

The background of the cover is a dynamic, abstract composition of bright blue light trails against a dark blue background. The trails appear to be moving towards the center, creating a sense of depth and motion, reminiscent of light painting or digital data streams.

Music, Electronic Media and Culture

Edited by
Simon Emmerson

An **Ashgate** Book

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Music, Electronic Media and Culture

About the volume:

There has never been greater public exposure to the musical products of electronic technology than there is today. Pubs, clubs, restaurants, banks and shops offer new environments for the experience of musical sound, in addition to the conventional concert hall. There are now many different ways to make music, and, thanks to the loudspeaker, many different ways of listening.

This new world of musical sound and the questions it poses are explored in the nine essays that comprise this volume. At the heart of the collection is the myriad of confusing and exciting possibilities that are raised by sound that we hear but whose source we cannot see – the acousmatic. Part One of the book challenges the received wisdom of generations of writing on the acousmatic, providing new perspectives including an ecological view of human perception. The essays in Part Two explore the ways in which the history and plurality of culture has itself become the object of musical creativity in the form of sampling or plundering. In Part Three the potential fields of sound perception offered by the imagination are probed and given a ‘textual’ voice in Katharine Norman’s concluding essay to the volume. This uses the text itself as a medium for expressing the multi-layered reflections that a listener may have to ‘the work’ of music.

About the editor:

Simon Emmerson is Reader in Music at City University, London. A composer and writer, he was first prize winner at the Bourges Electroacoustic Awards in 1985 for his work *Time Past IV*. He is the editor of *The Language of Electroacoustic Music* (Macmillan, 1986) and has contributed to the *Journal of New Music Research* and *Organised Sound*.

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Notes on contributors

Chris Cutler, born in 1949, a prolific composer, interpreter and improviser, first became known in the early 1970s as a member of English avant-garde rock group Henry Cow; this was followed by projects with Art Bears, News from Babel, Aqsak Maboul and Les Quatre Guitaristes. In the early 1980s he co-founded the Anglo-German quartet Cassiber. Other collaborations include productions for radio, theatre and dance. He is editor and publisher of the ReR Sourcebook and numerous articles (some collected in his book *File under Popular*). He founded and still runs the celebrated label and distribution service ReR/Recommended.

Simon Emmerson, born in Wolverhampton, 1950, studied Natural Sciences and Music Education at Cambridge, including work with Roger Smalley and Tim Souster. He taught music and physics at secondary school level before pursuing postgraduate studies at City University, London, where he subsequently joined the staff to direct the Electroacoustic Music Studio. He gained a doctorate at the University in 1982 and is now a Reader in the Music Department. In recent years he has received commissions, all including electronics or tape, from Lontano, Shiva Nova, Philip Mead, Nicola Walker Smith, Jane Chapman, the *Groupe de Musique Expérimentale de Bourges*, the Smith Quartet and Inok Paek. He was first prize winner at the Bourges Electroacoustic Awards, 1985, for his work *Time Part IV* (soprano and tape). He is editor of *The Language of Electroacoustic Music* (Macmillan, 1986); he has edited two issues of *Contemporary Music Review* and is a contributor to the *Journal of New Music Research* and *Organised Sound*. He is currently a director of Sonic Arts Network. A CD of his works appeared on the Continuum label in 1993.

Ambrose Field's compositional output includes electroacoustic music for tape, music education works and community music projects. After gaining a first-class degree from the University of York, he undertook postgraduate studies at Cambridge University. In 1993 he was awarded a British Academy studentship to study for a PhD in Electroacoustic Composition with Denis Smalley at City University, London. In 1996 he became a Lecturer at the University of York, where he teaches courses in Electroacoustic Composition, Postmodernism and Music Education. He was a director of Sonic Arts Network from 1995 to 1997. His research has been published in *Organised Sound* and he received a

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Kersten Glandien, born in 1953 in Germany, studied Philosophy, Aesthetics and Art History at the University of St Petersburg, Russia. She worked at the University and the Music College in Dresden and as a senior research fellow at the Institute of Aesthetics and Art Theory of the Academy of Science in Berlin. In 1989 she moved to England, lecturing currently at the American International University in London and working freelance as a writer, researcher and curator in the field of new music.

Katharine Norman, Senior Lecturer, Director of the Stanley Glasser Electronic Music Studios at Goldsmiths College, graduated from Bristol University before being awarded a Fulbright scholarship and a Wingate fellowship to study composition and computer music at Princeton University where she received her doctorate in 1993. From 1994 to 1997 she was Lecturer in Composition at Sheffield University. Her 'digital soundscape' *London* (NMC) was voted a critics' choice for 1996 by *The Wire* and she has works recorded on Discus (Sheffield), Empreintes Digitales (Canada) and Sonic Circuits (USA). Her research interests lie in the field of computer and electroacoustic music, in particular the use of recorded 'real world' or documentary sources as musical material. She has contributed to *Contemporary Music Review* and was issue editor for volume 15 ('A Poetry of Reality: composing with recorded sound'). She was also responsible for the extended article on Electronic Music for the world-English edition of Microsoft's Encarta CD-ROM encyclopaedia (1996–97) and for entries in *The New Grove Dictionary of Music and Musicians*. She has also been a board member of Sonic Arts Network and the International Computer Music Association, editing the ICMA newsletter, *Array*.

Simon Waters is a composer. He studied Music at the University of Nottingham before gaining MMus and PhD degrees in Electroacoustic Music at the University of East Anglia. His many residencies for composition and research projects include: 1986–90: Course Leader (with Sarah Rubidge) for Rambert Dance Company Education Unit and the South Bank Centre Education Unit; 1988–90: Research Associate of KACOR (Kineto-Audiologic Communication Research Group) at the Royal Technical University, Stockholm. From 1991 to 1993 he was South West Arts Research Fellow in Interactive Arts at Bath College of Higher Education with a remit to research the interrelationship between different arts practices, particularly music and visual art. In 1994 he

returned to the University of East Anglia as Lecturer and Director of the Electroacoustic Music Studio. He has published papers in *Contemporary Music Review*, *Leonardo*, *Sonus* and *ex tempore*, and has presented papers at international conferences such as ISEA, 1998 (The Hague) and ICMC, 1990 (Glasgow).

Luke Windsor has a BSc (Music), MA (Music Psychology) and a PhD (Music Analysis) from City University, London. Since 1994 he has been a Research Assistant at the universities of Sheffield and Nijmegen (Netherlands Institute for Cognition and Information). He is currently a lecturer at the University of Leeds. The results of his research have been published in *Contemporary Music Review*, *Psychology of Music*, *Music Perception* and in 'Song and Signification' (edited by Monelle and Gray), and have been reported at a number of international conferences (psychological and musicological).

Robert Worby is a composer (mainly of electroacoustic music), broadcaster, writer and teacher. In addition to occasional, one-off appearances on radio and television he has produced and presented two series for BBC Radio 3: *Cacophony Now* was broadcast in 1996 and *Ambience: Music and Spaces* in May 1997. His writings appear sporadically in *The Independent*, *The Sunday Times* and *The Gramophone*. His music is composed for the concert hall, dance companies, television and film, and he often produces sound works drawing on non-musical traditions.

For Professor Malcolm Troup
on the occasion of his seventieth birthday
with gratitude for his inspiration,
energy and vision.

Introduction

Simon Emmerson

The death in August 1995 of the founder of *musique concrète*, Pierre Schaeffer, coincided with a groundswell of interest in his ideas and the works of those who had developed the field – often in ways in which he would not have approved. This wave of interest, however, crossed boundaries in unexpected ways, for example, highlighting the growing contact of the popular (Dance) music world with the pioneers of ‘high modernist’ electronic music. Stockhausen, Xenakis and Henry have, amongst others, all been the subject of ‘cross-over’ projects.

But claims for the imminent abolition of boundaries between music art forms, ‘popular’ and ‘classical’ have not so simply materialised. Each may plunder the other’s materials, but an unease and distance still prevails. Indeed the term ‘classical’ has given way to the term ‘academic’ used in a pejorative sense to mean élitist, out of touch and self-consciously ‘arty’, requiring considerable education to ‘understand’. While, indeed, public perception of a large part of electroacoustic music is that it has ‘retreated’ into academic and other specialist institutions, there has never been greater public exposure to the musical products of electronic technology. This contrast of ‘common means but non-common ends’ throws both challenges and life-lines to the ‘art music’ composer, offering possibilities in ‘applied art’ unheard of a generation ago. But the question whether this is a compromise or a challenge, whether to defend ‘sound for sound’s sake’ or to go along with multimedia or commercial forces, are questions which can no longer be avoided by practitioners at any level as public funds for so-called ‘art music’ diminish.

Behind these contradictions and paradoxes lie fundamental shifts in listening habits. Shifts not revolutions: Christopher Small has recently pointed out (Small, 1998) that what we perceive as the decline of undistracted and concentrated listening, allied to music becoming a more integrated part of social exchange, is but a return to a behaviour quite common before the late romantic era in Europe.

For a considerable time now there has been music in all our spaces, from pubs and clubs to banks and shops. There has always been a corresponding variety of listening habits, from ‘background’ to ‘concert hall’. But these are perpetually shifting their relationships. Superficially

the 'style' of listening spaces is changing, but more importantly how we evaluate and work within them is shifting radically. Pubs and clubs have been centres of music for centuries, but the move to seeing these as alternatives to concert halls for the presentation of 'the new' in art and culture, suggests a profound shift in focus – 'where it's at' has quite literally changed.

The fixed seat proscenium becomes but one space and time of many. If in the twentieth century 'art music' was nearly always confined (in live instrumental performance, at least) to the concert hall, electroacoustic music has been evangelical in its search for new spaces to utilise – new to it, but old to the traditions of our social exchange. Of course it is still performed in concert halls, but one somehow senses a yearning to break free of the constraints, to allow the listener to move through the imaginary spaces it creates unfettered by old divisions of performer and audience.

What unites the themes in this book is the loudspeaker: a magical object that is as much creator as recreator. It remains the one link in the recording chain of which the technology (after electrification in the 1920s) has not fundamentally altered. In drawing the parallel to Pythagoras's curtain, behind which he lectured to his followers and which gives us the unenviable term 'acousmatic', Pierre Schaeffer confronted that essential drive in the human psyche – already prefigured in radio art well before the birth of *musique concrète* – to recreate imaginary sources of what we hear but cannot see: 'the pictures are better on radio'. We would not have survived had we not associated the snap of a twig behind us with potential danger, the sound of water at a distance with potential survival.

Now Schaeffer chose to banish, or at least keep at bay, the consequences of this propensity. Many of his followers did not. In the literature of electroacoustic music much has concentrated on assuming the 'reduced listening' that was Schaeffer's ideal. Do not listen with intent to gain real-life information! In such a view the play of sound-forms, addressing the deepest essence of the human spirit – its desire for balance, drama and resolution – need have no recourse to the crudity of recognising the 'real'.

Many of the essays in the present volume try to redress this balance, examining the consequences of re-opening the doors of perception to real or imagined sources which refer to the world outside the listening space, to events, stories and narratives. Some such references go beyond 'mere' representation to symbolism and even myth, while others prey on culture itself plundering the wealth of sounds already made into music to recycle into new work. Several contributions to this book address the 'sampling of history' and its consequences.

This volume is divided into three parts. Part I ('Listening and interpreting') challenges much of the received wisdom of earlier generations of writing on the subject of the 'acousmatic' (in both French and English traditions). Luke Windsor's chapter 'Through and around the acousmatic: the interpretation of electroacoustic sounds' introduces us to an ecological view of human perception, applying principles from evolutionary biology and psychology to the perception of sound and strongly situating the idea of a sound's 'meaning' in a negotiation between objective and subjective worlds. Ambrose Field examines the new resources which result when composers allow the sounds to carry into the work the references and meanings they held in the 'non-musical' world outside the listening space. In 'Simulation and reality: the new sonic objects' he goes beyond the simple 'surrealist' metaphor to further kinds of 'outside music' reference. Finally Simon Waters's chapter 'Beyond the acousmatic: hybrid tendencies in electroacoustic music' explores the contexts within which electroacoustic art has traditionally been placed. Technology at first helped establish new art-forms but has moved on to allow us to subvert, to hybridise, to challenge accepted authorities who define 'meaning' (not only in art).

The second part is titled 'Cultural noise'. Here the history and plurality of culture itself becomes the object of creativity. The inclusion of Chris Cutler's classic essay 'Plunderphonics' introduces us in depth to the history of 'sampling culture'. Appropriation is as old as culture itself, of course, but recording has unique and special qualities; the technology has both created and fed the demand for a radical acousmatic approach which challenges both the ownership and identity of the artwork. My own essay 'Crossing cultural boundaries through technology?' poses more questions than it could possibly answer. There are those who might argue that intercultural exchange should be left to happen 'naturally' – in some sort of global jam session which will produce new hybrids, some doomed to die, others to form the basis of 'new species'. But some attempts at deeper understanding of composition and performance practices might be allowed and developed through new technology. Robert Worby's chapter 'Cacophony' concludes this section. From the Futurists, Schaeffer and John Cage, we have had calls for the return of noise to an active role in music. Noise cannot just be described in acoustic terms but must be related strongly to a social and cultural infrastructure, of conflict between groups and generations. Cacophony articulates at once violence and exuberance, celebration and obliteration.

In the third part, 'New places, spaces and narratives', the new places and spaces tend to be those of the imagination – I have never been

happy with the word ‘virtual’ as all such spaces are real enough, although in a different sense, sometimes metaphoric. Kersten Glandien contributes one of the first in-depth discussions in English about that genre of acousmatic art that predates *musique concrète*. In ‘Art on air: a profile of new radio art’ she brings together a wide variety of sources in a synthesis to present an art form which will surely inform the web-art of the future. I hope that this chapter stimulates an evidently dormant interest in this field in Britain. My own contribution ‘“Losing touch?”: the human performer and electronics’ takes as its starting point a clear split which I hear emerging in recent electroacoustic music between gestures that can still be related to human action and those increasingly divorced from bodily experience; this sometimes corresponds to a separation between the clean and clear, and the (deliberately) noisy and chaotic. I have attempted to extend Denis Smalley’s notion of the ‘indicative field’ to include sounds which are themselves heard nowadays primarily through the ubiquitous loudspeaker and to relate these to life experiences (often urban and industrial) which are strongly indicative. Finally, Katharine Norman has contributed an experimental piece of writing which examines the layers of reality and human reaction to music (specifically the works *Things she carried* by Paul Lansky and Luc Ferrari’s *Presque rien avec filles*). ‘Stepping outside for a moment: narrative space in two works for sound alone’ uses the script itself as a medium for expressing the multilayered reflections that a listener (and the author) has to ‘the work’ of music.

It has been difficult to choose a group of nine contributors from the enormous wealth of authors now writing on contemporary music. I wanted to feature British-based work, to include younger contributors and to present material which challenges orthodoxies as soon as they appear to be ‘settling in’. I also wanted to include genres not usually deemed to be at the centre of electroacoustic music’s concerns. I see *Music, Electronic Media and Culture* as a first contribution to a reappraisal of the position of the electroacoustic arts whose effective half-century celebration in 1998 was at a *fin de siècle* in so many senses.

Reference

Small, Christopher (1998), *Musicking*, Hanover: Wesleyan University Press.

PART ONE

Listening and interpreting

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Through and around the acousmatic: the interpretation of electroacoustic sounds

Luke Windsor

Introduction: electroacoustics and the acousmatic

It has become common practice to use the term ‘electroacoustic music’ to describe a wide variety of musical praxes involving the mediation of loudspeakers. Music created using all kinds of sound synthesis, music using recorded sounds and music which uses amplification all fit into this broad category. Such music varies in its reliance upon technological mediation. One can, for example, imagine a performance of Tchaikovsky’s *1812 Overture* with or without sound diffusion and amplification, and in both live or recorded execution. However, one cannot say the same of Henry’s *Variations pour une porte et un soupir* (Henry, 1987), nor of Stockhausen’s *Kontakte* (Stockhausen, 1992): these pieces require diffusion by loudspeakers for their realisation. Nor could one say this of the music of Motorhead, which although often performed live, relies extensively on the use of amplification for its musical effect. This is not to suggest that some music is more inherently electroacoustic than others, but it does serve to illustrate that for certain pieces and kinds of music electroacoustic mediation is technically essential.

In this chapter I will interrogate the perceptual and music-theoretical consequences of music which not only requires this kind of mediation but also denies a visual source for its constituent sounds. Such music has been termed *acousmatic*, reflecting the theoretical ideas of Pierre Schaeffer (1966). In its broadest sense acousmatic music might be said to be all music which is presented for which we are unable to see the sources of the constituent sounds. A concert performed by musicians seated behind an opaque screen, directly mimicking the pre-Socratic concept of aurally transmitted *akousmata*, would fit into this category, as would an audio-only recording of an acoustic concert. A concert of

amplified live musicians or a multimedia presentation in which the sources of sounds were visible would not.

Schaeffer's view of the acousmatic was a complex one, but it is clear that his conception of acousmatic music was a music in which the composer attempted to ignore the physical causation of his or her source materials. The acousmatic was intended not just as a description of how listeners would perceive sounds, but of an attitude composers should develop towards their material. The phonograph, closely followed by analogue tape recording, made it possible to create a technical separation between sound source and sound which had hitherto been impossible. The two terms *objet sonore* and *écoute réduite* (Schaeffer, 1966) had particular importance in delineating this approach. 'Sound objects', isolated and repeated on tape, and 'reduced listening', the manner with which composers were exhorted to analyse them both took their place within a larger and highly prescriptive endeavour to propose a *recherche musicale* (Schaeffer, 1966). These terms point towards the development of new compositional listening strategies rather than toward an attempt to propose a method for either describing or prescribing how music should be perceived by an ordinary listener. Schaeffer himself stresses the varieties of aural experiences available to listeners in his etymological and structuralist notion of *les quatre écoutes* (Schaeffer, 1966, pp. 103–28). He distinguishes between an indexical mode of listening, concerned with the identification of the events that are responsible for the emission of sound (*écouter*), and listening as a symbolic mode, to do with sounds as signs, the relationship of sounds as signifiers to signifieds that are *extra-sonores* (*comprendre*). An example of the former would be the recognition by a listener that a sound was caused by a gong being struck, whereas the latter type of listening would involve the interpretation of this gong sound, perhaps as signalling the beginning of a meal. Similarly, he identifies two other modes of listening which do not refer beyond the sound itself; *ouïr*, the naïve reception of a sound's occurrence ('I heard something'), and *entendre*, attention to certain qualities of a sound itself, without reference to its source or significance ('it sounded "vibrant"').

Schaeffer proposed a programme of musical research which aimed to develop the everyday (*banale*), active, yet non-referential listening of *entendre* into a specialised (*pratiquienne*) semiotic system, equivalent to pre-existing musical and linguistic systems in its relational and abstract nature, yet wholly different in its development of 'natural' listening (Schaeffer, 1966, especially pp. 360–85). Unlike *écoute traditionnelle*, the traditional musical model, where a 'repertoire of timbres' (*écouter*) and a system of musical values (*comprendre*) leads to the types of

listening appropriate to a traditional sound-world, *la recherche musicale* would ideally be derived from the development of a system of musical values and structures based upon a return to the sound itself, mostly through the type of listening Schaeffer identifies as *entendre*. For this reversal of musical practice Schaeffer proposes a radical and specialised form of listening: *l'écoute réduite*, or reduced listening (Schaeffer, 1966, pp. 261–79, 349–59) in order that familiar sources and semiotic systems should not play any part in this research. The *objet sonore* as an ‘in-itself’ is to be explored while placing significations and causes in ‘brackets’.

Hence one might think of ‘acousmatic music’ (as opposed to music that is acousmatic) as a kind of music in which the listener would be drawn into an acousmatic approach to listening. One might assume that, like the composer, the listener should attempt to concentrate upon listening to the non-referential, non-symbolic aspects of sounds. In this chapter I will argue that although such a view is far from realistic, the concept of the acousmatic in music is important to our understanding of how we listen to and interpret both *intentionally* acousmatic music and music that is more *coincidentally* acousmatic. By doing so, it will become clear that for the listener at least, attempts to break through the acousmatic ‘screen’ in order to ascribe causation to sounds are an important facet of musical interpretation. I will begin by showing how a consideration of the relationship between action, perception and meaning can provide a more perceptually relevant analysis of the acousmatic situation. This will be done by exploring the relevance of an ‘ecological’ acoustics. I will then apply this approach to the perception of acousmatic music, and provide some analyses of pieces by György Ligeti, Pierre Henry and Fred Frith to show how a more subtle and perceptually motivated view of the acousmatic has important aesthetic consequences.

Ecological acoustics and the aesthetic consequences of acousmatic presentation

Gaver (1993a) notes that the concentration upon ‘musical’ sounds in acoustics, psychoacoustics, and latterly music perception, can be seen as a primary factor in our ‘ignorance’ regarding ‘everyday listening’:

an account of hearing based on the sounds and perceptions of musical instruments often seems biased and difficult to generalise. Musical sounds are not representative of the range of sounds we normally hear. Most musical sounds are harmonic; most everyday sounds inharmonic or noisy. Musical sounds tend to have a smooth,

relatively simple temporal evolution; everyday sounds tend to be much more complex. Musical sounds seem to reveal little about their sources; while everyday sounds often provide a great deal of information about theirs. Finally, musical instruments afford changes of the sounds they make along relatively uninformative dimensions such as pitch or loudness, while everyday events involve many more kinds of changes – changes that are often musically useless but pragmatically important. Our current knowledge about sound and hearing has been deeply influenced by the study of a rather idiosyncratic subset of sounds and sources (Gaver, 1993a, p. 3).

A growing body of research is attempting to study the perception of sounds which do not resemble traditional speech or music in a manner that takes account of the perception of sound sources and their potential to us as active (rather than passive) organisms. Within the field of ecological acoustics, sounds are not viewed as being perceived as abstract entities related only one to another, as ‘tone colours’ or timbres, nor are they perceived as standing for concepts or things, as signs. Instead they are seen as providing unmediated contact between listeners and significant environmental occurrences. In an ecological framework, sounds provide an organism with information that allows it to locate, identify and successfully interact with food sources, predators or members of its own species with which it may mate, collaborate or challenge for territory. It is within such a context, I will argue, that the concept of the acousmatic begins to make fresh sense. Before applying such a theory to acousmatic presentation, however, I will describe the ecological approach and outline its application to auditory perception.

The ecological approach to perception

According to Gibson (1966; 1979), perception does not require the mediation of mental representations of the external world. This is contrary to the dominant view of perception in which the processing, storage and manipulation of information by the mind is primary (see Costall and Still, 1991). Rather than assuming that the sensations passed from the sense organs to the central nervous system represent a chaotic source of information that mental processes organise and store in the form of meaningful percepts and memories, the ecological approach assumes that the environment is highly structured and that organisms are directly ‘sensitive’ to such structure. If this were the sum of Gibson’s approach accusations of naïve realism would indeed be justified. How could such a view ‘explain’ the way in which human beings utilise language, mental imagery, knowledge and memories in their experience of the world? Merely stating that an organism is ‘sensitive’ to

environmental structure seems to beg too many questions. Gibson's work is much subtler than this. He does not claim that memory, language and other symbolic systems play no role in our experience of the world. However, he is keen to distinguish between perception itself and the symbolic systems that facilitate the mediation, storage and communication of perceptions (Gibson, 1966; 1979; Reed, 1991).

Action, perception and affordances

The core of Gibson's contribution to psychology lies in the way in which perception is seen as the result of a dynamic relationship between organism and environment. Organisms and species evolve, both phylogenetically and ontogenetically, to become sensitive to information that will increase their chances of survival. Moreover, the dynamic relationship between a perceiving, acting organism and its environment is seen to provide the grounds for the direct perception of meaning. Gibson's term for this kind of meaning is 'affordance'. Objects and events are related to a perceiving organism by structured information, and they 'afford' certain possibilities for action relative to an organism. For example, a cup affords drinking, the ground, walking. For different organisms, affordances will differ; for a human being an open body of water might afford swimming or immersion, but for a water bug the same stimulus information, picked up by different perceptual systems and relative to different organismic structure, would afford support (Gibson, 1979, p. 127). Moreover, affordances are fluid relative to individual perceptual development: for a surfer, certain patterns of waves afford surfing, whilst to a non-surfer they might afford drowning. Affordances 'point both ways' (Gibson, 1979, p. 129) in that they can neither be explained purely in terms of the needs of the organism, nor in terms of the objective features of the environment. The affordance is a relationship between a particular environmental structure and a particular organism's needs and capacities.

As each organism, or species, evolves it will develop certain effectivities (possible actions) and its perception of an environment will reflect those features of the environment that allow for, constrain or demand such actions. Conversely, as an environment develops it will offer certain affordances, features of survival value to an organism. An organism can be said to exhibit an *effectivity structure*, a complex of actions that reflects its relationship to the affordance structure of an environment.

Event perception: the primacy of source recognition

Event perception attempts to identify the invariant properties of events that specify both the permanent and changing features of the environment that are significant to an organism. The aims of this approach are neatly encapsulated by Shaw, McIntyre and Mace (1974, p. 280):

By analyzing the organism's context of physical stimulation into events with adaptive significance, we have a means of conceptually distilling from the ambient flux of stimulation those aspects most relevant to the maintenance of equilibration in the organism's ecosystem.

Any event will be perceived in terms of its affordance structure, its potential to evoke adaptive behaviour. The affordance structure of an event will vary according to the particular effectivities of an organism, its potential for performing adaptive behaviour. The properties of events that make up a particular affordance structure are termed invariants and may be divided up into two classes, those that specify styles of change and those that specify persistence, or permanence (Warren and Shaw, 1985). An event can be defined as a process that leaves some physical properties unchanged and transforms others. The identification of the styles of change and persistent features of events that are ecologically significant is a primary motive in studying event perception. For example, the perception of facial growth seems to be the result of specific geometrical functions that transform certain elements of facial structure whilst leaving others permanent (Shaw, McIntyre and Mace, 1974; Mark, Todd and Shaw, 1981). Such geometrical functions can be termed transformational invariants, whilst those features left unchanged can be termed structural invariants.

In summary, events can be described in terms of their adaptive significance to an organism and are the result of the coevolution of the perceptual systems of organism and an environment. Within such a perspective, an event's 'meaning' is determined directly, not by mental processes or representation: an event produces structured information that affords further perception or action.

Auditory event perception

Gibson's discussion of invariances is largely dominated by the visual (Gibson, 1979), despite some preliminary work on audition (Gibson, 1966). As the concern here is with a primarily auditory phenomenon, it seems reasonable to move straight to work in audition although other

sources of information will prove relevant when we return to the 'acousmatic' listening context itself. Moreover, the research cited will betray a concentration (maintained throughout this chapter) upon invariants that specify sound producing objects, leaving aside work upon sound localisation. The motivation for adopting an ecological approach in this context is to redress the balance between abstract approaches to musical structure and those that take into account the connections between sounds and the environment that produces them.

Heine and Guski (1991) point out that although research in 'ecological acoustics' is as yet an underdeveloped area within ecological psychology, the concern with studying real sounds in realistic situations has a considerable history. Psychoacoustic research in many domains has consistently shown our ability to identify sources despite complex and noisy signals (for example, Solomon, 1958; 1959a and b; Howard and Ballas, 1983) and the influence of source classification and the semantic interpretation of individual sounds upon the syntactic parsing of sound sequences (Howard and Ballas, 1980; 1982). It seems that our ability to identify the causation of sounds depends upon our ability to classify certain acoustic attributes and that, even when we are not explicitly asked to perform such classifications, these acoustic structures tend to be hard to ignore:

the order of transient components within a pattern is not arbitrary, but rather reflects the temporal structure of the generating events. In an everyday example, one would expect to hear the garage door open before hearing the car being driven out. On the other hand, a car door opening could either precede or follow the sound of the engine being shut off. Although the temporal or syntactic structure which exists in patterns of this sort is clearly less rigid and well specified than that encountered in the grammars of language, some temporal structure does exist (Howard and Ballas, 1982, p. 158).

Whereas psychoacoustic research tends to focus upon noticeable differences in pitch, spectral structure or duration, ecological research attempts to identify the transformations in acoustic structure which inform the listener of some important change in the environment. For example, Warren and Verbrugge (1984) discovered that the distinction between 'breaking' and 'bouncing' glass is made by subjects on the basis of specific temporal invariants, rather than differences in global spectral information. These changes in organisation are specified by the physical natures of the contrasting events; it is hence possible to synthesise convincing *virtual* breaks and bounces by starting from a mechanical description of the masses, densities, elasticities and forces involved (Gaver, 1993b). In this sense Warren and Verbrugge (1984) are involved in

what might be described quite accurately as an 'ecological' acoustics where salient and invariant properties of the sound are directly and lawfully related to the physical properties of the causal event. It is this lawfulness and predictability which specifies the event for the perceiver:

sound in isolation permits accurate identification of classes of sound producing events when the temporal structure of the sound is specific to the mechanical activity of the source (Warren and Verbrugge, 1984, p. 705).

A number of related studies (Spelke, 1976; 1979; Warren, Kim and Husney, 1987) have demonstrated that structured auditory information can be used to predict the movements of objects due to there being lawful relationships between such auditory information and patterns of movement. For example, predicting the bounce height of a ball (from its elasticity) can be achieved just as well by *hearing* the duration of a single bounce as it can be by *seeing* it (Warren, Kim and Husney, 1987). In the domain of sound classification, Freed (1990) has investigated the acoustical and perceptual correlates of 'perceived mallet hardness' using real mallet sounds. Reliable judgements of mallet hardness could be predicted on the basis of the spectral energy distribution of the different mallet sounds. Here, spectral invariants seem to specify the interaction of materials according to the physical nature of the event. Similarly, Repp (1987) has discovered that hand claps are consistently yet incorrectly categorised by gender. Although classifications into male and female clappers are consistent across subjects they do not reliably predict gender. Instead, they predict the physical configuration of the hands and the tempo and intensity of the clapping. Low frequencies in the spectra seemed to correlate with palm to palm clapping; high frequencies with palm to fingers. The perception of gender differences seemed to rely upon the classification of higher, softer, faster claps as being female, according to a cultural stereotype. One must interpret this as providing evidence for lawful and invariant relationships between physical actions and judgements of causation, rather than the matching of stored representations of 'male' and 'female' clapping sounds with acoustic stimuli.

It is one thing to show how we are sensitive to such lawful auditory structures, but many researchers have begun to stress the primacy of such 'causal' listening (see, for example, Vanderveer, 1979; Jenkins, 1984; Gaver, 1993a and b) over more qualitative styles of perception. As Kendall notes:

In everyday life, sound events arise from action, in fact, from the transfer of energy to a sounding object. The auditory system provides

us with perceptual characterizations of the energy transfer and of the internal structure of the objects involved. Early in childhood one learns to recognize the occurrence of sound events and to relate them to physical events (Kendall, 1991, p. 71).

Moreover, as we have seen, sounds specify events or objects that *afford*. For example, striking a hollow object may produce a sound that informs the perceiver that the object affords ‘filling’ or ‘the carrying of water’, just as the perception of the elasticity of a bouncing ball allows a catcher to predict how high a ball will bounce given a certain input of energy (Warren, Kim and Husney, 1987). The transformational invariants which specify a bottle breaking (see Warren and Verbrugge, 1984) also specify its change in morphology and the transformation of one fillable object into a number of un-fillable fragments which precludes that object’s potential as a fluid-carrying vessel. A change in structure is not behaviourally neutral: the affordance structure has changed and this change may be directly specified by the event perceived. In this sense it is misleading to portray the perception of ‘breaking’ as some ecologically neutral classification of this event. It is perceived in so far as it changes the relationship between listener and environment: the bottle no longer affords filling. Within this perspective, the knowledge that the bottle is ‘broken’ does not explain why we do not attempt subsequently to fill it with water and drink from it. We might describe the bottle as broken in order to communicate this change in structure and its behavioural consequences but such a labelling cannot explain our actions. On the contrary, the representation of an object as broken, and hence useless for its task, relies upon a change in its affordance structure.

Additional support for the hypothesis that the structure of events is lawfully related to auditory perception is to be found in the literature on physical modelling in sound synthesis. Gaver (1993b), for example, has demonstrated the success of using physical models of vibration, and single and multiple collisions between objects, for synthesising the contrasting sounds of scraping surfaces and hitting wooden or metal objects. Cadoz, Florens and Luciani (1984; see also Cadoz, Lisowski and Florens, 1990) have also exploited the synthesis algorithms based upon physical models of objects (or instruments) with gesture transducers.

Such research has led Gaver (1993a; 1993b; and personal communication) to propose that both synthetic and real events may be perceived in terms of their probable causation, whether or not this causation is actual. A ‘real’ source is not necessary for the perception of a physical cause. Since the invariant structures which specify a particular event may be modelled, presented and controlled in synthesised sounds, it is

clear that the notion of 'true' causal correspondence is of limited importance: although events are specified by certain invariants this is not to say that these invariants have to be produced by any actual physical interaction of materials. It would be absurd to argue that controlling an algorithmic 'string' via a gesture transducer relies upon the perception of a causal relationship between player, 'bow' and 'string' in any physical sense. Rather it is the transaction between player and a set of familiar invariant haptic and auditory structures which forms the link between action and perception. In the following sections the consequences of this will be shown to be extremely important for understanding the relationship between sounds and their perceived sources in acousmatic music.

Event perception in acousmatic music

The ecological perspective described above does not imply that sounds cannot be described as having 'qualities' such as those provided by Schaeffer (1966) or that they cannot be used as signs, whether culturally convened or more directly motivated. It does imply, however, both that such mediated concepts are unnecessary for sounds to inform us about our environment and that the sources of sounds may be harder to ignore than one might hope.

This approach may seem at first peculiarly unsuited to describing the perception of music. However, as will become clear, acousmatic music, both due to its avoidance of conventional musical structures and its mode of presentation, benefits from exploring this most direct level of perception. The materials of the acousmatic composer are often precisely those sounds excluded from a traditional view of musical sounds and sources. More importantly it is these 'non-musical' sounds and sources that are perceived by listeners: the parameters of pitch and rhythm are often hard to find in acousmatic music and instrumental and vocal sources no more likely than the sounds of the everyday environment. Gaver's description of the distinction between musical and everyday sounds (Gaver, 1993a), despite his assertion that noisy sounds and pragmatic listening have no musical role to play, could almost be translated into a description of the distinction between the sounds of traditional and acousmatic music. Similarly, when Jenkins (1984, pp. 129–32) notes that 'Music seems to belong in a space or world of its own' and emphasises 'the special status that music may have in the realm of acoustic events' he is quick to discriminate between 'sound effects' which often rely upon contact with the more familiar 'everyday' world and perception in such a specialised context as music.