

Chapter 1

WHAT IS SONIC ART?

This book is based on a series of lectures given whilst in residence at Queen's University, Kingston, Ontario in the Autumn of 1983. The inspiration for this series of lectures was the new control possibilities opened up by digital analysis, synthesis and processing of sound-materials. Whilst attending the IRCAM¹ computer music induction course in the summer of 1981, I had many of my ideas about the internal structure of sounds confirmed through the research on psycho-acoustics then going on at IRCAM and also discovered an instrument — the computer — through which I could realise some of the concepts of musical transformation I had been dreaming of for some years.

This book is not about *how* to do it, though I will be discussing at some stage new techniques such as frequency modulation synthesis, cross-synthesis and model-building. Rather it is about *why*. Faced with all the new possibilities for structuring sound and sequences of sound-events thrown up by digital synthesis, analysis and control, what might be the effect of ordering sounds in one way rather than another, and what might be fruitful avenues for exploration?

This book is also essentially speculative, though I should stress it is based on my own experience of working with sounds over many years. I intend to throw up various possible options which might prove fruitful in the future, and discuss some of my attempted solutions to these problems. In so doing I am attempting to draw together various theoretical threads which have emerged from fifteen years experience of working in music, music-theatre and electro-acoustic music. Some of the material in this book has appeared elsewhere in similar form (Shepherd, Virden, Vulliamy and Wishart (1977); Wishart (1979)), but the majority of it is entirely new.

My own experience as a composer is quite broad. I have worked in the spheres of music-theatre and environmental music events and, of particular relevance to this book, free improvisation, electro-acoustic music, both live and in the studio, and with extended vocal techniques. I have also

¹ IRCAM, the *Institut de Recherche et Coordination Acoustique/Musique*, is part of the *Centre Pompidou* in Paris and was directed by Pierre Boulez from 1974–1992.

spent a good deal of time listening to the world, observing natural landscapes and events and their structure and interaction, observing speech and verbal communications and working with the calls of animals and birds. Although I will refer a great deal in the first part of the book to the work done by the *Groupe de Recherches Musicales*,² I should emphasise that I read their work (Schaeffer, Reibel and Ferreyra (1983)) only a few weeks before presenting the series of lectures which form the basis of this book. I quote extensively from it as it is both very thorough and it confirms my own experience up to a point. But, although I admire the French group's general refusal to present any written down theory of sound organisation, preferring to rely exclusively on the ears and direct aural feedback, I would like to go a small step further here and attempt to theorise about these matters. I would stress, however, that my theories remain heuristic tools, and not a means to replace intuition by an overall *logos* such as the serial principle (which I shall criticise in detail later).

One essential aim of this book is to widen the field of musical debate. One problem I have had in my own musical career is the rejection by some musicians and musicologists of my work on the grounds that 'it is not music'. To avoid getting into semantic quibbles, I have therefore entitled this book *On Sonic Art* and wish to answer the question what is, and what is not, 'sonic art'. We can begin by saying that sonic art includes music and electro-acoustic music. At the same time, however, it will cross over into areas which have been categorised distinctly as *text-sound* and as *sound-effects*. Nevertheless, focus will be upon the structure and structuring of sounds themselves. I personally feel there is no longer any way to draw a clear distinction between these areas. This is why I have chosen the title *On Sonic Art* to encompass the arts of organising sound-events in time. This, however, is merely a convenient fiction for those who cannot bear to see the use of the word 'music' extended. For me, all these areas fall within the category I call 'music'.

Of the eight sound examples³ which illustrate this chapter, only the fifth was originally presented *not* as music. Example 1.1, from *Pentes* by Denis Smalley, is at first glance a piece of pure electro-acoustic music on tape, into which live-performance instrumental material has been integrated. The second (Example 1.2) from my own *Menagerie* (the section called *Musical Box*), uses the accident of interruption of another piece of music as a starting

² The *Groupe de Recherches Musicales* (GRM), is the current name of the organisation (the originators of *musique concrète*) originally founded by Pierre Schaeffer in 1948 within Radio France, now part of the *Institut National Audiovisuel*.

³ See the introductory note to the sound examples list.

point for structuring an electro-acoustic piece. Example 1.3, from *Concrète PH-II* by Iannis Xenakis is the most persistently abstract example on first hearing. Example 1.4, from Michael McNabb's *Dreamsong* uses computer technology to transform representational and vocal material. Example 1.5 is an extract from BBC Radio's *Goon Show (Napoleon's Piano)*. Although the use of sound-effects here is essentially humorous, this is an early example of the creative use of sound-effects to do more than merely set a scene for an essentially verbal presentation. Example 1.6 is by Bernard Parmegiani, *Étude élastique* from *De Natura Sonorum*. Although at first hearing no two examples could seem more different than the previous two, I will show in a later chapter of the book how certain aspects of these two approaches to the organisation of sound are in fact very similar. Example 1.7, from *Thema — Omaggio a Joyce* by Luciano Berio, could hardly be rejected for inclusion in a text-sound collection, though it has always been presented as music. The final example (Example 1.8) is from an album of free improvisation by the English guitarist Richard Coldman.

From the final quarter of the twentieth century, it now seems clear that the central watershed in changing our view of what constitutes music has more to do with the invention of sound recording and then sound processing and synthesis than with any specific development within the language of music itself. These latter developments have vastly expanded our knowledge of the nature of sounds and our perception of them and contradicted many nineteenth century preconceptions about the nature of pitch and its relationship to timbre. Computer technology, offering us the most detailed control of the internal parameters of sounds, not only fulfils the original dream of early electronic music — to be able to sculpt all aspects of sound — but also (as evidenced by the McNabb piece) makes the original categoric distinctions separating music from text-sound and landscape-based art forms invalid. We can no longer draw these lines of division. In future it might therefore be better if we referred to ourselves as *sonic designers* or *sonic engineers*, rather than as composers, as the word 'composer' has come to be strongly associated with the organisation of notes on paper.

Looking around for a more general definition of the task of the composer, we are faced with the following definitions of what music might be. John Cage, for example:

*Music is sounds, sounds around us whether we're in or out of concert halls: cf. Thoreau.
(Personal communication to Murray Schafer (Schafer 1969: 1)).*

This is certainly a good definition to open our minds to the new possibilities but unfortunately it is much too wide to offer us any advice or sense of

direction in our approach to the vast new world of sounds at our disposal. At the other extreme Lejaren Hiller remarks, perhaps inadvertently, in an article in *Computer Music Journal*:

[...] computer-composed music involves composition, that is note-selection.
(Hiller 1981: 7)

Clearly for the contemporary composer, this is a uselessly narrow definition of composition. It does not even apply to the structuring of the extended drone sound in our first example *Pentes*. In fact, long ago, with the advent of the voltage control synthesiser, it was possible to generate a piece consisting of a singly attacked event which then proceeded to transform timbrally and perhaps split into a number of lines without ever re-attacking, i.e. a piece involving musical evolution, but without any 'notes'.

These narrow conceptions can equally be found on the other side of the fence. Richard Kostelanetz, in his compilation *Text-Sound Texts* (Kostelanetz 1980), makes the following distinction between text-sound and music:

The first exclusionary distinction then is that words that have intentional pitches, or melodies, are not text-sound art but song. To put it differently, text-sound art may include recognizable words or phonetic fragments; but once musical pitches are introduced, or musical instruments are added (and once words are tailored to a pre-existing melody or rhythm), the results are music and are experienced as such.
(Kostelanetz 1980: 15)

This definition is too narrow from the opposite point of view, as a listening to both the Berio and the McNabb examples will evidence.

A more sophisticated series of specifications for the boundaries between music and other disciplines is provided by Boulez in the book *Boulez on Music Today* (Boulez 1971). In some ways *On Sonic Art* can be viewed as a reply to Boulez's proposed limitations on the sphere of what constitutes music. Here is what Boulez has to say:

Pitch and duration seem to me to form the basis of a compositional dialectic, while intensity and timbre belong to secondary categories. The history of universal musical practice bears witness to this scale of decreasing importance, as is confirmed by the different stages of notational development. Systems of notating both pitch and rhythm always appear highly developed and coherent, while it is often difficult to find codified theories for dynamics or timbre which are mostly left to pragmatism or ethics [...].
(Boulez 1971: 37)

In this book I will suggest that the logic of this assertion is inverted. It is notatability which determines the importance of pitch, rhythm and duration

and not vice versa and that much can be learned by looking at musical cultures without a system of notation.

What is the series? The series is — in very general terms — the germ of a developing hierarchy based on certain psycho-physiological acoustical properties, and endowed with a greater or lesser selectivity, with a view to organising a FINITE ensemble of creative possibilities connected by predominant affinities, in relation to a given character; [...].
(Boulez 1971: 35)

In this book, I will suggest that we do *not* need to deal with a finite set of possibilities. The idea that music has to be built upon a finite lattice and the related idea that permutational procedures are a valid way to proceed will be criticised here and a musical methodology developed for dealing with a *continuum* using the concept of *transformation*.

When noise is used without any kind of hierarchic plan, this also leads, even involuntarily, to the 'anecdotal', because of its reference to reality. [...] Any sound which has too evident an affinity with the noises of everyday life [...], any sound of this kind, with its anecdotal connotations, becomes completely isolated from its context; it could never be integrated, since the hierarchy of composition demands materials supple enough to be bent to its own ends, and neutral enough for the appearance of their characteristics to be adapted to each new function which organises them. Any allusive element breaks up the dialectic of form and morphology and its unyielding incompatibility makes the relating of partial to global structures a problematical task.
(Boulez 1971: 22–23)

This is a rather eloquent example of the ideology of instrumental puritanism — *thou shalt not represent anything in music*. In this book I will propose:

- (1) that pitch-free materials can be structurally organised, though not in the hierarchic fashion used in lattice pitch music;
- (2) that anecdotal aspects of sound-material can also be organised coherently and in a complex manner and even enter into our perception of the most supposedly abstract pieces. We are not talking here about the concept of association which is often used in reference to nineteenth century programme music, but about much more concrete things which I will describe as *landscape* and *gesture*.

As has already been pointed out, sound-art can no longer be confined to the organisation of notes. Even this original conception had already been broadened to include at least three areas:

- (1) the instrumental approach where pitched sound-objects of short duration and fixed timbre were organised into larger structures through the medium of conventional notation;

- (2) *musique concrète*, using instead a vocabulary of sound-objects of various types categorised according to a phenomenological description of their properties and organised using studio techniques without (necessarily) any reference to the notated score;
- (3) voltage control synthesis techniques, giving us the possibility of sustained yet transforming streams of sound.

The power of the computer to help us construct the internal architecture of sounds from first principles allows us to broaden the concept of composer to include the notion of sonic sculpture. At the same time the use of sound-materials whose source is apparent or materials which, however abstract they may appear to the composer, suggest a source to the listeners, means that we may concern ourselves as composers with a landscape of the sound-world we are creating. The ability to capture and manipulate text or other vocal utterance (whether it be of human beings or other living creatures) brings into consideration other aspects of the presentation of sound-material which overlap almost completely with the concerns of text-sound-artists and in fact links us into the sphere of animal communication.

An additional reason that this book is called *On Sonic Art* is that, as I shall explain further, conventional music theories, dealing with the organisation of pitch in finite sets, rhythms using summative notation and most usually in fixed tempi, and sets of instruments grouped into clearly differentiated timbre-classes, I shall call *lattice sonics*. Everything from isorhythm through Rameau's theory of tonality to serialism comes under the general heading of lattice sonics and is adequately dealt with in existing musical text-books. I therefore intend to concentrate on areas that have conventionally fallen outside the scope of these theories. Hence *On Sonic Art*. I must stress, however, that I am not underrating the organisation of pitch and duration parameters as discussed in conventional theories. I am merely assuming that all this is by now common knowledge.

Also, one further important point, in contradistinction to what is implied in *Solfège de l'objet sonore* (Schaeffer, Reibel and Ferreyra (1983)⁴) this book assumes that there is no such thing as an *unmusical* sound-object.

⁴ An earlier identical LP version was issued to accompany Schaeffer (1966).

Chapter 2

BEYOND THE PITCH/DURATION PARADIGM

This chapter is an expansion and development of ideas first put forward in my contribution to the book *Whose Music? A Sociology of Musical Languages* (Shepherd, Virden, Vulliamy and Wishart (1977)). The principal point I am going to develop is that the priorities of notation do not merely reflect musical priorities — they actually create them. It is fundamentally important to grasp this point if we are to understand an approach to music based on our listening experience. In order to develop this particular point, we shall begin with a digression into media sociology. Our aim will be to draw a distinction between what our notation system puts an emphasis upon and what truly contributes to sound experience.

Three fundamental perspectives will be developed in this chapter. The first of these is that notation is *lattice-oriented*; there are fundamental aspects of sound experience even in the most highly notation-structured music, which are not conventionally notatable and therefore are not in the score. In fact music does not need to be lattice-based at all. Secondly, pitch and duration do not need to be the primary parameters in musical organisation. Thirdly, a perception and conception of music focused through notation can lead to an abstract formalist approach. What I am looking for are experientially verifiable criteria for making music. A preoccupation with conventional notation can lead us into formalism, a situation where there is no longer any experiential verification of our theories about how to compose music.

Writing, speaking

Since very ancient times, human thought and communication has been inextricably bound up with the use of the written word. So much so that it becomes almost impossible for us to disentangle ourselves for a moment from the web of written wisdom and consider the problems of meaning and communication *in vitro*, so to speak. Ever since the ancient Egyptians developed pictures into a viable form of hieroglyphic notation, our world has been dominated by a class of scribes, capable of mastering and hence

capable, or deemed capable, of controlling what was to be written down and stored in the historical record. Although this function was often delimited or occasionally usurped by illiterate or semi-literate political supremos, such tyrants have usually succumbed to the literate scribehood's cultural web as evidenced by the 'barbarian' invasions of the Roman and Chinese empires and to some extent by the Moslem conquest of Persia and Byzantium which generated a novel cultural epoch by throwing together the divergent scribehoods of these two long-established cultures under the unifying banner of Islam.

In the long era of scribery, all people regarding themselves as 'cultured' or 'civilised', as opposed to illiterate peasants or craftsmen, have lived within the confines of an enormous library whose volumes have laid down what was socially acceptable and, in effect, possible to know and to mean. Whilst those lying on the margins of 'civilisations' retain some subcultural independence — variously labelled as 'ignorance', 'backwardness', 'superstition', 'folklore' or 'folkculture' — they equally had no access to the pages of history, and hence whatever the significance of their cultural world, it was devalued by default. The vast growth in literacy in the last century, with its numerous undoubted social advantages, has, however, further increased the dominance of our conception and perception of the world through that which can be written down.

So here we are in a library, and I would like to convey to you what I mean. If, for a moment, we could put all these volumes of words on one side, if we could face each other across a table and engage in the immediate dialectic of facial and bodily gestures which accompany face-to-face speech communication, perhaps you could appreciate that what I intend to mean is not necessarily reducible to the apparent meanings of the words I employ during the interchange; perhaps you could reach through my words to my meanings.

Writing, originally a clever mnemonic device for recording the verbal part of important speech communications between real individuals, soon grew to such a degree as to dominate, to become normative upon, what might properly be said. Divorced from the immediate reality of face-to-face communication, it became objectified, generalised, and above all, permitted the new class of scribes (whether priests, bureaucrats or academics) to define and control what might 'objectively' be meant. Max Weber's conception of the advance of Western civilisation, spearheaded by a specialist rational bureaucracy, is a natural outgrowth of this simple development. In fact, Weber devoted a small volume to a discussion of the 'rationalisation' of musical systems embodied in the Western European tempered scale (Weber 1958).

For Plato, the *idea* of the object, which took on a new historical permanence in its notation in the written word, came to have more 'reality' than the object-as-experienced. The commonplace tables and chairs which we experience in the course of our everyday life were mere pale reflections of the ideal table and chair existing in some Platonic heaven. (This heaven in fact was to be found between the covers of books.) This radically new stance reflects a permanent tendency of scribe-dominated cultures towards the reification of ideas and the undervaluing of immediate non-verbal experience, which has special relevance to the history of music. Even for the average literate individual it might at first sight appear that what we can think is commensurate with what we can say, and hence to appear verbally confused or elliptical is easily interpreted as a failure of clear thought, rather than a difficulty of verbal formulation of a perfectly clear non-verbal idea. For example, the idea of a good 'break' in improvised musical performance is clearly understood by any practitioner but has never been adequately reduced to a verbal description.

I am going to propose that words never 'mean' anything at all. Only people 'mean' and words merely contribute towards signifying peoples' meanings. For the scribe meaning appears to result as the product of a combinatorial process; broadly speaking, various words with more or less clearly defined reference or function are strung together in a linear combination to form sentences, paragraphs, etc., which have a resultant clearly specified meaning. For the individual speaker, however, meaning is a synthetic activity. She or he *means*. Not merely the combination of words but a choice from an infinitude of possible inflections, tones of voice and accents for their delivery, together with possibilities of movement, gesture and even song, enter into the synthesis of the speech-act which attempts to convey what he or she means. In this way a speech act may uniquely convey quantities of information about the state of mind of the speaker and his relationship to what is said (for example irony and so on) which would be entirely lost if merely the words used were transcribed, but is certainly not lost on the person spoken to. It is clear that not meaning, but signification, resides in the words and that the mode and context of use of these significations all contribute towards the speaker's meaning. These two quite different conceptions of the meaning of words contribute differently to our experience. The idea of meaning as a synthetic activity is most significant in direct communications with other human beings, which might be mediated through musical instruments or recording. The idea of meaning as a structural property of written words governed by rules of combination is the basis for the operation of our system of law. Law codes are in a sense seen as existing transcendentally and having a meaning

independent of the original creators of the legal documents — though of course this does in time lead to difficulties of interpretation.

Now immediately we become aware of a problem, for all that remains of what we or anyone else ever meant, once committed to parchment or print, is these marks on the paper. Here in the library, we *see* love, tragedy, joy, despair, lying silently on the shelves, the entire history of the word. Occasionally, a gifted scholar does appear to question the very basis of a writing-dominated world-view. Lao Tse, the Chinese philosopher, resorted to extreme verbal ellipsis in a late attempt to notate his philosophical stance. At the other extreme, Marx, whose principal commitment lay outside the scholarly profession, still felt impelled to justify his world-view before the international scribehood and committed to paper the astonishing theory that the world is shaped by human *activity*, whilst talking, writing and the resulting development of ideas, constitute only one particular type of human activity, and this of secondary importance to materially productive economic activity. What had usually been regarded as history-as-such was, in his view, merely one particular reified result of human activity. The enscribed verbalisations of certain mortals with certain preconceptions, economic interests and systems of relevance.

Unfortunately, Marx's great scholarly erudition won for his radical works a more or less permanent place on the library shelves, but in so doing it delivered his work into the hands of the scribehood, who would promulgate his writings, but not very often their significance. The up-and-coming would-be radical scholar would learn about 'praxis' as a concept in 'Marxist epistemology', his understanding of alienation or class-consciousness would be understood by its verbal competence.

Music and social control

At the other extreme, we have music! Ever since the world library opened, there have been problems in this department. Somehow it seemed that music could mean something to people, judging by their reactions, but this something rarely seemed reducible to any definite verbal equivalent. Music as an alternative mode of communication, however, has always threatened the hegemony of writing and the resultant dominance of the scribehood's world-view. Therefore, from the earliest times, attempts have been made to lay down what could and could not be accepted as 'correct' musical practice. Both Plato and Confucius recognised the threat posed by uncontrolled musical experience to the 'moral fibre' of the rationalistic scribe state, and advised the exclusive adoption of forms of music which seemed to them to be orderly in some kind of verbally explicable way. As, for the moment, there

was no way of capturing music in the same way as speech — no notation procedure — it seemed safest to adhere absolutely to previous musical practice, while often ensuring that the music itself was subservient to an approved text. The codification and standardisation of church chant by Pope Gregory in post-Roman Europe may be seen as but one example of a tendency which is exemplified by the Chinese emperor's great concern for the 'correct' tuning of the imperial pitch-pipes at the beginning of his reign, the execution of performers who made mistakes during ceremonial performances in the Aztec world and in many other cultures, and so on.

With the appearance of musical notation, new factors came into play. However, a rapid glance at the syllabuses of most Western universities (centres of writing dominated culture) will reveal the tremendous emphasis placed upon the study of composers who employed a clearly, rationally codifiable (verbalisable) musical praxis, in particular the work of Palestrina (the champion of the Council of Trent), J. S. Bach and, of course, Schoenberg and his '12-tone technique'. Even so, music continued to convey its alternative messages and holy men (like St. Augustin) were obliged to admonish themselves before God for being seduced by the 'mere sensuous quality of musical sounds'. This feeling that attention to aspects of sound beyond those which are capable of description, and hence prescription, in writing (and later in musical notation), is lascivious or morally harmful is a recurring theme of scribe-dominated societies.

Committed verbalists will not be convinced by anything I have to say about the separation between 'meaning' and 'signification'. For the linguistic philosopher all problems are reducible to problems of signification within language and such a philosopher will merely deny the validity of our problem. However, if you are capable of imagining that talking to your lover is not merely an exchange of syntactically-related arbitrary signs and bodily gestures, but an essentially non-verbal communion between two people, mediated and articulated through word and gesture, but not constituted by them, then you may understand what I have to say.

Firstly, if this communion exists, surely it can be named. This is perfectly true; however, the point remains that its *articulation* is not the articulation of *signs*. We must not assume that we can notate its articulation by attaching signs to different parts of it and then articulating the signs. Written language constitutes what I will call a discrete/combinatorial system. Written words are strictly delimited, distinct and repeatable entities which form the finite elements of a combinatorial process of structure-building. Our internal 'state' (whether a 'bio-emotional state' or 'intellectual-physiological state' — but let us not be deceived by a label) constitutes a holistic/

processual system. The distinction between these two systems can be hinted at by reference to analogies. First of all we have the distinction between an analogue and a digital system. In an analogue system the state of the system can be represented by continuously varying parameters (corresponding to the holistic/processual system) whereas in the digital system the state is broken up into discrete samples which have discrete values (corresponding to a discrete/combinatorial system). Of course, with modern digital technology, the discrete states can be made so close together, particularly in terms of time that the distinction between a discrete and a holistic representation ceases to be of importance. However, on the grosser level of representation that we find in the discrete/combinatorial system of language, the distinction is absolutely crucial. A second, though more tenuous, analogy might be seen in the distinction between particulate and wave descriptions of phenomena such as the behaviour of light, though again these have a point of reconciliation in modern quantum theories.

The distinction between these two systems is perhaps one reason why our vocabulary for referring to internal states is so vague and ill-defined. Furthermore, there is an important distinction between the experience (the state) as the state of ourselves, and the mere notations of it, the arbitrary labels assigned to bits of the ongoing process; or between the most immediate reality of me, now, and the reality of socially interdefinable name-plates and syntactic laws. We may reach some agreement on how to use these name-plates, but that does not touch the heart of the matter. This problem is with us as soon as we begin to speak. But it is writing, with the consequent reification of ideas in written reportage and the scribal control of world-view that forces the problem to the centre of civilisation. Very soon we are beginning to deny the existence of any sub-label reality at all, and such things that we have called 'the emotions', or the highly articulate gestural response in improvised music which we may vaguely refer to as 'spontaneity', become as mysterious as Platonic ideals.

What the aural-tradition musician takes on faith is that music does touch the heart of the matter. With language, the actual medium may not be of special significance; it may be spoken (sound), written (visual), touched (Braille) and so forth. In a certain sense, a significant part of the message transcends the immediate concrete experience of the medium which carries it. Music, however, cannot be divorced from the medium of sound¹ and enters into our experience as part of an immediate concrete reality; it impinges on us and in so doing it effects our state. Furthermore, as Susanne

¹ Though various scribe-philosophers and aesthetes have attempted to declare that music is essentially abstract — we shall return to this point later.

Langer remarks in *Feeling and Form*, in its articulation of the time-continuum of concrete experience, it corresponds directly with the continuum of our experiencing, the continuous flux of our response-state (Langer 1953: chapter 7).

Hence, our pre-notation musician takes on faith that the way his musical articulation of sound impinges upon his own state is in many ways similar to the way it impinges upon the state of others. He seeks no verbal confirmation (except indirectly), understanding that there can be none. We might say that there is no divorce between the syntax of musical activity and the syntax of musical experience. Whatever is played is directly monitored, by the ears, by the player's immediate response to it. There is an immediate dialectic of musical action and experience by which music reaches directly to us in a way which language can never do, communicating powerful messages which are not refutable within the socially-approved categorical systems of any scribe-culture. It is music's intrinsic irrefutability, its going behind the back of language, which has caused it to be viewed with so much suspicion and disdain by guardians of socially-approved order.

Musical gesture

The essential feature of this direct musical communion is what I shall describe as *musical gesture*. In a sense it would be more logical to drop the qualifying adjective 'musical' as the concept of gesture has much more universal application both to other art-forms and to human experience in general. In Chapter 6 I will be discussing in greater detail this concept of gesture. Here I will confine myself to a few important observations. Gesture is essentially an articulation of the continuum. It is therefore of special relevance to any art-form or approach to an art-form which attempts to deal with the continuum. Conventional music theory (at least in the West) deals almost exclusively with the properties of sounds on a *lattice*. We will discuss this concept a little further on.

Secondly, musical gesture is evidenced in the internal morphology of sound-objects and also in the overall shaping of groups, phrases, etc.. In fact, the morphology of intellectual-physiological gestures (an aspect of human behaviour) may be translated directly into the morphology of sound-objects by the action of the larynx, or the musculature and an instrumental transducer. The translation of performance-gesture into the gestural-structure of the sound-object is most complete and convincing where the technology of instrument construction does not present a barrier. Thus vocal music where there is no socially-constructed mechanical intermediary — and particularly where performance practice has not become dominated by a notation-based

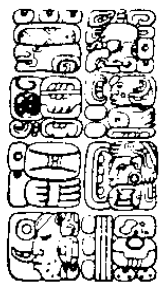
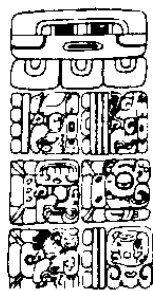
system of theory — is the most sensitive carrier of gestural information. This reaches down to the level of timbre modulation, as well as amplitude and frequency modulation (vibrato and tremolo and *articulation* of all these) and up to all higher levels of sound ordering. All wind instruments having a direct and continuous connection with the physiological breathing of the player are similarly gesturally-sensitive transducers although technology and performance practice can get in the way — compare, for example, typical contemporary performance practice on the flute and the saxophone. Bowed instruments, similarly, where sound is produced by a continuing physiological action, are also gesturally sensitive. Percussive instruments (from drums to pianos) are not gesturally sensitive at the level of the individual sound-event, except in the elementary sense that more energy in the gestural input leads to a louder sound, but gestural information may be carried by groupings of individual sound-objects.

It is this immediate dialectic, however, which is broken asunder by the advent of musical notation, causing a fundamental reorientation of musical conception and perception in the West, and rendering music susceptible to new verbal definitions and hence subjecting it to increasing interference from the 'verballigentsia'. Gestural structure is the most immediate and yet notationally the most elusive aspect of musical communication. One important feature of this book will be to suggest means whereby gestural structures may be both notated and harnessed to contrapuntal musical ends. Furthermore, in music which attempts to deal with the continuum (rather than the lattice), gestural structure becomes the primary focus of organisational effort.

Ideograms and alphabets: neumes and notes

Undoubtedly, musical notation, like 'speech-notation', originated first as a mnemonic device for already well-established musical practice, but, like writing, it quickly grew to dominate that musical practice. Just as the original form of writing, the ideogram (see Figure 2.1), did not attempt to convey the sound of words (as with alphabetic writing) but the ideas which were expressed through the word-sounds and hence demanded a familiarity with, and an adherence to, the sphere of those ideas, so the neume did not attempt to mark out what we have now come to regard as individual pitches and units of rhythm but only shapes and contours of melodic line customary in current practice, and hence also requiring a complete familiarity with that practice, and an adherence to it, before becoming usable.² In this way these

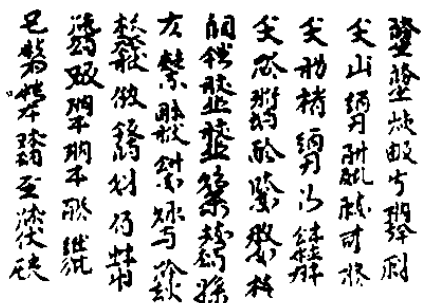
² An interesting example of this is to be found in the neumatic notation of Tibetan chant (see Kaufmann 1967), in which a single curvilinear neume might indicate changes in pitch, duration and timbre. See Figure 2.2a.



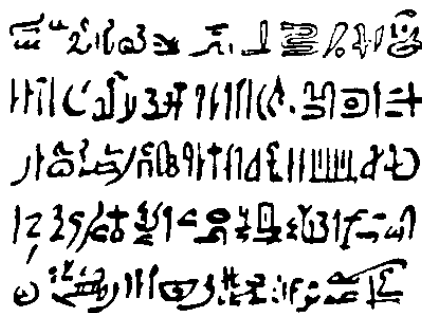
Mayan hieroglyphs



Ancient Egyptian hieroglyphs



Xituan characters from 16 China



Ancient Egyptian Hieratic (cursive hieroglyphs)

Isograms

א	ל
ב ב	מ מ
ג ג	נ נ
ד ד	ו ו
ה ה	ז ז
ו ו	ח ח
ז ז	ט ט
ח ח	י י
ט ט	כ כ
י י	ל ל
כ כ	מ מ
ל ל	נ נ

Hebrew syllabary: there are no vowels

ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ
a	i	u	e	o	ka	ki	ku	ke	ko
サ	シ	ス	セ	ソ	タ	チ	ツ	テ	ト
sa	shi	su	se	so	ta	chi	tsu	te	to
ナ	ニ	ヌ	ネ	ノ	ハ	ヒ	フ	ヘ	ホ
na	ni	nu	ne	no	ha	hi	fu	he	ho
マ	ミ	ム	メ	モ	ヤ	イ	ユ	エ	ヨ
ma	mi	mu	me	mo	ya	i	yu	e	yo
ラ	リ	ル	レ	ロ	ワ	キ	ウ	エ	ラ
ra	ri	ru	re	ro	wa	i	u	e	o
ガ	ギ	グ	ゲ	ゴ	ザ	ジ	ズ	ゼ	ゾ
ga	gi	gu	ge	go	za	ji	zu	ze	zo
ダ	ヂ	ヅ	デ	ド	バ	ビ	ブ	ベ	ボ
da	ji	zu	de	do	ba	bi	bu	be	bo
パ	ピ	プ	ペ	ポ	ヴ	ン			
pa	pi	pu	pe	po	vu	n			

Japanese Katakana script

Syllabaries

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z

А	Б	В	Г	Д	Е	Ё	Ж	З	И	Й	К	Л	М	Н	О	П	Р	С	Т	У	Ф	Х	Ц	Ч	Ш	Щ	Ъ	Ы	Ь	Э	Ю	Я
а	б	в	г	д	е	ё	ж	з	и	й	к	л	м	н	о	п	р	с	т	у	ф	х	ц	ч	ш	щ	ъ	ы	ь	э	ю	я

Alphabets

Figure 2.1 Forms of script.

first notation procedures tended to stabilise, if not to atrophy, the pre-existing ideological and musical praxes. A more significant breakthrough occurs with the emergence of analytic notation systems (see Figures 2.2b and 2.2c). Here the verbal or musical praxis is analysed into constituent elements which are notated, and the notations combined to form the meaningful or characteristic units of verbal or musical praxis. In terms of language, the earliest examples were afforded by the syllabary, as in Hebrew, where constituent, but meaningless, syllables are assigned separate written signs, and these strung together to form the combined sounds of meaningful words and utterances. However, the most significant form of analytic notation for language was the alphabet, probably invented in the Middle East but taken up by the Greeks as the foundation of the first literate, critical culture.³ The alphabet takes the principle of the syllabary one stage further, notating the (idealised) sound-constituents of the syllables themselves, and in so doing achieving such a considerable economy of means — for example 26 letters in the English version of the Roman alphabet as compared to tens of thousands of Chinese ideograms — that universal literacy became a practical possibility for the first time (see Figure 2.1).

Particularly in relation to the further development of ideas in this book, it is important to bear in mind that even in almost entirely phonetic languages, like Finnish, there is not a one-to-one correspondence between the spoken sound-object and the notation of it. The distinction we have made earlier between the sequence of combinatorial sound-units in speech and the use of inflection, tone of voice, etc. in the conveying of meaning is only one level at which this comment is true. This distinction has been raised as an issue within the sphere of linguistics. The original theorists of language seem to have been committed to the discrete/ combinatorial view of the subject, but the conflict between 'discreteness' and 'gradiance' is now an issue. At a deeper level, computer analyses of the sounds of speech show that the individual sound constituents (phonemes) are not spliced onto each other in a way one might achieve in an editing studio but in most cases elide into one another very rapidly in the course of the speech-act. Even more fundamental, as will be discussed later, many consonants are characterised by their morphology — the way in which they change form — rather than by their spectrum (their particular frequency or formant characteristics). All this relates very strongly to what I shall be saying about the architecture of music.

The ideogram-writer had attempted to write down what was meant by the speaker in terms of the ideograms which were notations of

³ A fuller discussion of these issues is to be found in Goody and Watt (1963).

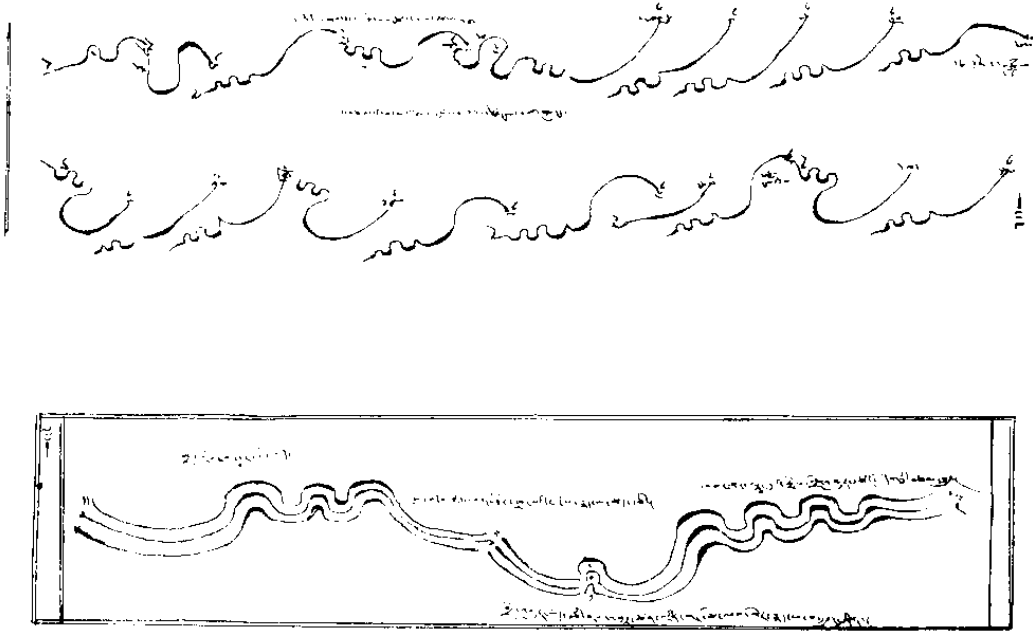


Figure 2.2a Tibetan neumes.

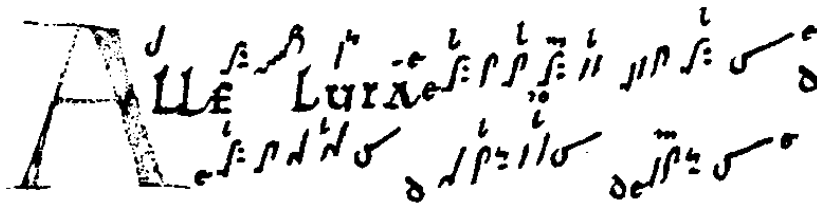


Figure 2.2b 10th century European neumes.



Figure 2.2c Modern European analytic notation.

conventionalised and traditional ideas; by the intrinsic nature of the system, novel ideas were extremely unlikely to be recorded, even if they did arise in speech-discourse. With the alphabet, however, the notation of the constituent *sounds* of language made possible the recording of what was actually *said* and hence made possible the recording of conflicting statements and the emergence of the critical tradition (see Goody and Watt 1963). Whilst this freed language from the domination of the tradition-bound ideas of a tiny elite of priest-scribes, it vastly expanded the spread and domination of writing as a vehicle for mediating and explaining human experience, and hence led to the devaluation by default of all non-verbal modes of action and communication and all non-notatable aspects of discourse — the ultimate triumph of a newly-expanded secular scribeshood.

The effect of analytic notation of music in the context of a writing-dominated world was much more fundamental. Arising only in Western Europe, it developed considerably later than alphabetic writing. The fundamental thesis of this system is that music is ultimately reducible to a small, finite number of elementary constituents with a finite number of 'parameters', out of which all sounds possibly required in musical praxis can be notated by combination. *It must be noted from the outset that this finitistic thesis is a requirement of notation rather than fundamentally necessary to conceivable musics.* For a notation procedure to be of any use it must use only a manageable (small) number of constituents which are then permuted; notation of the continuum is necessarily approximate. This is the same problem we have met with verbal categorisation of the internal experiential state (and also in the discreteness/gradience issue) and is very important in relation to my discussion of gesture.

The two features of sound used in tenth century Western musical practice which appeared most accessible to analytic musical notation were pitch-level and rhythm. Timbre was not tackled in this way, up until the twentieth century being limited by the available instrument technology; the continuum of possible dynamic levels has never been remotely accurately categorised, despite attempts to give it a notational rationale in some integral serial composition; while dynamic balance — remaining largely a matter of unspoken convention — and acoustics — usually the accident of performance location — have only come under accurate control with the advent of electronic sound-recording techniques.

However, even pitch and rhythm could only be captured in a very particular way, determined by the exigencies of analytic notation itself. Thus, whereas aural rhythm takes place against the silent backdrop of somatic rhythm, enabling the aural musician to indulge in the most intricate articulations of time, notated rhythm is limited by the problem of

notational economy. We can divide time infinitely and in performance can judge directly the effectiveness of the most subtle placements of sounds. But analytic notation is a finitistic procedure. We must be able to count the divisions in order to write them down — but not necessarily in order to judge aurally what is effective. Hence, analytically notated music is bound within the limitations of summative rhythm (see Figure 2.3).

Similarly, discrete fixed pitches are idealisations of acoustic reality. In practice there are only sounds in their infinite variety of possible frequency, spectrum, timbre, dynamic-envelope, and change (dynamic morphology) and combinations of all these. Consider the irreducible infinitude of tones of voice. But the infinite is not simply notatable. What notation demands is a finite set of pitch-levels which we can permute and combine. The refinement of instrument technology attempts to impose this discrete permutational rationality upon the very production of sounds, and our ears learn to approximate our acoustic experience to the discrete steps of our imposed logic.

Lattice and continuum; on instrumental streaming

We are now in a position to describe the concept of a *lattice* and its bearing on conventional music theory. For anyone who has ever heard a pitch portamento or a tempo accelerando, both pitch and tempo can take on an infinitude of possible values and may vary continuously over this continuum. Notation, however, imposes a finite state logic upon the two domains. The result is that music, at least as seen in the score, appears to take place on a two-dimensional lattice (see Figure 2.4a). Two things should be said about this lattice formulation. First of all it is our conception of what constitutes a valid musical object which forces 'musical sounds' onto this lattice; secondly, despite our intentions, the lattice only remains an approximate representation of what takes place in actual sound experience (except in the extremely controlled conditions of a synthesis studio).

The technology of instrument design underlines and reinforces this lattice conception of musical architecture. First of all, on keyed, holed or fretted instruments, the discrete logic of the pitch lattice is imposed on the production mechanism of sound-objects. Secondly, the concept of the instrument itself further expands the lattice notion. Conceptually, at least, an instrument is a source of stable timbre, but variable pitch. The essential function of an instrument is to hold timbre stable and to articulate the pitch parameter. This conception contributes to the myth of the primacy of pitch (and duration) in musical architecture. The grouping of instruments into families of distinct timbral type and the development of music based upon

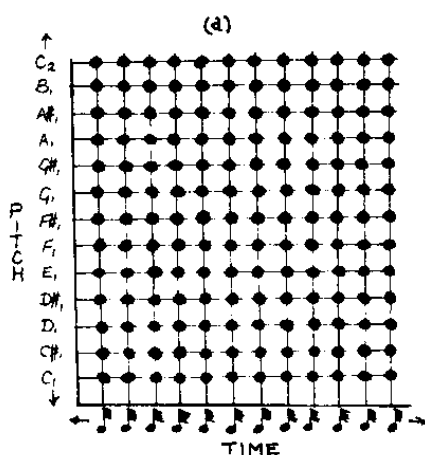


Figure 2.4a Music on a two-dimensional lattice (schematic representation).

fixed-timbre (or instrumental) streaming develops the lattice one stage further.

Hence music can now be viewed as taking place on a three-dimensional lattice (Figures 2.4b–2.4d). The three dimensions being made up of discrete pitch-levels, discrete durational values, and discrete timbral objects (or instrumental types). In fact, the concept of the instrumental stream is perhaps the most persistent in conventional musical thought — the lattice of both pitch and duration have been challenged by composers working within conventional notation. Even in the classical voltage control studio it was possible to conceive of a musical composition in which a single sound stream evolved, possibly diverged into separate streams which might be separately articulated, might reconverge and continue thus to the end of the piece (see Figure 2.5). The evolving streams within such a piece might be continually changing their timbral characteristics, even though they were continuously connected to the opening event (i.e. the piece need only have one attack — at its opening — and therefore in the conventional musical sense contain only one ‘note’). The conception of music as consisting of fixed-pitch, fixed-timbre entities called ‘notes’ is extremely persistent.⁴ It even imposes conceptual limitations upon the design of digital musical instruments (where such traditional conceptions are no longer necessary). Computer music machines such as the Fairlight and Synclavier with their keyboard input and instrument definition, and even the more general Music 11 program, carry with them into the digital

⁴ See the quote from Lejaren Hiller in Chapter 1 (Hiller 1981: 7).

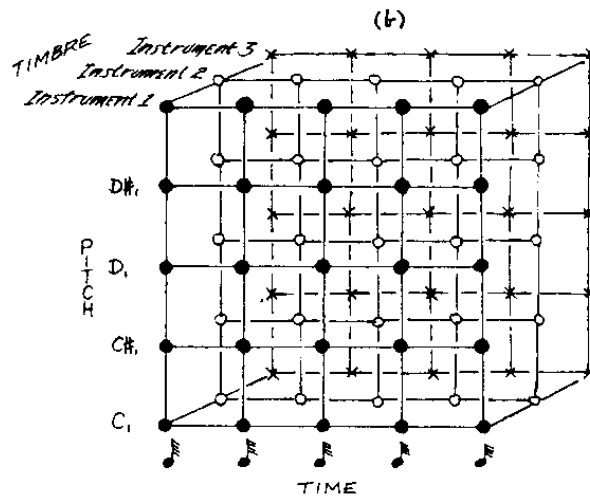


Figure 2.4b Music on a three-dimensional lattice (schematic representation).

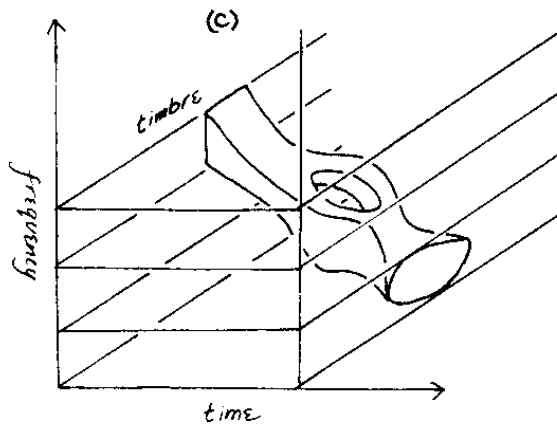


Figure 2.4c A complex sound-object moving in the continuum (schematic representation).

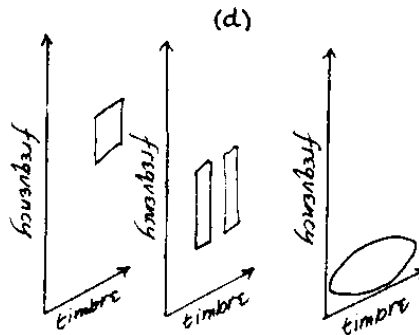


Figure 2.4d Frequency/timbre cross-section of sound at start, mid-point and end.

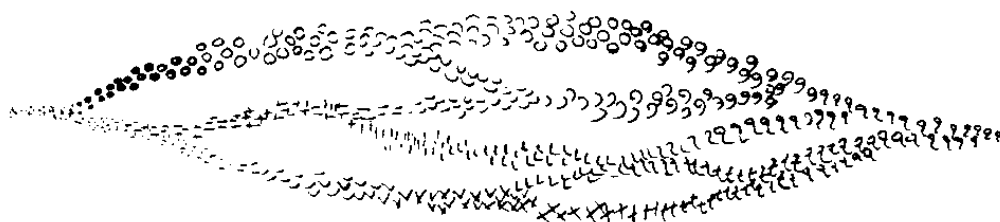


Figure 2.5 Evolving timbre-stream composition (schematic representation).

world the concept of instrumental streaming from conventional musical practice.⁵ It is of course possible to subvert the various systems but it is a struggle against the design concepts of the instrument or software.

We can, however, perceive important distinctions within lattice-based musical conventions. The major distinction — though this is usually a matter of degree — is between music ‘hung around’ a lattice and music developed ‘on’ the lattice. Examples 2.1, 2.2, 2.3 and 2.4 illustrate Japanese *yoruri* singing (*gidayu* style used as part of the *bunraku* (puppet) and *kabuki* theatres), North Indian singing, jazz singing and part of a Haydn mass. In certain musical cultures, the pitch lattice (which might also be referred to as a *harmonic field* so long as we do not connect this with Western harmonic thinking) may be regarded as a framework around which the music takes place, thus in the example of *yoruri* singing, the pitch set (or rather the pitches which can be identified as being on a lattice) is fairly limited and does not change its general character. However, the focus of attention of the performer (and of the listener) is heavily weighted towards aspects of the sound articulation which cannot be related directly to the lattice. Thus there is a complex articulation of portamento structures leading onto or away from the lattice pitches, the control of articulation of vibrato (frequency modulation) — in Western art music vibrato is usually a relatively constant parameter of a particular type of vocal production rather than a parameter which one articulates through time — and focusing on the evolution of timbre within individual events (particularly the development of sub-harmonic colouration). These aspects of musical articulation are carried over into the more speech-like sections of *gidayu* style presentation. An attempt to capture the essence of this music in conventional Western notation would clearly fail miserably.

In North Indian music concepts of pitch (or more precisely pitch on lattices), as opposed to the kind of subtle portamento articulation found in

⁵ This situation has only partly been alleviated in the years since this was written and was certainly reinforced by the Midi protocol, relatively new at the time of writing (*Ed.*).

the Japanese example, are more highly developed, although musical development still takes place over a fixed pitch-set (harmonic field). Even here, however, we find the use of subtle sliding inflections onto and away from the lattice pitches and the internal articulation of the sound-objects which make up the ululation-based runs. Again, these cannot be approximated by conventional Western notation procedures but are clearly a fundamental aspect of the musical structure. Jazz is clearly much more strongly influenced by the lattice-based approach of Western harmony. Yet typical jazz vocal and wind instrument production is very heavily concerned with the internal articulation of sound-objects including sliding ornamentations and careful control of vibrato and other timbral modulations of the sound. All these features can now be clearly described — they are not mysterious in any way — but again would be lost in conventional Western notation.

Finally, the example from Haydn illustrates what happens to vocal production when musical conception is focused upon the lattice itself. Vocal production becomes conventionalised and aims at an idealised type of production focusing on the lattice pitches. Idiosyncratic developments of timbral and pitch articulation, which serve to identify and project particular jazz singers, for example, are to be rejected in favour of a universally stereotyped *bel canto* production. Vibrato is no longer a parameter for musical articulation but a relatively fixed feature of the required sonority. The latter example typifies music developed on a lattice where development of the parameters of the lattice itself dominate all other types of musical articulation. If we now turn to the instrumental Examples 2.5, 2.6 and 2.7 which are of Japanese shakuhachi playing, a classical chamber work (using wind instruments) and a piece of jazz, we will hear a similar development in the use of wind instruments. In fact, it is the combination of a conception of music focusing on the parameters of the lattice and the developing technology of instrument design going along with this developing conception which leads us away from the multi-dimensionally rich articulation of the shakuhachi towards the timbral uniformity of the present-day Western keyed flute.⁶ Despite these developments, however, articulation of the continuum is still present in performance practice. As we have discussed earlier, the articulation of the continuum in intellectual-physiological gesture is transferred directly to the sound-object by the player of a wind instrument. Even in the most rationally developed notated scores,

⁶ Contemporary instrumental composers have, of course, sought to counteract the stranglehold of technological rationalisation by exploring non-conventional modes of sound production on the Western instrument (flutter-tonguing, key-slapping, whistle-tones etc.).

aspects of performance gesture, often loosely referred to under the term 'interpretation', still have an important bearing on our musical experience. In certain types of music, articulation of the continuum plays a much more significant role as can be discerned by comparing the typical use of the trombone, trumpet and particularly the saxophone in jazz with the typical use of the keyed flute in classical Western music.

In this continuing technological development, the voice and the keyboard may be seen as occupying the two opposite ends of the musical spectrum. Voice, the immediate source of intellectual-physiological gesture, will be seen as an important focal model for music throughout this book. The keyboard on the other hand represents the ultimate rationalisation of a lattice-based view of music. Timbre is fixed; pitches are incapable of any sort of inflection, physiology is only allowed one single point of contact with the sound-object, at the initiation of the note, and thereafter can have no impact on the internal morphology of the sound. This distance can perhaps best be appreciated by comparing the ululated trill articulation of the North Indian vocal music example with the typical trills and turns on a keyboard instrument. Vocal articulations such as trills and turns are semi-unified objects, the apparent pitch-elements of which are bonded by subtle internal portamenti and timbre transitions. On the keyboard instrument the individual notes of the trill or turn are as close as we can possibly approximate to the individual notes on the page. It is interesting and ironic in this respect that the computer, in some senses the ultimately definable and controllable musical instrument, has for the first time begun to reveal to us the subtle inner architecture — the continuum architecture — of sounds.

It is very important to understand that the lattice is a conceptual construct. It is we who have decided to construct our musical architecture on the lattice. Because we do, however, it is very easy to fall into the mental trap of observing the world of sounds as if it divided up neatly on a three-dimensional lattice. Thus for anyone with a conventional musical training — and particularly for those with no studio experience — sound-objects appear to be divisible into three distinct categories of pitch, duration and timbre. This is of course true of most sound-objects appearing in conventional music — they have been constructed on the lattice and are therefore divisible in terms of that lattice. In fact as we proceed we shall see how the conventional (Helmholtzian) view of acoustics tends to fall into the same trap. At this stage we will merely note that lattice notation encourages the following connections:

- (1) instrumental streaming leads us to suppose that timbre is a simple category like frequency;

- (2) focus on pitch leads us to suppose that pitch itself is a simple category (though it is in fact simpler than timbre);
- (3) viewing duration through lattice notation leads some members of the musical community to view Dave Brubeck's excursion into 5/4 metre as a major breakthrough in jazz rhythm (rather than the minor excursion on the lattice which it is), while entirely overlooking the highly articulate development of phrase-structures against the lattice (Charlie Parker) or placement of individual events or groups against the lattice (the essence of 'swing').

Even where it is clear that the lattice is only an approximation to musical reality, notation focuses our attention on the lattice. In the long run, all 'respectable' theory is based on the lattice (see below).

Pitch versus timbre: primary and secondary qualities

In the West, the rationalisation of music on a lattice is taken to its extreme. First from the infinitude of possible pitch levels which could give rise to numerous subtly different musical scales, such as the scales of the ragas of Indian music and probably those of Western medieval pre-notation chant — though this we will never know — a small set of twelve clearly specified pitch-levels is gradually selected. Then partly through the tendency — intrinsic in the notation system and its realisation in the technology of instrument (especially keyboard instrument) design — towards a rational simplicity, a notational economy, the well-tempered scale arrives, permitting a considerable opening up of the field of harmonic inter-relations among a limited set of fixed pitches as Bach and composers through Wagner and Schoenberg were to demonstrate.⁷

In similar ways to alphabetic writing, analytic notation is in many ways a liberating invention. It frees composers from the established norms of a musical tradition and permits him or her to explore new and unheard possibilities. At the same time it is this very malleability of the *notatable*

⁷ Bach's Art of Fugue, arguably one of the finest achievements of the traditional art music of Europe, illustrates our thesis in an interesting way. Bach confines himself to the notation of pitch and 'summative' rhythm, leaving unspecified dynamics and even timbre (instrumentation), both of which are usually notated (or at least indicated in the score). Although this approach may appear to approximate very closely to the 'abstract' view of music, we would argue that the work is, however, not an illustration of 'rational formalism' as discussed below, as the score notates sets of relations between sound-qualities which are experientially valid (see text), even if the range of possibilities is necessarily restricted by the nature of the notation system itself.

parameters which enables and encourages the one-sided, two-dimensional expansion of musical possibilities. This eventually leads to Boulez's theoretical distinction between primary and secondary qualities in music.⁸ The primary qualities are those which have been accurately notated — in a certain limited sense — the secondary qualities those which have not.

There is a striking parallel here with the distinction made by Descartes between primary and secondary qualities of perceived natural phenomena. For Descartes, a phenomenon such as motion which could be given a direct quantitative mathematical description was regarded as primary, whereas qualitative phenomena such as colour were seen as secondary qualities and ultimately reducible to descriptions in terms of primary qualities. Exact mathematical representation, at least in theory, here plays the same role as accurate score-notation plays in Boulezian music theory. An interesting sidelight on this parallel is thrown up by the recent development of 'catastrophe theory' which will be discussed more fully below. Very briefly, physicists have tended to confine themselves to a study of equilibrium situations where in most cases precise quantitative mathematical formulation of the problem is possible. Note that most musical objects may be considered as examples of stable equilibria (for example after the initiation of a flute tone, a stable resonance is set up within the body of the instrument which constitutes the sound-object which we hear). Recently, however, attention has been focused on the study of more complex regimes whose stability may vary along with small changes in the parameters which define the situation. The study of such situations has established the first essentially qualitative branch of mathematics — differential topology. This branch of mathematics may give us some insight into the structure of the continuum and therefore has a bearing on the study of sound-objects in the continuum that we are pursuing in this book. In a similar way, the Helmholtzian theory of timbre may be seen as an attempt to reduce the qualitative (timbre) to the quantitative (frequency) which has in fact proved untenable (see Helmholtz (1954 originally 1877)).

In its constant search for new modes of expression, the Western classical music tradition was, however, constrained by its very concentration upon relationships of a limited set of thus notatable 'pitches' to extend the notatable field of harmonic relationships to the limit. The final step into a twelve-tone and thence 'integral' serial technique, rather than being a liberation from this restricted-set tonality, should be seen in historical perspective as the final capitulation to the finitistic permutational dictates of

⁸ See the quotation in Chapter 1 (Boulez 1971: 37).

a rationalised analytic notation system. Within this same tradition, however, composers have made attempts to abandon the lattice-dominated aesthetic.

Consider now Examples 2.8, 2.9, 2.10 and 2.11. In Example 2.8, from the Webern *Symphonie*, we hear the apotheosis of the rational extrapolation of lattice aesthetics. In Example 2.9, from Penderecki's *Polymorphia*, we have a fairly typical example of this composer's approach to composing music which no longer conforms to the traditional lattice. In particular, he uses thick groupings of pitches only a quarter-tone apart (thus destroying the twelve-note chromatic lattice) and also textural aggregates of sounds with no, or ambiguous, pitch content. The sonorities are very striking, but the overall architecture does not seem so strong. The music seems to develop monophonically and tends to fall into long blocks of a particular sonority. We can say that the composer has broken free quite successfully from the domination of the lattice but as yet no strong and sufficiently articulate means of organising the new material has emerged.

In Example 2.10, from the end of Xenakis' *Pithoprakta*, we have a more interesting example of non-lattice-based musical organisation. The written score for this piece is superficially impenetrable, but if we sketch out the various notated pitch glissandi on a sheet of graph paper in which pitch and time form the axes the architecture of this particular section is quickly revealed (see Figure 2.6). Xenakis has grouped individual short glissandi on the string instruments into larger arching glissandi (glissandi of glissandi!).⁹ At the same time the sounds are grouped into three contrasting string sonorities and the three resulting timbre streams arch up and down independently. In this way a pitch-based counterpoint of timbre streams is created which in no sense depends on the typical pitch lattice of conventional music. At the end of the section, as will be seen clearly from the figure, the glissandi of glissandi thicken out and unfold into a sustained chord, a wonderful process of pitched evolution which has no real parallel in typical lattice aesthetics. Although the processes of musical organisation here seem more articulate and evolved than in the Penderecki example, they have what Pierre Schaeffer has described as an architectural feel, that is to say that the gestural unfolding of events is quite slow and controlled. There is as yet not a moment-to-moment feeling for the gestural development of musical form. This is partly due to the essentially cumbersome nature of the orchestra when it comes to attempting to define non-lattice structures. Inevitably such structures must be constructed from individual elements which are notated on the lattice or in relation to the lattice and it becomes difficult to notate a

⁹ Figure 2.6 is from Trevor Wishart's PhD Thesis (University of York, UK 1973).

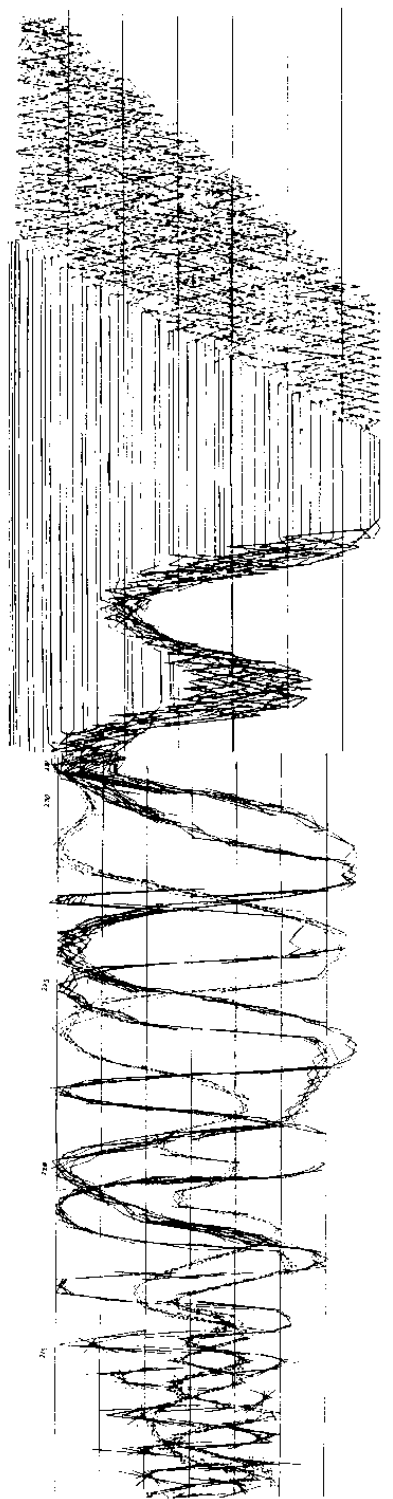


Figure 2.6 Glissandi of glissandi in Iannis Xenakis's *Pittoprakta*.

rapidly evolving event. Such events with rapidly involving internal morphologies are much more easily accessible in the electro-acoustic studio and it is here where the problem of their organisation begins to confront traditional musical aesthetics.

Then finally in this group, Example 2.11, from Stockhausen's *Carré*, illustrates yet another attempt to deal with the internal morphology of sound-objects. Stockhausen's piece is largely concerned with relatively sustained events in which there is internal motion, for example the slow glissandoing of trombones and voices in the opening moments. The larger-scale relationship between these individually articulated 'moments' is still governed by serial permutational criteria which, in my view, are an outgrowth of lattice-oriented thinking, and not on a gestural interaction between the individual sound-events which would generate a truly dynamic non-lattice-based musical form.

It is interesting in this respect that a composer like Boulez, who seems so adamantly committed to a lattice-based view of musical aesthetics produces music which is, from the listener's point of view, much more clearly gesturally articulate. In Example 2.12 we may consider a section from *Don* (from *Pli selon Pli*). The pitch and durational characteristics of this section are no doubt exceedingly carefully worked out, but in practice what one hears is its gestural structure. The music is dominated by sustained but hovering — and by implication pregnant — events. The initial loud attack and the mode of sustainment suggest that the events will burst forth into something else. This feeling is underlined both by the fact that separate events enter on different, though related, harmonic fields and particularly by the brass event, which, after its initial attack, begins to die away and then crescendos. This emergence verifies the pregnancy of the other (sustained) gestures. I will not attempt to give a more detailed gestural analysis of this particular passage here, but even this much serves to underline the significance of musical gesture, even where a lattice-based aesthetic appears to dominate through the score.

Musical values distorted; the emergence of formalism

As we have mentioned previously analytic notation is in many ways a liberating phenomenon; it permits us to explore new possibilities for musical expression. Using it we may, but need not, discover new modes of musical experience. However, this begs the central question of what defines a musical experience and this very concept has been fundamentally twisted by the impact of musical notation itself, gradually forcing music to kow-tow to the verbally definable. In fact, with the increasing domination of

notation, there has been a move towards Platonic idealism in our conception of what music is. In the most extreme cases, music is viewed as an essentially abstract phenomenon and the sound experience of essentially secondary importance. More commonly the score is seen as normative on the musical experience.

The split in conception between what are seen as primary and secondary aspects of musical organisation leads to a split between composer and performer, between composition and interpretation and the gradual devaluation of non-notatable formations. This development leads directly to the attitudes expressed by Boulez and to the intellectual devaluation of forms of music (such as jazz improvisation) where non-notatable aspects of musical form have greater importance than in conventional classical music. At the same time, the spatialisation of the time-experience which takes place when musical time is transferred to the flat surface of the score leads to the emergence of musical formalism and to a kind of musical composition which is entirely divorced from any relationship to intuitive gestural experience.

What takes place is not merely a focusing of our *perception* upon the notatable and the consequent feedback upon our musical praxis, but a reorientation of our conception of music. Whereas previously verbal discourse had little of permanence to grasp onto in music except the very continuity and unity of established practice, which it could reinforce and stabilise by verbal decree, now musical process appeared to reveal itself concretely in the form of musical scores. A fleeting succession of musical experiences in time appeared to be captured in a continuously present spatial representation which could be studied at any time, at any speed and in any order. Just as the immediate dialectic of speech had been fundamentally subverted and devalued by the permanent monologues of the written word, so an intuitive and unverbalisable knowledge of music as an immediate dialectic of musical action and the fleeting, inscrutable musical experience was to be fundamentally challenged by the permanence and scrutability of the score. Permanently available and amenable to rationalistic verbal explication the score rapidly usurps the sound experience of music as the focus of verbal attention and becomes the keystone of an eminently verbalisable conception of what 'music' is.

The most obvious consequence of the discovery of analytic notation is the emergence of the *composer*, who is able to challenge and expand existing musical praxis through creating notations of novel musical activities, his original scores. The novel split which gradually emerges between composer and performer, between a score and its 'interpretation' is the concrete realisation in music praxis of the perceptual focusing upon notatable 'parameters'.

Interpretation, still a semi-intuitive discipline, remains of great importance in the education of the musical performer, who remains somewhat outside the sphere of intellectual respectability. For the music scholar, however, raised in primarily verbally-based institutions, especially the new European 'university', the focus of attention is on that musical syntax which can be discovered *in the score*. At the same time, the composer, whose musical tools are the notations at his disposal, will clearly tend to develop a musical syntax based on the organisation of these notatables. Hence, whilst ever the musical scholar concerns himself with notation-composed works, there will be a congruence of attention upon analytically notatable syntax, as scholar and composer have the same vested interest in notatability. The concatenation of scribal domination, compositional necessity and the limitations of analytic notation, however, elevate the organisation of a certain limited range of musical variables to the status of 'music' as such and leads to an inevitable clash of values when the classically trained musician comes into contact with music from an alien tradition.

We have already listened to and discussed music from the Japanese *yoruri* tradition and from jazz, musics which to some extent develop their form outside the notatable lattice. A more radical example of such a music can be found in *free improvisation*. In Example 2.13 (free improvisation) we are faced with a musical experience where reference to the notational lattice is completely useless. The reaction of classically trained musicians to free improvisation, often on the basis of limited experience, can be quite negative. In fact the lack of explicit criteria in the field of free improvisation does lend itself to exploitation by mediocre performers. 'Spontaneity' is taken by some to mean self-indulgence, arbitrariness or whimsicality and in a typical bad performance, the participants ignore each other for most of the time, except at points where they all get louder and then (hopefully) all get quieter again. In a performance, however, where the participants have absorbed themselves in the technique of this kind of improvisation and freed themselves from conventional response and musical clichés, what we hear is a rapid and highly articulate gestural interaction between the performers. The ebb and flow of musical tension can be exceedingly rapid and the music highly articulate in its impact. Because of its essentially highly gestural basis, free improvisation need not confine itself to the use of conventional sound sources. Any sound-producing object may be turned to musical advantage¹⁰ — an interesting parallel with *musique concrète*. The use

¹⁰ Such as paper bags, soft trumpets (Martin Mayes, Trevor Wishart), amplified springs (Hugh Davies), or long pieces of elastic (Paul Burwell) (see discography).

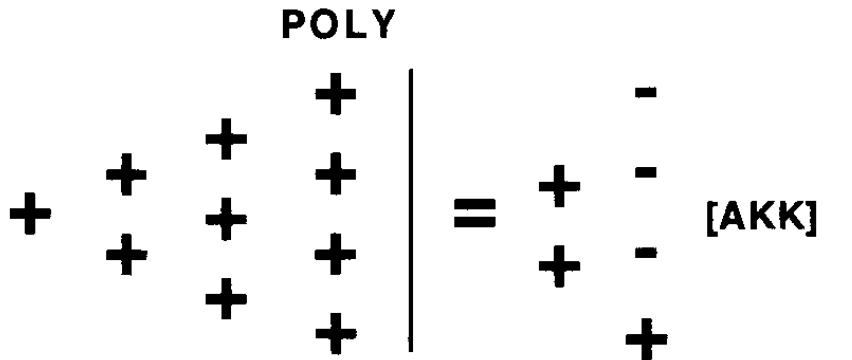


Figure 2.7 An example of 'plus/minus' notation (after Stockhausen).

of simple and non-prestructured sound-sources allows, in fact demands, strong gestural input from the performer. Experience from the free-improvisation forum can be extended into the electro-acoustic studio, as is shown by Example 2.14 from my own *Anna's Magic Garden* where the use of sounds of a piece of elastic is extended by simple *musique concrète* techniques.

Free improvisers in general make no attempt to notate the gestural structures and interactions which underlie their musical activity. Stockhausen, during his short digression into the sphere of improvised music, did attempt to develop some kind of simple notation to give form to otherwise freely-improvised music pieces. The '+/-' notation of this period (see Figure 2.7)¹¹ is an interesting early attempt to impose some sort of compositional rationale upon this basically intuitive discipline. Its simplicity and rationality meant, however, that not very much of what actually happens in the musical unfolding is really captured in the score and in some ways it seems to function more as an enabling device for permutational procedures to be imposed at least on the notations if not on the actual musical experience!

I shall have much to say about the sphere of electro-acoustic music elsewhere in this book, but in this particular context it is interesting to note the relative failure of electro-acoustic music to achieve academic respectability. This can to some extent be put down to the fact that no adequate notation exists for it — in fact many composers have actively avoided developing notational parallels to their musical events. But scholars like to see the music! The arrival of vast reams of computer print-out will

¹¹ For an explanation of Stockhausen's '+/-' notation system and some examples of its application see the introduction to the score of *Spiral* (Universal Edition).

no doubt put an end to this lacuna. Even the skills of the professional mixing engineer in achieving balance and artificial acoustic in the typical rock recording would not normally be considered 'musical' by the traditionally trained musical scholar, though composers who have worked in the electro-acoustic studio have come to see this rather differently.

A further, somewhat negative effect of the focus on lattice aesthetics is the destruction of the lively non-lattice aspects of various folk music cultures by concerned composers anxious to preserve these traditions in conventionally scored arrangements. In the extreme case, the combination of pitch, rhythm and timbre inflection in jazz and rock music is seen as lascivious, sexually suggestive and ultimately a threat to social order. As we can now see, this is more than a mere rejection of that which falls outside the clearly-definable limits of a long-established notation (perception and conception) procedure with its verbal-explicability and hence its social controllability. In a narrow sense, this attitude is correct, for musical experience, even where apparently constrained by clearly explicable notation-based procedures, is ultimately irreducible to verbalisations and hence beyond any direct social control.

The most radical impact of analytic notation on musical praxis is to transfer the musical structure out of the uni-directional continuum of experiential time, in which the musical dialectic takes place and in which musical gestures unfold, into the spatialised, perfectly reversible (Newtonian) time of the printed page.¹² In sound, the musical experience begins at the beginning and must be taken in the irreversible order and at the rate at which it comes to the listener. Furthermore, our experience of what arrives later is modified by our (perhaps inaccurate) memories of what has passed and, in this sense, there can never be a clear-cut 'recapitulation'; everything is modified by the context of what went before. In the score, however, the whole span of the music appears to exist in a timeless, spatialised, present. We may peruse its contents at any rate, in any order. In this way we may be able to see relationships, for example of recapitulation, which, however, after repeated and thorough aural experience of the music as sound we may never be able to hear. Can we thus treat such a recapitulation as an element of *musical structure*? This, of course, begs the central question of what constitutes music, what we experience in the sounds, or what we might theoretically appreciate of the score through the sounds, if our aural selectivity were more finely developed.

¹² I am indebted to Jan Steele for the following line of argument concerning the problem of musical retrogrades.

The best example of the split between a view of music based in uni-directional experiential time, and one based on spatial reversibility of time as represented in the score, is found in the concept of the *retrograde* as found in serial music, and also in some medieval and renaissance polyphony. Here the notational view is that by reversing the order of a group of notatable pitches we arrive at a pitch-set which is merely a derived form of the original. In the immediately present and spatially reversible time of the printed page the relationship of the two sets may be abundantly visually clear, but in the uni-directional and memory-dependent time of musical experience, considerable aural retentivity and the performance of a rapid feat of mental inversion is necessary to grasp this relationship. This may be a simple matter if the sequence of pitches is quite short or very fast. It is also true that if we conceive of the pitch set as a harmonic field the relationship between the two sets may be easier to grasp. With long and complex structures, however, the difference in perception between the sound experience in time and the visual scanning of the score is extremely marked. When we consider extended use of retrograde or cancrizans form, such as the perfect arch-form of *Der Mondfleck* from Schoenberg's *Pierrot Lunaire*, where the entire movement runs in reverse order of pitches and durations from the centre point — except, to complicate matters, the voice and piano, the latter having an elaborate fugato at the same time! — we must declare that experiential structure has been sacrificed to notational 'conceptual art'. The retrograde of a 'duration series' as used in 'integral serial' composition, is even more experientially problematic. All this then begs the question. What *is* music? The time-based experience in sound? Or an essentially abstract entity existing outside time, a Platonic conception of music?

Thus, just as the permanence of the written word 'table' appeared to Plato to project something more permanent and more 'real' than the many experienced tables of a concrete reality, so, to the Western musical scholar, musical notation can appear to project something more permanent and more 'real' than the direct, but fleeting, experiences of the sound of a musical performance. Music may hence be regarded as a phenomenon which transcends immediate sense-experience. With the accompanying dominance of composed music, 'music' and its 'interpretation' can hence be distinguished from one another and notatable syntax, discussible in a verbal space divorced from direct sense-experience, elevated to the position of *musical syntax* itself.

Schoenberg, the originator of the serial method, was clearly not unaware of the notational ideal/experiential dichotomy we have discussed. In actual practice the 'harmonic style' of his later serial works is not greatly

dissimilar to that of his pre-serial 'expressionist' works, where the harmonic tensions characteristic of tonal music can still be felt even though traditional tonal progressions have disappeared. Having abandoned tonality as a basis it would seem that Schoenberg still felt the need to rely on an intuitive feel for harmonic relationships, and this approach is characteristic of his musical language with or without serialism. This fact is underlined by the rejection of Schoenberg's 'backward-looking' approach by proponents of the post-Webern school of serial (and integral serial) composition.

The fundamental conflict between the two views of music is in fact most clearly expressed in the symbology of Schoenberg's serial opera *Moses and Aaron*. The conflict between Moses' view of God as the all-pervasive, yet ultimately intangible, *idea* and Aaron's desire to relate God to *tangible experience*, is represented at a surface level by a verbal/musical dichotomy — Moses' part is confined to heightened speech (*Sprechstimme*), while Aaron sings expressive melodic lines — and at a deeper level by a notational/experiential dichotomy — the tone-row is all-pervasive in the score as the structural material out of which the opera is built but is not generally audible as such.

The second act (the end of the opera as it exists) ends with a dramatic duologue in which Moses (the speaker) holding the tablets of the written law, confronts Aaron (the singer) and finally breaks the tablets declaring "O Wort, du Wort, das mir fehlt" ("Oh word, you word, which has failed me"). In the archetypal ideology of Schoenberg's biographer,

[...] in contrast to Moses the thinking character who clings to eternity, metaphysics and real values, Aaron is a materialist of everyday life who is impressed by the glitter of gold and the successes of the moment.

(Stuckenschmidt 1959: 151, my emphasis)

However, the fact that Schoenberg felt unable to write the third act of the opera, in which Moses' view triumphs has, in the light of the present discussion, far-reaching significance for an understanding of contemporary avant-garde music.

Where concrete musical relationships — at least originally based on their experiential success — are represented by their notations in the score, and study and conception focuses upon this structure, divorced from the experiential immediacy of the sound itself, these relationships, as *rediscovered* in the score, may be mistaken for *conventional* relationships. In other words, what to direct gestural experience may appear as a *necessary* relationship — in that it is only through that particular musical structure that a successful communication of the kind intended can take place — can come to appear in the score as merely *arbitrary* permutations of 'notes' and 'time-values'. On the timeless flat surface of the score the visual-spatial relationships of the notes

(used to represent real time) may be changed at will to produce arbitrarily arrived-at visual-spatial structures, all having equal validity in visual space, but not necessarily so in experiential time.

Once, however, we demand that music be heard in terms of the score, then it is no longer experiential success which justifies notational visual-spatial arrangements, but notational arrangements become their own justification. Hence, 'musical form' may become freed from any restriction of direct experiential success in our original terms. This leads ultimately to a rational formalism in music. The composer establishes certain visual relationships between entities in his notation, the musical scholar is trained to listen for these relationships, he hears them and a successful 'musical' communication is declared to have taken place.

This beautifully closed rationalist view of music is the ultimate in scribal sophistication, it is complete and completely unassailable in its own terms. Music is hence completely socially definable and musical success may almost be measured with a slide rule. How much more tidy and convenient such a norm-adherent view of music than one bringing in the messy business of inter-personal, yet unverbalisable, gestural dialectics. The rationalist view of music fits ideally into a technocratic age with its linguistic and positivist ideologies. What we cannot talk about we cannot know, only that which we can talk about is real — so much for music!

Thus, ultimately, the score becomes its own rationale. It is what it is, and there is nothing more to say about it. The composer cannot be in error.¹³ We see this spatial score-based focus in preoccupations with such two-dimensional visual forms as the golden section in analytical articles, but it is *permutationalism* which is the ultimate notation-abstracted procedure. Because musical notation presents music to us outside of time in an essentially two-dimensional scannable score, it does not seem immediately unreasonable to extract various parameters of the sound and arrange these into various other patterns. The most thorough-going way of going about this is the technique of the permutation of parameters as used in much serial composition. The technique of permuting objects is very general and is in fact a principle of ordering which does *not* relate to the materials being permuted directly. We may permute pitches, dynamic levels or, for that matter, sizes of shoes, using exactly the same criteria. Applications of the principle can be very sophisticated, based upon analysis of the nature of sound-objects. The principle problem from our point of view is that being an outside-time procedure, there is no reason why the resulting

¹³ Although of course, not all composers, even today, accept this absurd view! There are often other criteria involved in composition, even where composers refuse, in a strictly positivist way, to talk about them.

sequences of sounds should have any dynamism. The parameters, separated through a lattice-based conception of musical structure, cease to have any meaningful linkage or gestural continuity and serve merely as evidence that the permutational procedure has taken place. This abstract architecture, therefore, reduces all objects which it touches to the same rather empty non-dynamic experience. There is no rationale beyond the arrangement of the bricks; the nature of the bricks becomes irrelevant so long as they fit into the pattern. The committed permutationalist is the musical (or artistic) equivalent of the linguistic philosopher. He or she cannot understand that there is a problem inherent in this approach.

A much more sophisticated and satisfactory approach can be seen in the work of Brian Ferneyhough. Ferneyhough is clearly (from my listening to the music) concerned with musical gesture and in a piece such as his *Second String Quartet* the interaction of musical gestures between the four players is of primary importance in our apprehension of the music. In works for a greater number of performers, however, (such as *Time and Motion Study III* for sixteen amplified voices) the sheer density of musical gestures leads to a process of self-cancellation. The individual details of each part are extremely interesting but an overall sense of direction is lost in the welter of interaction. In 1981 I had the pleasure of meeting Brian Ferneyhough over dinner in Paris and the ensuing conversation may serve as an interesting footnote to our discussions of idealism and materialism in the conception of music. Ferneyhough and myself both declared that we were anarchists but on further discussion it transpired that our conceptions of anarchism could not have been more different. Ferneyhough's view was that he could take the strongest stand against the system by not voting. In this way he symbolically denied the relevance of the system and therefore in some way negated it. My more pragmatic view was that it was important to vote in order to keep out the worst possible contender. These conflicting idealist and materialist views of anarchist action had an interesting parallel in our discussions about musical structure. Ferneyhough noted that a particular passage in one of his works sounded pretty well aleatoric and that this was interesting because it was the result of a multi-layered process of complex compositional decisions. He seemed to be saying that the methodology of composition was the principle object, not the effect on the listener. The composition is more like a document which evidences the composer's methodology and it is evident in the particular case under discussion that the methodology will only become apparent through detached analytical study of the document, not directly through the effect of the music. Thus a *priori* design, not directed pragmatically to some practical sonorous end, has become the principal focus of the composer's interest. The concept of musical experience has been

redefined as rediscovering the composer's methodology through the musical experience (or rather through the score) rather than feeling the gestural structure in time of the music in the listening experience, and hence directly understanding, through the gestural experience, the composer's design.

For me, on the other hand, a musical experience which appears aleatoric *is* aleatoric. The experience that the listener has *is* the music and the composer's methodology, no matter how rational it may be, is a heuristic device realising the source of that experience in sound. In Ferneyhough's case it would seem that music is an idealist object defined essentially by the composer's intention (just as the political stance is defined by the intention of the act of not voting). In my case, music is a material entity which is socially defined and judged by its results (similarly the political act must be an action taken in the world that will be judged by its success there). This being said, one must not confuse materialism with populism, but that is the subject of another essay and I will not pursue it here.

A fundamental thesis of this book is that, in order to understand and control the musical continuum, we will have to appeal to time-based notions like gesture and not only at the level of the individual musical event. Although a formalist, permutationalist approach can be applied to literally anything, including a particular classification of gestural types, we cannot ultimately learn anything from it because it is not open to any experiential verification (except in the tautologous sense that it evidences the permutations made). What I am searching for in this book are criteria for composing music with non-lattice materials which 'work' in some experientially verifiable sense that is not merely circular.

A final comment: it is clear that the separation of notation and actuality is of great value for the purposes of scholarship, even though it does lead to a distortion of our understanding of the object of study. The advent of digital recording and analysis of sound opens up a wonderful new opportunity for such scholarship. In one sense it can be very negative as this is a heaven-sent opportunity for formalism to run riot with a new ultra-powerful permutational tool. To date, however, computer technology seems to have been used in a much more sensitive way in the exploration and understanding of the inner details of sound architecture. The preliminary results of this exploration have been a source of inspiration for this particular book and the control which the computer will give us over this inner architecture makes the control of the details of gestural structure a compositional possibility for the first time. With musical sensitivity we may allow the computer to do the number-crunching and with real-time, or at least acoustic, feedback we can begin to make more refined aesthetic decisions about the gestural structure of sound on its most refined levels.