [or down] one quarter-tone), is to retune the scales of the sound source device. The disadvantage of this approach is that one loses the guiding properties of the keys of one's controller. (The note D might for example become C#.) Patches on *Max* were devised here to translate traditional controller strokes into desired data.

²⁴ This paradox is highlighted by Louis Barron who, with his wife B     composed and produced the electronic score for Fred McLeod Wilcox's 1956 film *Forbidden Planet* using sounds generated with home-made, valve-based technology which is inherently unstable. It has a life of its own which is allowed to dictate the music at times. 'Mistreating' these circuits with inappropriate currents could sometimes result in interesting sonic results.

You have to have some intuitive direction, rather than randomly poking around. If you sort of do it with feeling, very often, something happens. ...It only works if there is a sort of spiritual involvement with what's going on. It's like these authors who say "I wasn't thinking when I wrote that. It's coming through me". The same thing applies to musicians.

(GREENWALD, Ted. *The Self-Destructing Modules behind the Revolutionary 1956 Soundtrack of Forbidden Planet*. 'Keyboard' magazine. February, 1986, pp54-65.)

What I found interesting with this piece, was the way that taking different interpretations of the tapestry as points of departure for the structure and style of each of the piece's sections, did not seem to interfere with the natural flow of the work, which can be experienced as a continuous whole. 'Interpretations' of a visual resource do not prevent one from delving back into common sound resources and harmonic outlines for development. It is useful that phonoscopic working does not prevent one from being able to use traditional compositional resources.

Postlude

In composing, it becomes clear that processes have less to do with the objects being used themselves, and more to do with the way we make our own experiences as composers taint the evocation and processes of inter-reaction with the aural images imagined from the aural objects we choose.

Music is a powerful substrate for expression through which we as composers can share our reactions to the world we find ourselves in with our listeners. As such, we are ambassadors of the heart. Let us tread truly.

Appendix

C-1	16.352	C1	65.406	C3	261.626	C5	1046.502	L1	4186.009
C+-1	16.831	C+1	67.323	C+3	269.292	C+5	1077.167	C+7	4308.668
C*-1	17.324	C*1	69.296	C*3	277.183	C*5	1108.731	C*7	4434.922
D-1	17.832	D_1	71.326	D_3	285.305	D_5	1141.219	D_7	4564.875
D-1	18.354	D1	73.416	D3	293.665	D5	1174.659	D7	4698.636
D+-1	18.892	D+1	75.567	D+3	302.27	D+5	1209.079	D+7	4836.317
Eb-1	19.445	Eb1	77.782	Eb3	311.127	Eb5	1244.508	Eb7	4978.032
E-1	20.015	E_1	80.061	E_3	320.244	E_5	1280.975	E_7	5123.899
E-1	20.602	E1	82.407	E3	329.628	E5	1318.51	E7	5274.041
E+-1	21.205	E+1	84.822	E+3	339.286	E+5	1357.146	E+7	5428.582
F-1	21.827	F1	87.307	F3	349.228	F5	1396.913	F7	5587.652
F+-1	22.466	F+1	89.865	F+3	359.461	F+5	1437.846	F+7	5751.382
F*-1	23.125	F*1	92.499	F*3	369.994	F*5	1479.978	F*7	5919.911
G-1	23.802	G_1	95.209	G_3	380.836	G_5	1523.344	G_7	6093.377
G-1	24.5	G1	97.999	G3	391.995	G5	1567.982	G7	6271.927
G+-1	25.218	G+1	100.87	G+3	403.482	G+5	1613.927	G+7	6455.708
G*-1	25.957	G*1	103.826	G*3	415.305	G*5	1661.219	G*7	6644.875
A-1	26.717	A_1	106.869	A_3	427.474	A_5	1709.896	A_7	6839.585
A-1	27.5	A1	110.0	A3	440.0	A5	1760.0	A7	7040.0
A+-1	28.306	A+1	113.223	A+3	452.893	A+5	1811.572	A+7	7246.288
Bb-1	29.135	Bb1	116.541	Bb3	466.164	Bb5	1864.655	Bb7	7458.62
B-1	29.989	B_1	119.956	B_3	479.823	B_5	1919.294	B_7	7677.174
B-1	30.868	B1	123.471	B3	493.883	B5	1975.533	B7	7902.133
B+-1	31.772	B+1	127.089	B+3	508.355	B+5	2033.421	B+7	8133.683
C0	32.703	C2	130.813	C4	523.251	C6	2093.005	C8	8372.018
C+0	33.661	C+2	134.646	C+4	538.584	C+6	2154.334		
C*0	34.648	C*2	138.591	C*4	554.365	C*6	2217.461		
D_0	35.663	D_2	142.652	D_4	570.609	D_6	2282.438		
D0	36.708	D2	146.832	D4	587.33	D6	2349.318		
D+0	37.784	D+2	151.135	D+4	604.54	D+6	2418.158		
Eb0	38.891	Eb2	155.563	Eb4	622.254	Eb6	2489.016		
E_0	40.03	E_2	160.122	E_4	640.487	E_6	2561.95		
E0	41.203	E2	164.814	E4	659.255	E6	2637.02		
E+0	42.411	E+2	169.643	E+4	678.573	E+6	2714.291		
F0	43.654	F2	174.614	F4	698.456	F6	2793.826		
F+0	44.933	F+2	179.731	F+4	718.923	F+6	2875.691		
F*0	46.249	F*2	184.997	F*4	739.989	F*6	2959.955		
G_0	47.605	G_2	190.418	G_4	761.672	G_6	3046.689		
G0	48.999	G2	195.998	G4	783.991	G6	3135.963		
G+0	50.435	G+2	201.741	G+4	806.964	G+6	3227.854		
G*0	51.913	G*2	207.652	G*4	830.609	G*6	3322.438		
A_0	53.434	A_2	213.737	A_4	854.948	A_6	3419.792		
A0	55.0	A2	220.0	A4	880.0	A6	3520.0		
A+0	56.612	A+2	226.446	A+4	905.786	A+6	3623.144		
Bb0	58.27	Bb2	233.082	Bb4	932.328	Bb6	3729.31		
B_0	59.978	B_2	239.912	B_4	959.647	B_6	3838.587		
B0	61.735	B2	246.942	B4	987.767	B6	3951.066		
A+0	63.544	A+2	754.178	A+4	1016.710	A+6	4066.841		

François EVANS

Frequency/Hz->Pitch
Conversion Chart.

+ = 1/4-tone sharp
_ = 1/4-tone flat

François EVANS

AURAL IMAGE & THE LANGUAGE OF ELECTROACOUSTIC MUSIC

Folio of Composition: Recordings /Track Listing
--

DAT I Complete Pieces

Two recordings of the piece *Manches en bois ...manches de joie* are presented here. The first, a studio recording that makes clear the live electronic processing intended on the piece but that has drum and S900 parts triggered by computer, the second a more raw, live concert recording in which the electronics do not come across quite as clearly. Together the two recordings give a good perspective on the piece.

1. Manches en bois ...manches de joie (Studio Mix) 9'30
Sample Rate: 44.1 KHz

Clarinet /Bass Clarinet:	Nicolas del Grazia
Analogue Synthesizer,	
Drum & S900 programming:	François Evans
Trumpet:	Fraser Tannock
Piano:	David Wickham
'Cello:	Judith Robinson

Conducted by François Evans

Engineered by Martin Robinson; concertmaster: Robin Gordon-Powell. Electronics programmed at the *Laboratoire Musicale Phonoscopique*, London by François Evans. Produced & Mixed by François Evans at the City University Recording Studios, London.

2. Manches en bois ...manches de joie (Live) 9'48
Sample Rate: 48 KHz

City Lights Chamber Ensemble:

Clarinet:	Nicolas del Grazia
Trumpet:	Alex Poots
Drum kit:	Simon Limbrick
Analogue synthesizer:	Oliver Vessey
Piano /S900:	Darla Crispin
'Cello:	Judith Robinson

Sound Diffusion: Michael Rosas-Cobian & Jonathan Scott

Conducted by François Evans.

Recorded in a public concert at the City University XIVth Annual Festival of Electroacoustic Music.

3. Repeal (Concerto for Piano & Synthetics) 16'09

Sample Rate: 44.1 KHz

Piano:

Stephen Gutman

Produced & mixed by François Evans at the City University Recording Studios, London.

4. Electro-clip: Matchstrike Memory from Pulse 1'00

Produced & mixed by François Evans at the City University Recording Studios, London.

5. Suite from List of Contents 9'48

Produced & mixed by François Evans at the City University Recording Studios, London.

Corporation (uneasy reflections on Camping) 10'27

- | | | | |
|----|---------------|----------|------|
| 6. | Movement I. | Thrilled | 4'07 |
| 7. | Movement II. | ♩ = 100 | 4'00 |
| 8. | Movement III. | Thrilled | 2'20 |

Clarinet: Nicolas del Grazia

Church Organ: Edward Kemp-Luck

Voices: Harold Innocent & Stratford Johns

Recorded at the Church of St John the Evangelist, Duncan Terrace, Islington, London with grateful thanks to Father Haines.

Electronics produced, mixed and edited by François Evans at City University Recording Studios, London 8/1994.

9. Conquête de l'espace

Ensemble Intercontemporain:

Bassoon: Paul Rixiaux

Percussion: Daniel Ciampolini

Harp: Frédérique Cambrelaing

Conducted from the SONAR by François Evans.

Recorded live at IRCAM, Paris 12/2/1994. Pre-recorded sound processed and live electronics programmed at IRCAM, Paris by François Evans. Tape part produced and mixed at the City University Recording Studios, London.

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DAT II Tape Parts only

10. Repeal Tape part only 13'30

Corporation (uneasy reflections on *Camping*)
Tape part only

11.	Movement I:	Thrilled	4'07
12.	Movement II:	♩ = 100	4'00
13.	Movement III:	Thrilled	2'20

14. Conquête de l'espace Tape part only

All items composed & produced by François Evans.

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Bibliography

Books

- ANDERSEN, Hans Christian. *Fairy Tales Book I: The Emperor's New Clothes* (Pan Books reprint 1976), pp 20-28.
- BAKER, Fred & FIRESTONE, Ross (Ed.). *Movie People at Work in the Film Industry: Quincy Jones on the Composer* (Abelard-Schuman Ltd, 1972) pp147-167.
- BALAZS, Béla. *Theory of the Film*. (New York: Dover, 1970) pp194-241.
- BAZELON, Irwin. *Knowing the Score: Notes on Film Music*. (Van Nostrand Reinhold, 1975).
- BORDWELL, David and THOMPSON, Kristin. *Film Art: An Introduction* (University of Wisconsin. Addison Wesley, 1992) esp. Chapter 7, pp189-219.
- BURCH, Noel. *Theory of Film Practice* (New York: Praeger, 1973) Chpt. 6 pp90-101.
- CLARKE, Eric. Expression & Communication in Musical Performance in Music, Language Speech & Brain (Sundberg, J.; Nord, L. & Carlson, L. Eds). (London, Macmillan, 1991.)
- COPLAND, Aaron. *How to Listen to Music*. Chapter 17 on Film Music pp152-157.
- DOWLING, W. J. & HARWOOD, D. *Music Cognition* Chapter 8: Emotion & Meaning. pp202-224. (New York Academic Press, 1986).
- EISENSTEIN, *The Film Sense*. 1953
- EISLER, Hans. *Composing for the Films*. 1957
- EMMERSON, Simon. (Ed.) *The Language of Electroacoustic Music*. (Macmillan, 1986).
- FLEW, Anthony. (Ed.) *A Dictionary of Philosophy* (Pan, 1979).
- GORBMAN, Claudia. *Unheard Melodies: Narrative Film Music*. (BFI Publications, 1988).
- HILL, Napoleon. *Think & Grow Rich* (Wilshire Book Co., 1937) esp chapter 1.
- HINDEMITH, Paul. *A Composer's World*, Harvard University Press (1952).
- JOHNSON, Ron and BONE, Jan. *Understanding the Film* (National Textbook Co., 1976).
- LACAN. *Ecrits*. (Gallimard, 1969). esp. lecture on *The Mirror*.
- LAURENDEAU, Jean. *Maurice Martenot, luthier de l'électronique* (Dervy Livres, Croissy-Beaubourg, France, 1990).
- LENDVAI, Ernő. *Béla Bartók. An Analysis of his Music* (Khan & Averill Publishers, 1971).
- LIMBACHER, James L. (Ed.) *Film Music* (Scarecrow press, 1983).

- LURIA, A.R. *The Mind of a Mnemonist*. (New York: Avon Books, 1969).
- MALTZ, Maxwell *Psychocybernetics*. (Wilshire, 1960).
- MANVELL, Roger and HUNTLEY, John: *The Technique of Film Music*. Revised and enlarged by Richard Arnell & Peter Day. (Focal Press, 1975).
- MONACO, James. *How to Read a Film*. (Oxford University Press, 1977).
- Musical Score, The*. Chapter from unidentified book. pp190-205
- NATTIEZ, Jean-Jacques. *Music & Discourse* (Chpt. on Representation) trans. Carolyn Abbate (Princeton University Press, 1990).
- PRENDERGAST, Roy M. *Film Music: A Neglected Art*. (New York: Norton, 1977).
- ROY, Claude & LURCAT, Jean: *Jean Lurçat* (G.I. Edition, Toulouse, France, 1992).
- SCHAEFFER, Pierre. *Traité des Objets Musicaux* 2nd ed. (Paris: Editions du Seuil, 1966).
- SEAY, Albert. *Music in the Medieval World* (Prentice Hall, 1965).
- STRAVINSKY, Igor. *Poetics of Music*. (Harvard University Press, 1942).
- TRASK, R. L. *Language: The Basics* (Routledge, 1995).
- WISHART, Trevor. *On Sonic Art* (Imagineering Press, 1985).

Articles

- AUSTIN, Bruce A. (Ed.) *Current Researches in Film: Audiences. Economics and Law* Vol. II p62.
- MARCHETTI, Gina. *Subcultural Studies and the Film Audience: Rethinking the Film Viewing Context*.
- AUSTIN, Bruce A. *The Film Industry, Its Audience and New Communications Technologies*. Ibid. p80
- BELKIN, Alan. *Orchestration, Perception and Musical Time: A Composer's View*. Computer Music Journal. Vol. 12 No. 2, Summer, 1988. pp47-53.
- CLARKE, E. & FORD, C. *A General Semiotic Theory of Music*. in Hans Werner Henze: Neue Aspekte der Musikalischen Ästhetik II: Die Zeichen Frankfurt Fischer Verlag. 1981.
- CLARKE, E. F.: *The Perception of Expressive Timing in Music*. Psychological Research, Vol. 51. pp2-9.
- CLYNES, Manfred. 1985. *Music Beyond the Score* Magazine Journal of the Bodily Arts & Sciences Vol. 5, No. 1. pp4-14.

- EVANS, Philip. *Henri Ey's Concepts of the Organisation of Consciousness and its Disorganisation: An Extension of Jacksonian Theory*. Brain. Vol. 95, pt. 2, 1972. pp413-440.
- GORBMAN, Claudia. *Clair's Sound Hierarchy and the Creation of Auditory Space*. Purdue Film Studies, 1976, pp113-123.
- GORBMAN, Claudia. *Music as Salvation: Notes on Fellini & Rota*. Film Quarterly, Vol. 28. Part 2 pp17-25 Winter 1974.
- GORBMAN, Claudia. *Narrative Film Music* Yale French Studies No. 60 (1980).
- GORBMAN, Claudia. *Teaching the Soundtrack*. Quarterly Review of Film Studies Vol.1, No.4, Nov. 1976. pp446-452.
- GORBMAN, Claudia. *Vigo /Jaubert* Cine Tracts Vol.1, Part 2 1977 pp65-80.
- GREENWALD, Ted. *The Self-Destructing Modules behind the Revolutionary 1956 Soundtrack of Forbidden Planet*. Keyboard magazine. February, 1986. pp54-65.
- JAMES, Richard S. *Avant Garde Sound-on-Film Techniques and their Relationship to Electroacoustic Music*. The Musical Quarterly. pp74-89.
- JANZEN, Thomas E.: *Aesthetic Appeal in Computer Music*. Computer Music Journal Vol.10, No.3. Fall 1986. pp83-88.
- JOHNSON, William *Face the Music*. Film Quarterly 1962. Vol. 22, Part. 4 pp3-19.
- JONES, Chuck. *Music and the Animated Cartoon*. Hollywood Quarterly, 1946, Vol. I Pt. 4. pp 364-370.
- KAROWSKI, T.F., ODBERT, H.W., & ECKERSON, A.B. *Studies in Synesthetic Thinking: Musical and Verbal Associations of Colour and Mood*. Journal of General Psychology, 26, 1942, pp153-173.
- KENDALL, Gary S. *Visualisation by Ear: Auditory Imagery for Scientific Visualization and Virtual Reality*. Computer Music Journal Vol. 15 No. 4 Winter 1991.
- LEWIN, Frank. *The Soundtrack in Non-Theatrical Motion Pictures*. Journal of the Society of Motion Picture and Television Engineers. March, 1959 pp113-118; June, 1959 pp407-412 and July, 1959 pp 482-488.
- McADAMS, Stephen and BREGMAN, Albert. *Hearing Musical Streams*. Computer Music Journal, Vol. 3, No. 4, 1979 pp26-43.
- MORRIS, David. *Theory of Metaphor*. Chapter 4, pp60-70. (University of Ulster, 1990)
- SERRA, Marie-Hélène *Manuel SVP* (Paris: IRCAM, 1993).
- TERHARDT, Ernst; STOLL, Gerhard & SEEWANN, Manfred: *Algorithm for Extraction of Pitch and Pitch Salience from Complex Tonal Signals*. Journal of the Acoustical Society of America 71 (3), March, 1982.

TERUGGI, Daniel *What About Acousmatics?* in Journal of Electroacoustic Music, Sonic Arts Network, London. pp17-20. Vol. 7, October, 1993.

WILLIAMS, Allan. *Is Sound Recording Like a Language?* Yale French Studies Vol. XII No. 1. pp51-66.

ZICARELLI, David M and Jam Factory. Computer Music Journal, Vol. 11, No. 4, Winter 1987.

Audiovisual Media

BARKER, Clive. *Hellraiser* video cassette. Film preceded by documentary on Clive Barker, featuring quotations from his writings. New World Video, 1987.

BERNSTEIN, Leonard. Harvard Lectures, 1973.

BOULEZ, Pierre. Contact: Pierre Boulez interview with Pierre Boulez broadcast on French television, Planète cable TV station, 12/7/1995 11.55am-12.55am.

MILLER, Jonathan. The Moving Image broadcast Channel Four 9/7/1989.

PREVIN, André. Interview with John Williams. Personal Notes Broadcast BBC2 8/11/1988 7.20pm.

Lectures

SHAW, William. *The IMAX Experience*. Given at Museum of the Moving Image, South Bank, London 15th April, 1992. Notes taken by the author.
