# SOUNDSCAPE DESCRIPTION

A collection of Text Extracts, proposed by Nadine Schütz

Raymond Murray Schafer, Features of the Soundscape. In: R. Murray Schafer, Our Sonic Environment and the Soundscape. The Tuning of the World. New York, 1977.

## *Features of the Soundscape*

What the soundscape analyst must do first is to discover the significant features of the soundscape, those sounds which are important either because of their individuality, their numerousness or their domination. Ultimately some system or systems of generic classification will have to be devised, and this will be a subject for the third part of the book. For the first two parts it will be enough to categorize the main themes of a soundscape by distinguishing between what we call *keynote sounds, signals* and *soundmarks.* To these we might add *archetypal* sounds, those mysterious ancient sounds, often possessing felicitous symbolism, which we have inherited from remote antiquity or prehistory.

*Keynote* is a musical term; it is the note that identifies the key or tonality of a particular composition. It is the anchor or fundamental tone and although the material may modulate around it, often obscuring its importance, it is in reference to this point that everything else takes on its special meaning. Keynote sounds do not have to be listened to consciously; they are overheard but cannot be overlooked, for keynote sounds become listening habits in spite of themselves.

The psychologist of visual perception speaks of "figure" and "ground," the figure being that which is looked at while the ground exists only to give the figure its outline and mass. But the figure cannot exist without its ground; subtract it and the figure becomes shapeless, nonexistent. Even though keynote sounds may not always be heard consciously, the fact that they are ubiquitously there suggests the possibility of a deep and pervasive influence on our behavior and moods. The keynote sounds of a given place are important because they help to outline the character of men living among them.

The keynote sounds of a landscape are those created by its geography

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and climate: water, wind, forests, plains, birds, insects and animals. Many of these sounds may possess archetypal significance; that is, they may have imprinted themselves so deeply on the people hearing them that life without them would be sensed as a distinct impoverishment. They may even affect the behavior or life style of a society, though for a discussion of this we will wait until the reader is more acquainted with the matter.

Signals are foreground sounds and they are listened to consciously. In terms of the psychologist, they are figure rather than ground. Any sound can be listened to consciously, and so any sound can become a figure or signal, but for the purposes of our community-oriented study we will confine ourselves to mentioning some of those signals which *must* be listened to because they constitute acoustic warning devices: bells, whistles, horns and sirens. Sound signals may often be organized into quite elaborate codes permitting messages of considerable complexity to be transmitted to those who can interpret them. Such, for instance, is the case with the *cor de chasse,* or train and ship whistles, as we shall discover.

The term *soundmark* is derived from landmark and refers to a community sound which is unique or possesses qualities which make it specially regarded or noticed by the people in that community. Once a soundmark has been identified, it deserves to be protected, for soundmarks make the acoustic life of the community unique. This is a subject to be taken up in Part Four of the book, where the principles of acoustic design will be discussed.

I will try to explain all other soundscape terminology as it is introduced. At the end of the book there is a short glossary of terms which are either neologistic or have been used idiosyncratically, in case doubt exists at any point in the text. I have tried not to use too many complex acoustical terms, though a knowledge of the fundamentals of acoustics and a familiarity with both musical theory and history is presupposed.

Raymond Murray Schafer, The Hi-Fi Soundscape. In: R. Murray Schafer, Our Sonic Environment and the Soundscape. The Tuning of the World. New York, 1977. S. 43-44.

## *The Hi-Fi Soundscape*

In discussing the transition from the rural to the urban soundscape, I will be using two terms: hi-fi and lo-fi. They need to be explained. A hi-fi system is one possessing a favorable signal-to-noise ratio. The hi-fi soundscape is one in which discrete sounds can be heard clearly because of the low ambient noise level. The country is generally more hi-fi than the city; night more than day; ancient times more than modern. In the hi-fi soundscape, sounds overlap less frequently; there is perspective—foreground and background: ". . . the sound of a pail on the lip of a well, and the crack of a whip in the distance"—the image is Alain-Fournier's to describe the economic acoustics of the French countryside.

The quiet ambiance of the hi-fi soundscape allows the listener to hear farther into the distance just as the countryside exercises long-range viewing. The city abbreviates this facility for distant hearing (and seeing) marking one of the more important changes in the history of perception.

In a lo-fi soundscape individual acoustic signals are obscured in an overdense population of sounds. The pellucid sound—a footstep in the snow, a church bell across the valley or an animal scurrying in the brush—is masked by broad-band noise. Perspective is lost. On a downtown street corner of the modern city there is no distance; there is only presence. There is cross-talk on all the channels, and in order for the most ordinary sounds to be heard they have to be increasingly amplified. The transition from the hi-fi to the lo-fi soundscape has taken place gradually over many centuries and it will be the purpose of several of the following chapters to measure how it has come about.

In the quiet ambiance of the hi-fi soundscape even the slightest disturbance can communicate vital or interesting information: "He was dis-

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turbed in his meditation by a grating noise from the coachhouse. It was the vane on the roof turning round, and this change in the wind was the signal for a disastrous rain." The human ear is alert, like that of an animal. In the stillness of the night a paralyzed old lady in a story by Turgenev can hear the moles burrowing underground. "That's when it's good," she reflects; "no need to think." But poets do think about such sounds. Goethe, his ear pressed to the grass: "When I hear the humming of the little world among the stalks, and am near the countless indescribable forms of the worms and insects, then I feel the presence of the Almighty, Who created us in his own image. . . ."

From the nearest details to the most distant horizon, the ears operated with seismographic delicacy. When men lived mostly in isolation or in small communities, sounds were uncrowded, surrounded by pools of stillness, and the shepherd, the woodsman and the farmer knew how to read them as clues to changes in the environment.

Raymond Murray Schafer, Glossary of Soundscape Terms. In: R. Murray Schafer, Our Sonic Environment and the Soundscape. The Tuning of the World. New York, 1977. S. 271-275.

# *Glossary of Soundscape Terms*

**The following short list of terms includes only neologisms or acoustic terms which I have adapted and given special meanings to for the purpose of this book. The list does not include general acoustic terms employed in the customary manner, definitions of which may be found in standard works of reference.**

ACOUSTIC DESIGN: A new interdiscipline requiring the talents of scientists, social scientists and artists (particularly musicians), acoustic design attempts to discover principles by which the aesthetic quality of the acoustic environment or SOUNDSCAPE may be improved. In order to do this it is necessary to conceive of the soundscape as a huge musical composition, ceaselessly evolving about us, and to ask how its orchestration and forms may be improved to bring about a richness and diversity of effects which, nevertheless, should never be destructive of human health or welfare. The principles of acoustic design may thus include the elimination or restriction of certain sounds (noise abatement), the testing of new sounds before they are released indiscriminately into the environment, but also the preservation of sounds (SOUNDMARKS), and above all the imaginative placement of sounds to create attractive and stimulating acoustic environments for the future. Acoustic design may also include the composition of model environments, and in this respect it is contiguous with contemporary musical composition. Compare: ACOUSTIC ECOLOGY.

ACOUSTIC ECOLOGY: Ecology is the study of the relationship between living organisms and their environment. Acoustic ecology is thus the study of the effects of the acoustic environment or SOUNDSCAPE on the physical responses or behavioral characteristics of creatures living within it. Its particular aim is to draw attention to imbalances which may have unhealthy or inimical effects. Compare: ACOUSTIC DESIGN.

ACOUSTIC SPACE: The profile of a sound over the landscape. The acoustic space of any sound is that area over which it may be heard before it drops below the ambient sound level.

AURAL SPACE: The space on any graph which results from a plotting of the various dimensions of sound against one another. For convenience in

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reading usually only two dimensions are plotted at once. Thus time may be plotted against frequency, frequency against amplitude or amplitude against time. Aural space is thus merely a notational convention and should not be confused with ACOUSTIC SPACE, which is an expression of the profile of a sound over the landscape.

CLAIRAUDIENCE: Literally, clear hearing. The way I use the term there is nothing mystical about it; it simply refers to exceptional hearing ability, particularly with regard to environmental sound. Hearing ability may be trained to the clairaudient state by means of EAR CLEANING exercises.

EAR CLEANING: A systematic program for training the ears to listen more discriminatingly to sounds, particularly those of the environment. A set of such exercises is given in my book *Ear Cleaning.*

EARWITNESS: One who testifies or can testify to what he or she has heard.

HI-FI: Abbreviation for high fidelity, that is, a favorable signal-to-noise ratio. The most general use of the term is in electroacoustics. Applied to soundscape studies a hi-fi environment is one in which sounds may be heard clearly without crowding or masking. Compare: LO-FI.

KEYNOTE SOUND: In music, keynote identifies the key or tonality of a particular composition. It provides the fundamental tone around which the composition may modulate but from which other tonalities take on a special relationship. In soundscape studies, keynote sounds are those which are heard by a particular society continuously or frequently enough to form a background against which other sounds are perceived. Examples might be the sound of the sea for a maritime community or the sound of the internal combustion engine in the modern city. Often keynote sounds are not consciously perceived, but they act as conditioning agents in the perception of other sound signals. They have accordingly been likened to the ground in the figure-ground grouping of visual perception. Compare: SOUND SIGNAL.

LO-FI: Abbreviation for low fidelity, that is, an unfavorable signal-to-noise ratio. Applied to soundscape studies a lo-fi environment is one in which signals are overcrowded, resulting in masking or lack of clarity. Compare: HI-FI.

MOOZAK (MOOZE, etc.): Term applying to all kinds of schizophonic musical drool, especially in public places. Not to be confused with the brand product Muzak.

MORPHOLOGY: The study of forms and structures. Originally employed in biology, it was later (by 1869) employed in philology to refer to patterns of inflection and word formation. Applied to soundscape studies it refers to changes in groups of sounds with similar forms or functions when arbitrarily arranged in temporal or spatial formations. Examples of acoustic morphology might be a study of the historical evolution of foghorns, or a geographical comparison of methods of telegraphy (alphorn, jungle drums, etc.).

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NOISE: Etymologically the word can be traced back to Old French (*noyse*) and to eleventh-century Provençal (*noysa, nosa, nausa*), but its origin is uncertain. It has a variety of meanings and shadings of meaning, the most important of which are the following:

1. *Unwanted sound.* The Oxford English Dictionary contains references to noise as unwanted sound dating back as far as 1225.
2. *Unmusical sound.* The nineteenth-century physicist Hermann Helmholtz employed the expression noise to describe sound composed of nonperiodic vibrations (the rustling of leaves), by comparison with musical sounds, which consist of periodic vibrations. Noise is still used in this sense in expressions such as white noise or Gaussian noise.
3. *Any loud sound.* In general usage today, noise often refers to particularly loud sounds. In this sense a noise abatement by-law prohibits certain loud sounds or establishes their permissible limits in decibels.
4. *Disturbance in any signaling system.* In electronics and engineering, noise refers to any disturbances which do not represent part of the signal, such as static on a telephone or snow on a television screen.

The most satisfactory definition of noise for general usage is still "unwanted sound." This makes noise a subjective term. One man's music may be another man's noise. But it holds open the possibility that in a given society there will be more agreement than disagreement as to which sounds constitute unwanted interruptions. It should be noted that each language preserves unique nuances of meaning for words representing noise. Thus in French one speaks of the *bruit* of a jet but also the *bruit* of the birds or the *bruit* of the waves. Compare: SACRED NOISE.

SACRED NOISE: Any prodigious sound (noise) which is exempt from social proscription. Originally Sacred Noise referred to natural phenomena such as thunder, volcanic eruptions, storms, etc., as these were believed to represent divine combats or divine displeasure with man. By analogy the expression may be extended to social noises which, at least during certain periods, have escaped the attention of noise abatement legislators, e.g., church bells, industrial noise, amplified pop music, etc.

SCHIZOPHONIA (Greek: *schizo* = split and *phone* = voice, sound): I first employed this term in *The New Soundscape* to refer to the split between an original sound and its electroacoustic reproduction. Original sounds are tied to the mechanisms that produce them. Electroacoustically reproduced sounds are copies and they may be restated at other times or places. I employ this "nervous" word in order to dramatize the aberrational effect of this twentieth-century development.

SONIFEROUS GARDEN: A garden, and by analogy any place, of acoustic delights. This may be a natural soundscape, or one submitted to the

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principles of ACOUSTIC DESIGN. The soniferous garden may also include as one of its principal attractions a Temple of Silence for meditation.

SONOGRAPHY: The art of soundscape notation. It may include customary methods of notation such as the sonogram or sound level recording, but beyond these it will also seek to register the geographic distribution of SOUND EVENTS. Various techniques of aerial sonography are employed, for instance, the isobel contour map.

SONOLOGICAL COMPETENCE: The implicit knowledge which permits the comprehension of sound formations. The term has been borrowed from Otto Laske. Sonological competence unites impression with cognition and makes it possible to formulate and express sonic perceptions. It is possible that just as sonological competence varies from individual to individual, it may also vary from culture to culture, or at least may be developed differently in different cultures. Sonological competence may be assisted by EAR CLEANING exercises. See O. Laske, "Musical Acoustics (Sonology): A Questionable Science Reconsidered," *Numus-West,* Seattle, No. 6, 1974; "Toward a Theory of Musical Cognition," *Interface,* Amsterdam, Vol. 4, No. 2, Winter, 1975, *inter alia.*

SOUND EVENT: Dictionary definition of *event:* "something that occurs in a certain place during a particular interval of time." This suggests that the event is not abstractable from the time-and-space continuum which give it its definition. The sound event, like the SOUND OBJECT, is defined by the human ear as the smallest self-contained particle of a SOUNDSCAPE. It differs from the sound object in that the latter is an abstract acoustical object for study, while the sound event is a symbolic, semantic or structural object for study, and is therefore a nonabstractable point of reference, related to a whole of greater magnitude than itself.

SOUNDMARK: The term is derived from *landmark* to refer to a community sound which is unique or possesses qualities which make it specially regarded or noticed by the people in that community.

SOUND OBJECT: Pierre Schaeffer, the inventor of this term (*l'objet sonore*), describes it as an acoustical "object for human perception and not a mathematical or electro-acoustical object for synthesis." The sound object is then defined by the human ear as the smallest self-contained particle of a SOUNDSCAPE, and is analyzable by the characteristics of its envelope. Though the sound object may be referential (i.e., a bell, a drum, etc.), it is to be considered primarily as a phenomenological sound formation, independently of its referential qualities as a sound event. Compare: SOUND EVENT.

SOUNDSCAPE: The sonic environment. Technically, any portion of the sonic environment regarded as a field for study. The term may refer to actual environments, or to abstract constructions such as musical

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compositions and tape montages, particularly when considered as an environment.

SOUND SIGNAL: Any sound to which the attention is particularly directed. In soundscape studies sound signals are contrasted by KEYNOTE SOUNDS, in much the same way as figure and ground are contrasted in visual perception.

WORLD SOUNDSCAPE PROJECT: A project headquartered at the Sonic Research Studio of the Communications Department, Simon Fraser University, British Columbia, Canada, devoted to the comparative study of the world SOUNDSCAPE. The Project came into existence in 1971, and since that time a number of national and international research studies have been conducted, dealing with aural perception, sound symbolism, noise pollution, etc., all of which have attempted to unite the arts and sciences of sound studies in preparation for the development of the interdiscipline of ACOUSTIC DESIGN. Publications of the World Soundscape Project have included: *The Book of Noise, The Music of the Environment, A Survey of Community Noise By-Laws in Canada* (1972), *The Vancouver Soundscape, A Dictionary of Acoustic Ecology, Five Village Soundscapes* and *A European Sound Diary.*

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# Space-form and the acousmatic image

DENIS SMALLEY

Department of Music, City University, Northampton Square, London EC1V OHB, UK
E-mail: d.smalley@city.ac.uk

**The analytical discussion of acousmatic music can benefit from being based on spatial concepts, and this article aims to provide a framework for investigation. A personal experience of soundscape listening is the starting point, and uncovers basic ideas relating to the disposition and behaviour of sounding content, and listening strategy. This enables the opening out of the discussion to include source-bonded sounds in general, giving particular consideration to how experience of sense modes other than the aural are implicated in our understanding of space, and in acousmatic listening. Attention then shifts to a source-bonded spatial model based on the production of space by the gestural activity of music performance, prior to focusing in more detail on acousmatic music, initially by delving into spectral space, where ideas about gravitation and diagonal forces are germane. This leads to concepts central to the structuring of perspectival space in relation to the vantage point of the listener. The final section considers a methodology for space-form investigation.**

## 1. INTRODUCTION

Acousmatic music is the only sonic medium that concentrates on space and spatial experience as aesthetically central. Although there has been much of value written about spatial attributes and the role of space, mainly by composers, the thinking is somewhat scattered, and as yet there is no substantial, unified text on the topic, nor any solid framework which might provide a reasonably secure basis for investigating space. This essay seeks to begin to provide such a framework, and to offer a sense of direction for future study.

Firstly, I set out the experiential basis on which our understanding of space resides, since this is necessary if we are to be able to identify how acousmatic music relates to spatial experience in general. Then I move on to discuss ways of defining spatial forms, through source bonding approaches, through the composition of spectral space, and the creation of perspective, taking into consideration that the effectiveness of spatial conceptions depends on the vantage point of the listener. Spatial forms add up to space-form, and my main purpose is to propose that analytical investigation of acousmatic music focused on space-form is a way of integrating the multiple facets of the acousmatic image. A space-form approach is different from other methodologies in that it places time at the service of space.

While I concentrate on acousmatic music, there is much that can be taken over to other electroacoustic music genres which possess an acousmatic component, and since I also discuss the conventional model of 'performed space', it should be possible for others to extend what I have to say to investigate live and interactive genres.

Focusing on space as the key, integrating element requires a reorientation of listening priorities and attentions: in my experience we are not that used to listening out for spatial attributes, for spatial forms, and space-form, partly because there is so much else to listen out for. But perhaps this is also because we are not sure what space really is, in sonic terms, or that we lack a sufficiently comprehensive bundle of concepts to talk about it, or that we think it tangential rather than central.

I start by discussing a personal listening experience.

## 2. ORBIEU SOUNDSCAPE

It's after 9 p.m. Late June. Night is closing in. I am sitting near a first-floor window in a house on the edge of a village in the south of France. The house is one in a variegated row, set on the quay of the Orbieu River. A road passes along the quay in front of the house – only the odd vehicle at this time of day – and on the other side of the road, high, shade-providing plane trees planted in 1900, line the quay. Almost immediately on the other side of the trees' trunks is a low stone wall, and then a drop of about twenty feet to the river. A gap between two of the trees affords me a view of the river, and the landscape beyond. The river flows and laps nonchalantly (at this time of year) directly towards the house (always audible from inside), turning left to continue along the quay; the stone wall and height of the quay hide from view the stretch of the river flowing parallel to the quayside. The river has broadened its domain as it approaches the quay from the distance, creating an extensive stony riverbed to the left (dry for most of the year), dotted with plant clumps nearer the water's edge. On the right of the river approach are some allotments,

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sleeping at this time of day. My vantage point is nigh perfect. Sitting by the window I don't see the road or any other houses, just the river and the landscape, the only sign of obvious human intervention being the, more or less, cultivated allotments. At its closest visible point the river lies at about forty-five degrees below me.

In the dusk, sounds of day and night mingle. I lean on the windowsill and put my head outside to let my ears enter the outdoors space. My listening space is bounded by the house walls, now to each side just behind my ears. The conditions are acousmatic: I may be able to make out the lie and shapes of things but cannot see the sources of any of the sounds I hear. There are four, longer-term sounding participants – the river, frogs, cicadas, swifts.

The river's sound is a permanent texture – a generalised ground (as opposed to a figure). Its space spreads over a central area of the sonic image. Because it moves towards me its textural resolution offers both more generalised, distant features (flow), and closer detail (lapping in the shallows). Despite the distance from my vantage point I can focus on a certain degree of micro-detail if I am attentive, but I am less interested in this habitual sound right now, and I tend to background it.

Over to the left of the river (and the sonic image), close to the water, among stones and plant clumps, is the frogs' territory – a *zoned space*.[1] We can also regard this, in ecological terms, as a *signal space*.[2] Furthermore, the collective practice of near-field call communication makes this a type of *behavioural space*. Spectromorphological[3] similarity, married to an appropriate proximity of the inhabitants, creates the relationship between zone, signal and behaviour. The frog calls are short, repeated units, whose polyphonic layering shifts. There are not so many individuals as to create a congested texture, and some have more distinctive spectromorphological identities than others, as well as a more relaxed rate of repetition. Some are fairly loud, no doubt amplified a little through reflection off the stones and the river wall, adding a slight resonance to the zone's identity. They are not easy to localise precisely without listening effort (just a few too many individuals to keep track of). I am more aware of the dispersal of the zone's texture, with some more soloistic individuals standing out in relief (not really a chorus); knowing that these frogs do not move, I regard the texture as an array of fixed spatial points.

There was a curious intervention in the frog texture – a singular event that appeared related to the loudest frog calls, in terms of morphology and timbre. Hidden from view, below the river side of the wall (where there is some vegetation down towards the water), came two crow-like cries, the first to the left, and a short time later the second to the right. Why, I don't know. Was it one bird displaced in space, or two birds signalling each other? Reflecting off the wall, the sound projected out towards the frogs, seeming temporarily to expand, and add elevation to, the frogs' zone.

Cicadas, residues of the sinking daylight, sound in the two plane trees framing my river view; they inhabit their own spatial zone, which starts not that far above my vantage point, but around twenty or so feet away. These are the sounds closest to me, occupying the most *proximate space*[4] of the sound image, but not close enough for me to feel as if they are approaching my *personal space*. The iterative, but also granular noise-bands, coagulate, oscillating in wave-like fashion between the trees, creating a continuity in space, almost as if I had composed them to cover and balance the space between two tree-loudspeakers. (Mind you, these trees are over forty feet tall.) I know that the cicadas do not move, and I therefore regard the perceived collective rhythm of the spatial movement as the result of the relative time-shifts emitted by multiple fixed sources. Loud though the cicadas may be, their occupancy of spectral space does not mask any of the other sounds. However, I need to blot them out of consciousness, treating them as a proximate ground, in order to concentrate on the more variable frogs.

Air-bound, above and stretching out beyond the plane tree to the right, is the swifts' zone, their high-frequency calls delineating the canopy of the soundscape's space. At this time of day they have confined their space to a limited, higher zone, rather than practise, over a wider and sometimes proximate space, their rapid swooping approach contours to catch insects, at which they are very adept. (They could pass within a few feet of me outside the window.) This is another example of signal/behavioural space, but this time the sources are mobile, though it is impossible to tell how far successive calls are separate source instances, or the utterance of a same individual displaced in space: I assume a mixture. I cannot see the swifts' spatial texture but the *perspectival space*[5] created by the calls makes me imagine I can see it in action. The morphology of the calls, if one quickly focuses on an individual shape, approaches the

[1]New terms representing key concepts appear in italics when initially introduced.

[2]Slabbekoorn, in Marler and Slabbekoorn (2004) discusses birds' space; this idea is applicable to other living beings, and can be applied to textures in acousmatic music, where sources are not 'living' or identifiable. We might also interpret an instrumental musical context that has repeated call- or response-like elements in a similar way. See also Wallin (1991).

[3]Spectromorphology is 'the interaction between sound spectra (spectro-) and the ways they change and are shaped in time (-morphology)' (Smalley 1997).

[4]I use the term 'proximate' to designate space nearest to the listener, and 'distal' for space furthest from the listener. The relationship between proximate and distal space creates depth of image.

[5]Perspectival space – the relations of spatial position, movement and scale, viewed from the listener's vantage point – is the subject of Section 8.

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graduated continuant archetype;[6] the slight pitch dip seems to express the birds' physical contour drift, and this impression is enhanced by the grouping of multiple calls. This is an elevated *distal space*, where the distance between me and them, their known and deduced mobility, and the close similarity among the call-signals, combine to form a collective behaviour, a spatial texture with free-drifting internal motion. This contrasts with the frogs' rhythmic polyphony of grounded, sometimes individualistic, fixed point-sources. For a moment I wonder what would happen to the swifts' space were I to record it and bring it indoors for loudspeaker listening. The recorded image could not reproduce the spatial elevation, but I would nevertheless deduce it: in acousmatic music actual spatial localisation is not essential to create elevation. Aerial cues can be interpreted from morphological features set in spectral space (spectromorphology), the behaviour of texture, and the spectral resolution of the sound that informs me about relative distance. Of course there is also strong source bonding[7] involved: I recognise the swifts' calls as flight calls. So doing away with the actual elevation will have no effect on my diagnosis of elevation. Identified sources carry their space with them.

There were two more singular sonic events, caused by passing cars. Each of these outlined a *vectorial space*.[8] The first, approached from the right, creating an extension of the *panoramic space*,[9] passed along the quay, then turned left about 250 feet away, moving out of earshot into the village. It had emerged from distal space at the extreme right of the image, and in journeying past my vantage point, turned out to be the most proximate of all the sounds. Its vector was articulated through changes in spectral quality, and its graduated-continuant morphology was the most extended of the soundscape. Some time later the second car approached, its sound emerging relatively rapidly from the village at the spot where the other car had turned, 250 feet away, but instead of coming along the quay, it continued straight on over the only bridge in the area, heading off into the landscape. This vector extended the left of the panorama, fading gradually into the reaches of distal space. The first car is an example of the *vectorial wipe*, a sound travelling across proximate space, that wipes out, in this case only temporarily, the ongoing distal image behind it.

Unlike water, frogs, cicadas or swifts, the cars represent cultural artefacts and human presence, possibly to be regarded as intrusions in the 'natural' environment, but for me they fulfilled a welcome quasi-compositional function: each created a different distal-proximate vector, extending lateral space in both directions, the second car extending into deeper distal space, and the first drawing proximate space forward.

## 3. HOLISTIC SPACE AND SPACE-FORM

By now the perspectival and spectral space of this soundscape had, to my mind, become as satisfying and fully formed as it could be, and I could arrive at an holistic view. This holistic space comprised an array of zoned spaces. I could regard the frog-river-crow zone as a *nested space* (spaces within a space) in which three adjacent sub-zones combine to create a riverbed zone, invested with a slight elevation due to the crow event; the cicada, swift and riverbed zones are independent of each other. The two cars taken together (forgetting that they happened at different times), meet to describe a vector that delineates the peripheral border of the whole. Three of the zones – the frogs, cicadas and swifts – are behavioural, signal spaces, each differentiated from the other by its spectromorphological structure and perspectival site.[10] The river itself, through its central placement, its permanence, and the generality of its oblivious textural flow, anchors and grounds the holistic space, yet in relation to the figural interest of other zones it is inevitably backgrounded. The swifts, in elevated space, act as the river's foil.

A listener needs time to progress from an initial listening encounter with the soundscape to a state of engaging actively and fully in scanning and exploring the spectromorphological and spatial properties on offer. I cannot listen to everything simultaneously and need to devote attention to each of the zones in turn, accumulating a global view, which emerges over time. Note that in my account of the soundscape I used the present tense to describe the longer-term, ongoing activity and space, as if they embody a certain permanence, even though, in fact, the swifts' presence was relatively brief, the cicadas stopped once it became darker, and the frogs went on into the night; the river is still sounding as you read this. I chose to discuss passing events in the past tense, as completed actions, thereby recognising their more compressed temporality. I did not state how long I listened, and this is not important: I listened as long as I could, or needed to.

Possibly the most important strategy in arriving at an holistic view of the space-form of this experience is that I disregard temporal evolution: I can collapse the whole

[6]A graduated continuant is a morphology that enters gradually, faded in without attack (though this could happen quite rapidly), and exits in the same fashion; see Smalley (1997: 112–13).

[7]Source bonding is 'the natural tendency to relate sounds to supposed sources and causes, and to relate sounds to each other because they appear to have shared or associated origins' (Smalley 1997: 110).

[8]The space traversed by the trajectory of a sound.

[9]The breadth of frontal space, extending to the limits of the listener's peripheral view.

[10]The behaviour of the sounding identities of the zones accords with the gestalt grouping principles of similarity, proximity in space and/or time, continuity, organisation, context, belongingness and common fate as discussed in Handel (2006: 377–81) and Bregman (1990: 196–203)

Dennis Smalley, Space-form and the acousmatic image. In: Organised Sound 12(1), pp. 35-58. Cambridge University Press, 2007. (Auszug: S.35-38, Auslassungen = [...])



experience into a present moment, and that is largely how it rests in my memory. The temporal disposition of, and relations among, sounds serve to articulate and shape spectral and perspectival space, but even though my perception of sound is the product of time, I ultimately sideline time's formative role. So space can be more significant than time, or at least we can profit by starting with the idea that time can be placed at the service of space rather than the reverse. Time becomes space.

[. . .]

Dennis Smalley, Space-form and the acousmatic image. In: Organised Sound 12(1), pp. 35-58. Cambridge University Press, 2007. (Auszug: S.35-38, Auslassungen = [...])

## GLOSSARY

| | |
|---|---|
| Agential space | A space articulated by human (inter)action with objects, surfaces, substances, and built structures, etc. Combines with utterance space to create enacted space. |
| Approach/recession | Typical relational processes in perspectival space, concerned with shifts and movement between proximate and distal space, and/or between periphery and proximate centre. Associated with ouverture/enclosure. |
| Arena space | A sub-category of performed space – the whole public space inhabited by performers and listeners, within which gestural space and ensemble space are nested. |
| Automated mode of delivery | Where automated processes and systems are used to deliver perspectival space in public listening. |
| Behavioural space | A zone of perspectival space produced by the interaction of sounds which, spectromorphologically and texturally, indicate collaborative, group identity. See also 'signal space'. |
| Circumspace | In perspectival space – the extension of prospective and panoramic space so that sound can move around the listener and through or across egocentric space. |
| Circumspectral space | The spatial distribution or splitting up of the spectral space of what is perceived as a coherent or unified spectromorphology. |
| Containment/transcendence | How far the acousmatic image appears bounded within the physical confines of the listening space, and how far the image appears to transcend such confines. |
| Diagonal forces | The motion of spectral energy towards or away from a spectral region which acts as a plane. Planes can be expressed or implied. See 'gravitation'. |
| Distal space | The area of perspectival space farthest from the listener's vantage point in a particular listening context. |
| Distal interpolation | A temporary rupture in ongoing proximate space thereby permitting access to a distal view. |
| Egocentric space | The personal space (within arm's reach) surrounding the listener. |
| Elevated space | A high zone in perspectival space. Not to be confused with 'levitation'. |
| Enacted mode of delivery | The active diffusion of perspectival space in public listening. |
| Enacted space | Space produced by human activity – a space within which humans 'act'. See also 'agential space' and 'utterance space'. |
| Ensemble space | A sub-category of performed space – the collective space within which gestural spaces are nested. Can be thought of as a type of behavioural space. |
| Fixed mode of delivery | Where the delivery of perspectival space is integrated into the format of the composition, and is not further diffused via the enacted mode of delivery. |
| Gestural space | The intimate or personal, source-bonded zone, produced by the energy of causal gesture moving through space, as with performer and instrument, or agent and sound-making apparatus. |
| Gravitation | The attraction towards lower or higher regions of spectral space. See 'diagonal forces'. |
| Holistic space | An analytical stance, realised by mentally amalgamating an array of spatial forms into a unified spatial view. |
| Immersive space | The filling of spectral and perspectival space in circumspace so that the listener feels immersed in the image. |
| Lateral space | The extension of panoramic space towards the rear of the listener. |
| Levitation | A relatively effortless ascent in spectral space. |
| Mechanised space | A source-bonded space produced by sound-emitting machines, mechanisms and technologically based systems, independently of human activity. Can participate in enacted spaces. |
| Mediatic space | An amalgam of spaces associated with communications and mass media, creating an image of spaces, places, distances, events, etc. |
| Mediatised performed space | A type of arena space within which the transmission of gestural/ensemble space is mediated by technology (microphone, loudspeakers, video) in order to preserve the intimacy of gestural space. |
| Microphone space | A performed gestural or utterance space where intimacy of the image is magnified. Used for creating proximate and intimate spaces in the acousmatic image. |
| Nested space | In perspectival space – the embracing of one space within another. |
| Ouverture/enclosure | Typical relational processes in perspectival space, concerned with the opening up of spatial view by ceasing proximate activity, and the (en)closing of space through introducing proximate activity which masks or cuts off any distal image. Associated with approach/recession. |
| Panoramic space | The breadth of prospective space extending to the limits of the listener's peripheral view. |

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| | |
|---|---|
| Performed space | Spaces produced by intentional sound-making, as in musical performance. See 'gestural space', 'ensemble space', and 'arena space'. |
| Perspectival space | The relations of spatial position, movement and scale among spectromorphologies, viewed from the listener's vantage point. |
| Prospective space | In perspectival space – the frontal image, which extends laterally to create panoramic space. |
| Proximate space | The area of perspectival space closest to the listener's vantage point in a particular listening context. |
| Signal space | A type of behavioural space produced by the signal calls of the participants, either to communicate with each other, or to communicate their presence to other inhabitants. See also 'behavioural space'. |
| Source-bonded space | The spatial zone and mental image produced by, or inferred from, a sounding source and its cause (if there is one). The space carries with it an image of the activity that produces it. |
| Space-form | An approach to musical form, and its analysis, which privileges space as the primary articulator. Time acts in the service of space. |
| Spatial form | A smaller or larger spectromorphology or musical passage (but not necessarily an identifiable 'unit') that may be analysed according to its various perceived spatial attributes. Space-form is made up of spatial forms. |
| Spectral space | The impression of space and spaciousness produced by occupancy of, and motion within, the range of audible frequencies. |
| Tonal pitch space | The subdivision of spectral space into incremental steps that are deployed in intervallic combinations – a sub-category of spectral space. |
| Transmodal perception | The interaction and interdependence of various sense modalities. |
| Utterance space | A space produced by vocal sound. This may be an intimate, personal, or social space, and in communicational contexts can also be regarded as a behavioural space. Combines with 'agential space' to create 'enacted space'. |
| Vantage point | The position from where the listener views perspectival space, and perceives and receives the acousmatic image. The vantage point may be fixed, variable or peripatetic. |
| Vectorial space | The space traversed by the trajectory of a sound, whether beyond or around the listener, or crossing through egocentric space. |

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[. . .]

***

*Écoute*

Écouter, c'est concentrer l'attention sur ce que l'oreille perçoit et tenter de déchiffrer ce que les sons veulent dire. L'exemple musicien est extrême dans ce qu'il suscite : ici, écouter, c'est saisir les sons pour eux-mêmes, dans leurs rapports aux autres et au silence. Dans l'espace du quotidien, les données sont différentes ; le son résulte d'une organisa-

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tion qui lui est étrangère quant à la finalité des fonctions. S'il y a parfois possibilité d'agir sur les sources sonores, celles-ci resteront, le plus souvent, non déterminées dans leur manifestation temporelle. Autrement dit, le fait sonore n'est pas nécessairement voulu, il n'est que conséquent, involontairement présent. Comment dans ce cas composer l'espace du quotidien dans sa dimension sonore ? Précisément en agissant sur l'espace et ses caractéristiques acoustiques plutôt que sur ses sources sonores. Plus exactement sur les rapports entre les sources et l'espace de leur propagation.

Le concept d'écologie sonore s'est imposé par la confrontation historique entre l'univers actuel de sons résiduels et un monde où le son s'entendait et s'écoutait.

*Silence*

Le souvenir que l'on peut avoir d'un possible dialogue son/écoute restitue un milieu silencieux. Le degré maximum de *perspicuité* sonore – graduation de la transparence dans l'écoute – était la règle. Aujourd'hui, c'est l'exception. Cela veut dire que la continuité de sons mécaniquement ou électriquement reproduits – entretenus – masque la qualité silencieuse du milieu. - 53

La première réaction à cet état de fait a été de se protéger contre le déséquilibre sonore. Les murs anti-bruit, l'isolation phonique des bâtiments, la législation pallient au plus pressé et ont en commun d'être des actions négatives. Empêcher ne peut apporter une solution positive à la problématique d'équilibre sonore du milieu de vie. L'exemple de certaines voitures des Chemins de fer fédéraux suisses dans lesquelles l'emploi des téléphones mobiles est interdit en fait la démonstration. Il arrive que dans ces voitures certains voyageurs s'offusquent d'une discussion entre autres voyageurs, et leur demandent de faire silence. Ces personnes oublient que le train fait du bruit. On voit jusqu'à quel degré d'absurdité ces mesures peuvent conduire ; jusqu'à ne plus reconnaître une discussion entre personnes présentes et un entretien « à moitié virtuel ». Plus qu'un problème de voix à éliminer, il semblerait qu'il s'agisse de régler un problème de sonnerie. Et peut-être d'avoir un comportement social respectueux des autres, de leur silence et aussi de leur besoin de communiquer

C'est par un effet paradoxal que le recouvrement permanent de certains sons par d'autres a conduit à la prise de conscience de la réalité

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sonore environnementale. Il devenait alors normal de rechercher des lieux réputés préservés des nuisances et de les maintenir en l'état. Tout un travail d'archéologie sonore s'est développé autour de cette préoccupation. Le principe de la réserve dont s'inspire cette démarche, comme en d'autres domaines, recouvre une volonté de survie.

On imagine une voie moins exclusive, plus créatrice, dans une recherche équilibrée du milieu et de l'environnement sonores. La qualité acoustique, au-delà de sa référence de protection phonique, devrait être l'un des éléments constitutifs du projet architectural et urbain.

En l'absence de références – on n'a pas beaucoup construit pour l'oreille - une démarche expérimentale s'impose dans la recherche d'outils de représentation sonore.

Il apparaît que l'appréhension visuelle de l'environnement a bénéficié d'un apprentissage du regard. Des exigences esthétiques se sont révélées au fur et à mesure que la critique visuelle du milieu se développait. Une démarche analogue pourrait bénéficier du pouvoir de l'écoute en tant que révélateur de la configuration acoustique de l'environnement, tenant compte du fait que l'échelle sonore dépend d'une appréhension temporelle de l'espace.



Le *concept de rumeur* que nous avons imaginé met en œuvre la relation qu'il y a entre une globalité sonore et les émergences permettant de la caractériser. L'écoute analytique de la rumeur d'une ville aide à mieux saisir ce qu'elle est. Elle est manifeste de la configuration du lieu, de l'association de ses sources sonores dans leurs rapports sensibles aux formes naturelles et bâties du site. Sa définition va bien au-delà de celle du bruit de fond qui ne dit rien sinon que révéler un état de vie indéfini. (Dès qu'un bruit de fond est perçu, ce n'est plus un bruit de fond). Le concept de rumeur permet une définition plus pertinente de ce qu'est un site en comparaison des quelques sons isolés habituellement considérés comme éléments de reconnaissance d'une ville. (Sons qui souvent disparaissent vite et se font tout aussi rapidement oublier). La rumeur de Séoul est immédiatement reconnaissable, dissemblable de celle de New York.

Si les sons de la rumeur peuvent-être considérés en tant que composantes variables, l'élément invariable est l'espace, considéré comme volume de diffusion acoustique, participant de façon pérenne à la création de la *sonorité* du lieu. *Sonorité* qui se définit par ses caractéristiques de résonance valorisant certaines données acoustiques plutôt que d'autres créant ainsi une marque auditive unique, propre au lieu en question. Les collines qui entourent Séoul forment une « caisse harmo-

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nique » différente de l'espace de résonance de New York exprimé par l'alignement des grandes avenues et rues, de ses gratte-ciel entourés d'eau.

Un autre outil d'observation et d'analyse, le *concept de perspicuité sonore* peut aider à mieux définir la qualité d'un site. Il détermine le degré de reconnaissance des sons les uns par rapport aux autres dans une aire de perception auditive.

[...]

Le concept de *situation sonore* s'exprime par la mise en œuvre d'un format temporel résultant de la durée d'un événement ; passage d'un avion traçant un son dans le ciel, une averse s'installant dans le silence et disparaissant, le temps de passer d'un espace sonore à un autre... Il peut aussi se comprendre dans le temps nécessaire à la reconnaissance d'un rapport rumeur/émergence contenu dans un espace de résonance identifiable. Dans et avec ces temps et espaces déterminés, les faits sonores peuvent devenir les éléments constitutifs de modèles acoustiques urbains.



Rêvons à une ville dans l'utopie de ses espaces sonores maîtrisés. Elle se construit d'abord *lieu hors lieu du commun.* Son silence bruit de sons révélateurs. ses références sonores multiples et discrètes sont pertinentes dans ce qu'elles signifient. Jamais un son masquera un autre son. Le silence est continuité temporelle et spatiale qui laisse les sons apparaître ; *le silence a besoin de son et le son a besoin de silence.* Dans l'orchestre, tous les musiciens ne jouent pas ensemble tous les sons que leurs instruments pourraient produire, mais font silence dans l'ordre choisi pour laisser naître la forme musicale. Les dimensions des espaces, leur configuration, leur consistance physique, participent à la détermination formelle du corpus sonore d'un lieu. L'ensemble s'articule en parfaite adéquation ; *source, propagation, perception sont les tenants indissociables d'une chaîne acoustique maîtrisée.* Ensuite la ville se caractérise par des données sonores qui lui sont propres et reconnaissables.

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## ESQUISSE DE DÉFINITIONS

**Rapport entre silence et son :** Ce qui est à prendre en considération, c'est le son dans son rapport à d'autres sons comme dans son rapport au silence. Retenons l'idée que *trop de silence n'est pas plus acceptable que trop de bruit et que le besoin de silence correspond à un besoin de son.* Le silence devrait être constitutif de la structure sonore (musicale ou environnementale) pour que l'écoute puisse précisément s'exercer dans sa capacité à différencier les sons les uns des autres.

**Bruit de fond, rapport signal/bruit :** On ne peut se satisfaire de la maîtrise du *rapport signal/bruit* où seul est retenu le paramètre énergétique en tant que critère normatif. La notion de bruit de fond, et son corollaire, le *rapport signal/bruit de fond,* servent d'outil élémentaire pour la mesure quantitative du bruit ambiant. Nous avançons l'idée que le bruit de fond n'a plus lieu d'être, dès lors qu'il est écouté. À l'instant où il est consciemment perçu, il n'est plus un phénomène qui recouvrirait un continuum sonore uniformément qualifié .



**Rapport du son et de l'espace :** La source sonore n'est qu'une forme inachevée du phénomène acoustique. L'espace, l'entre-deux qui sépare la source de l'oreille, module le son tout autant que celui-ci participe à la détermination de l'espace. La projection sonore est qualifiée par les caractéristiques formelles et matérielles de l'espace alors que celui-ci en retour est partiellement défini par les phénomènes acoustiques qui s'y manifestent.

**Faits sonores :** *Le fait sonore* est défini par les paramètres physiques et les caractéristiques qualitatives du son qui s'inscrivent dans un contexte précis, comme le lieu où ils se produisent, pouvant associer plusieurs sons identifiables. Le lieu est déterminant par le rapport entre configuration, volume, matériaux qui le constituent et les qualités acoustiques qui en résultent.
Le temps ne joue pas un rôle déterminant dans le fait sonore, sinon pour en donner la durée hors contexte. Le fait sonore est un instant pris tel quel, sans évolution.
*Les faits sonores* peuvent devenir les éléments constitutifs de modèles acoustiques urbains.

**Environnement sonore/Milieu et… :** La musique peut être considérée en tant qu'instant et espace privilégiés du monde sonore. Une situation qui, cependant, s'inscrit dans un temps et un espace plus vaste que l'on peut qualifier d'environnement sonore.
Le concept même d'environnement sonore procède d'une distinction que l'on peut ressentir entre *milieu et environnement.* Le milieu, c'est l'espace où nous avons la capacité d'agir. L'environnement, pris dans un sens plus large, c'est tout l'espace perçu ici par l'oreille, sur lequel nous n'avons pas nécessairement la possibilité d'intervenir spontanément.

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**Rumeur : rapport rumeur, émergence :** *Le concept de rumeur* recouvre la globalité des sources sonores d'un lieu, associées par la nature acoustique de l'espace où elles se produisent. ce qui crée à travers leurs rapports réciproques une entité reconnaissable. *La rumeur* n'a pas de durée, (on ne peut connaître son début ou sa fin). *L'émergence* temporaire d'un son identifiable contribue à sa qualification, lui donne une « couleur », un format temporel provisoire. Des bruts isolés ne créent pas *la rumeur.* Pour que celle-ci existe, les sources en tant que telles ne sont pas identifiables pour/par elles-mêmes, sauf quand elles émergent temporairement. D'autre part, la rumeur se caractérise par la qualité de résonance propre à un lieu.
L'écoute analytique de la rumeur d'une ville aide à mieux saisir ce qu'elle est. La rumeur est manifeste de la configuration du lieu, de l'association de ses sources sonores dans leurs rapports sensibles aux formes naturelles et bâties du site. Elle se réfère non seulement aux caractéristiques des sons, par essence fugitifs, mais à des critères pérennes Sa définition va au-delà de celle du bruit de fond.
Dans la recherche de qualité environnementale, *la rumeur* pourrait être considérée en tant que valeur acoustique dont la qualité première serait de se situer en équilibre juste au-dessous du niveau sonore ambiant de celui qui la perçoit. Nous pouvons nous risquer à une comparaison avec une structure musicale connue : *la rumeur* est telle la note grave et tenue de la musique sur laquelle se valorise le contour aigu de la mélodie. Elle doit aussi se situer juste au-dessus du niveau, où le silence serait insupportable, parce qu'il laisserait apparaître le bruit de fond qui se produit en nous.



**Situations sonores :** *La situation sonore,* entité acoustique, met en jeu le son, l'espace et le temps dans leurs rapports réciproques. Le concept de *situation sonore* s'exprime par la mise en œuvre d'un format temporel résultant de la durée d'un événement ; passage d'un avion traçant un son dans le ciel, une averse s'installant dans le silence et disparaissant, le temps de passer d'un espace sonore à un autre... Il peut aussi se comprendre dans le temps nécessaire à la reconnaissance d'un rapport rumeur/émergence contenu dans un espace de résonance identifiable.
La recherche des limites de perception auditive est un moyen de définir une *situation sonore ;* avec la dimension temporelle, cela devient une sorte de mise en séquence d'une durée événementielle, qui se manifeste à l'oreille dans un site, à un moment donné.

**Sonorité :** *Le concept de rumeur* met en œuvre la relation d'une globalité sonore avec ce qui en émerge, dans la tentative de décrire, non seulement les sources sonores, mais aussi les conditions spatiales dans lesquelles elles se font entendre. Cet outil d'analyse d'un site à l'oreille conduit à définir ce qu'est *la sonorité* propre à un lieu. Au-delà d'une saisie élémentaire de signes sonores, toujours éphémères, il s'agit de prendre en compte des données qui expriment la configuration du site. Ses composantes formelles, matérielles, volumétriques créent les conditions d'une résonance qui lui est particulière, reconnaissable en tant que tel, qu'il est possible de nommer *sonorité,* créant ainsi une marque acoustique unique, propre au lieu en question. Si les sons de la rumeur peuvent-être considérés en tant que composantes variables, l'élément invariable est l'espace, considéré comme volume de diffusion acoustique, participant de façon pérenne à la création de la *sonorité* du lieu.

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**Perspicuité sonore :** Nous utilisons le terme de *perspicuité* pour exprimer et déterminer le degré de reconnaissance des sons les uns par rapport aux autres, dans un espace donné, tenant compte des critères de propagation sonore
Le degré de *perspicuité* varie avec la nature et la densité des faits sonores, les conditions de la propagation sonore, le climat, les vents, les saisons, les heures du jour et de la nuit, la matière, la dimension et la forme d'un espace délimité par les frontières auditives.
Le degré maximum de *perspicuité auditive* – sur l'échelle de graduation de la transparence dans l'écoute – pourrait être l'un des critères définissant la qualité acoustique de l'environnement.

**Entendre n'est pas écouter/écoute intérieure :** Ouïr, c'est la captation concrète, acoustique des sons. Entendre, c'est le sentiment que provoque le son en nous. L'une et l'autre fonctions ne sont que des étapes vers une prise de conscience de ce que dit le son, qui conduisent à l'écoute. Écouter, c'est sélectionner l'information qui passe par le son. C'est aussi la réaction qui suit et incite l'écoute à se renouveler, ou autrement dit, à porter toute l'attention sur le contenu et la raison du message sonore.
Contrairement à l'œil qui, *lorsqu'il est ouvert, n'est capable que de focaliser l'attention sur un point,* l'oreille a la faculté de capter en permanence, et même d'une certaine manière au cours du sommeil, une globalité de données, l'attention ne se portant sur un point sonore que quand il y a nécessité de s'y rapporter. C'est à cet instant que l'écoute se concrétise, l'oreille tendue vers une source qui « lui dit quelque chose ».
L'oreille se situe en permanence au centre d'une sphère où elle saisit indifféremment tous les sons qui s'y produisent. La limitation du champ sonore dépend de la capacité auditive des individus à percevoir les sons.
Le grand nombre et la diversité des informations reçues par l'oreille font qu'on ne peut en avoir constamment conscience. Il faut choisir. L'écoute est une activité qui demande de l'énergie avec la mise en œuvre du dispositif auditif dans toute sa complexité.
L'oreille capte et engrange une multitude de données qui restent gravées dans la mémoire, parfois à tout jamais. Elle sélectionne sur l'instant ce que nous lui demandons de retenir, laissant le reste en attente d'une exploitation possible.
Le rapport qu'on a, volontaire ou non, à l'espace et au temps du quotidien, ne peut faire abstraction des passages entre dedans et dehors. À la sphère sonore, c'est-à-dire le volume au centre duquel nous évoluons physiquement, se superpose, par moments, une autre sphère d'écoute intérieure justement alimentée par ce que la mémoire auditive a retenu dans le champ des impressions reçues, des émotions vécues.



[...]

Pierre Mariétain, Lire la ville à l'oreille. In: Pierre Mariétain, L'Environnement Sonore. Approche sensible, concepts, modes de représentation. Nîmes, 2005. S. 49-57. (Auszug: S.52-56, Auslassungen = [...])

**Perspicuité sonore :** Nous utilisons le terme de *perspicuité* pour exprimer et déterminer le degré de reconnaissance des sons les uns par rapport aux autres, dans un espace donné, tenant compte des critères de propagation sonore
Le degré de *perspicuité* varie avec la nature et la densité des faits sonores, les conditions de la propagation sonore, le climat, les vents, les saisons, les heures du jour et de la nuit, la matière, la dimension et la forme d'un espace délimité par les frontières auditives.
Le degré maximum de *perspicuité auditive* – sur l'échelle de graduation de la transparence dans l'écoute – pourrait être l'un des critères définissant la qualité acoustique de l'environnement.

**Entendre n'est pas écouter/écoute intérieure :** Ouïr, c'est la captation concrète, acoustique des sons. Entendre, c'est le sentiment que provoque le son en nous. L'une et l'autre fonctions ne sont que des étapes vers une prise de conscience de ce que dit le son, qui conduisent à l'écoute. Écouter, c'est sélectionner l'information qui passe par le son. C'est aussi la réaction qui suit et incite l'écoute à se renouveler, ou autrement dit, à porter toute l'attention sur le contenu et la raison du message sonore.
Contrairement à l'œil qui, *lorsqu'il est ouvert, n'est capable que de focaliser l'attention sur un point,* l'oreille a la faculté de capter en permanence, et même d'une certaine manière au cours du sommeil, une globalité de données, l'attention ne se portant sur un point sonore que quand il y a nécessité de s'y rapporter. C'est à cet instant que l'écoute se concrétise, l'oreille tendue vers une source qui « lui dit quelque chose ».
L'oreille se situe en permanence au centre d'une sphère où elle saisit indifféremment tous les sons qui s'y produisent. La limitation du champ sonore dépend de la capacité auditive des individus à percevoir les sons.
Le grand nombre et la diversité des informations reçues par l'oreille font qu'on ne peut en avoir constamment conscience. Il faut choisir. L'écoute est une activité qui demande de l'énergie avec la mise en œuvre du dispositif auditif dans toute sa complexité.
L'oreille capte et engrange une multitude de données qui restent gravées dans la mémoire, parfois à tout jamais. Elle sélectionne sur l'instant ce que nous lui demandons de retenir, laissant le reste en attente d'une exploitation possible.
Le rapport qu'on a, volontaire ou non, à l'espace et au temps du quotidien, ne peut faire abstraction des passages entre dedans et dehors. À la sphère sonore, c'est-à-dire le volume au centre duquel nous évoluons physiquement, se superpose, par moments, une autre sphère d'écoute intérieure justement alimentée par ce que la mémoire auditive a retenu dans le champ des impressions reçues, des émotions vécues.



[...]

Jian Kang, Soundscape description in urban open public spaces. In: Jian Kang, Urban Sound Environment. London, 2007. S. 91-94. (Auszug: S.91/93, Auslassungen = [...])

## 3.8 Soundscape description in urban open public spaces

To investigate the acoustic environment of an urban open space or to design a soundscape, it is important to develop an appropriate description system. Raimbault *et al*. (2003) suggested that three categories of analysis should be considered for urban open public spaces: activities such as human presence or transport, spatial attributes like location, and time history including moment or period.

[. . .]

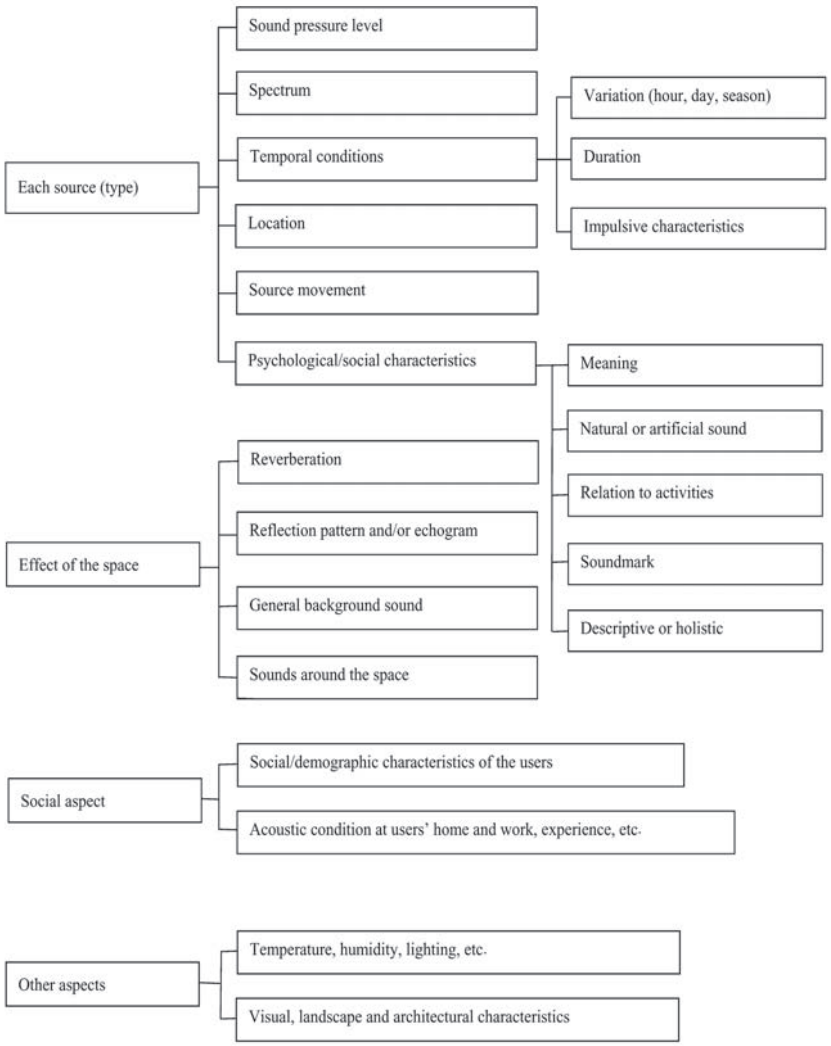
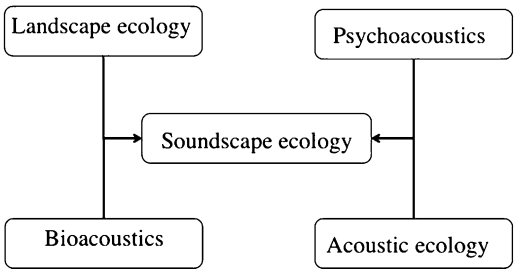



*Figure 3.19* A model for describing the soundscape of urban open spaces.

[. . .]




[. . .]

## 1.6 The Three Sources of the Sonic Environment

The soundscape is the result of the mixture of different and concurring sounds. According to the source of such sounds it is possible to distinguish a geophonic component, a biophonic component, and an anthrophonic component. We refer to a physical dimension of the soundscape as a first descriptive approach, and this represents the more simplified and objective classification of a soundscape.

This distinction is particularly useful especially when we intend to explore the relationship between soundscape patterns (sonic patches or sonotopes) and landscape configurations.

### 1.6.1 Geophonies

The geophonies are represented by all the sounds produced by nonbiological natural agents such as winds, volcanoes, sea waves, running water, rain, thunderstorms, lightning, avalanches, earthquakes, and floods and represent the sonic background with which other sounds can overlap, mix, or mask. The geophonies are strongly affected by the geomorphic trait of a region (steepness, exposition, etc.) and by climatic conditions and local weather.

The morphology of a region, the presence of valleys, canyons, ridges, and cliffs, determines a different propagation of sounds strongly affecting the sonic degradation. Breeze regime, air humidity, and temperature affect the propagation patterns of sound waves. In the water environment, depth, salinity, and temperature are important drivers of the sonic processes.

### 1.6.2 Biophonies

The biophonies are defined as the emerging nonhuman sound produced by living organisms in a given biome (Krause 2012, p. 68). Every biome, and inside the biomes every landscape patch (ecotopes), have distinct biophonies.

In temperate terrestrial biomes, the majority of the biophonies are produced by birds, frogs, insects, and mammals.

In tropical regions, insects and frogs dominate, followed by birds and mammals. In the freshwater environment, insects and fishes are important components. In shallow seawater, crustaceans are the dominant "musicians," but in deep-sea waters whales, dolphins, and killer whales (orcas) are the most frequent biophonic sources.

Although not included by Krause, human voices must be considered to pertain to the biophonies. The complexity and plasticity of such acoustic expression known as voice is a human peculiarity.

Biophonies have different patterns according to latitude, season, and hours of day. In fact, vocal animals are more active during the day in particular hours (e.g., birds and frogs perform choruses at dawn and at dusk), varying with the seasons (e.g., birds are acoustically active in springtime), and according to latitude (e.g., in intertropical regions birds are acoustically active at all times, but are silent outside the breeding season at high latitudes) (Fig. 1.2). In subtropical regions, seasonal invariance reduces the seasonal effect, whereas the effects of seasonal changes are maximal in boreal and polar regions. This reasoning can be applied to terrestrial biomes: in marine biomes, other factors are concurrent such as currents, light penetration, sea depth, and water transparency.

A long-term fluctuation of vocal activity can be expected according to the changes in phenological cycles under climatic changes.

The acoustic activity of animals is finalized to communicate actively or passively with other intra- and interspecific individuals for several reasons and functions.

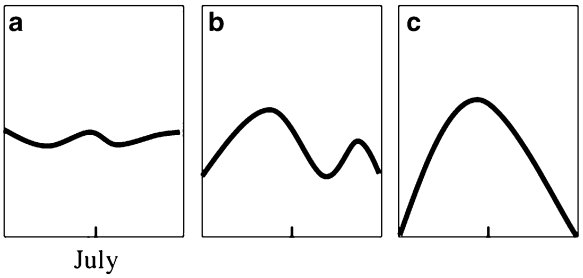



**Fig. 1.2** Biophonies have different patterns during the year according to latitude. (**a**) At intertropical latitudes, animals are acoustically active all year around. (**b**) In temperate regions, biophonies have a major peak in spring and a second peak in early autumn. (**c**) At the highest latitudes, there is a peak only in the middle of summer, with a dramatic reduction of biophonic sounds during the rest of the year

This phenomenon activates communicative channels that concur to the acoustic complexity that we can hear around us. The apparent complexity of the acoustic communication largely depends on factors such as species-specific acoustic performance, population density, number of species composing the local aggregation (community), time of the day, and season, and finally by the typology of the vegetational cover (biomes and ecoregions). All these factors are strongly affected by geographic positioning along the parallels.

With the use of digital technology, the expansion of magnetic memory and highly sophisticated microphones and amplifiers assembled into programmable devices for long-time autonomous (in terms of power supply) operation, the recording of soundscapes has made a leap forward during the last decennia. Despite these tremendous improvements, however, until now there have not been processes able to identify automatically every type of sound. This limitation poses problems in the identification of the components of a soundscape and largely reduces the possibility of efficient evaluation of the potentialities expressed in distinct sites.

At the moment it is not possible to identify all the species that compose a soundscape, but nevertheless new approaches are available.

Acoustic diversity, expressed in terms of frequencies, became an important matter of investigation and of estimation of the complexity that we can expect in a specific site or habitat. Acoustic diversity cannot be correlated with biological diversity, at least in birds (Gasc et al. 2013), but nevertheless a high acoustic diversity is associated with a specific assemblage of species. In fact, species such as birds that have a special organ, the syrinx, to produce sounds, are able to produce a great variety of sounds.

Biophonies present different dynamics according to the temporal scale of resolution.

Observations of a breeding colony of European starlings at the University Farm, Wytham (Oxfordshire, UK) by Wright and Cotton (1994) have demonstrated the alternation of singing momentum with feeding activity at the ground. This alternation occurred twice per hour, but as egg-laying time approached, the majority of birds spent their time close to the breeding colony.

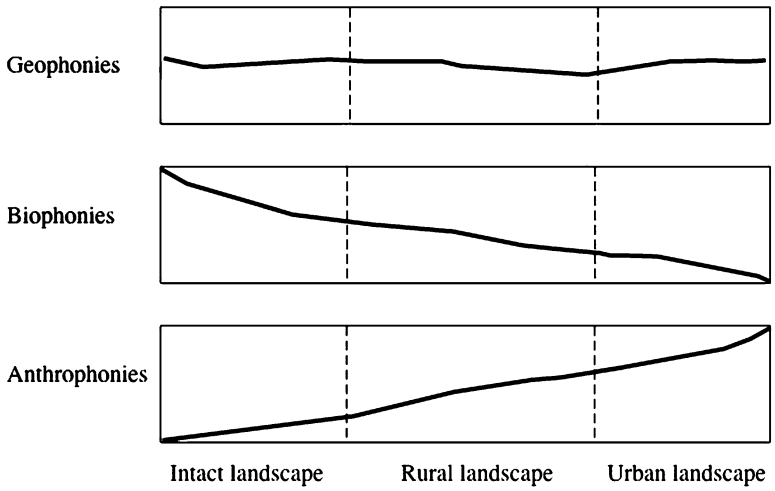



**Fig. 1.3** Along a gradient of increased human intrusion (from intact natural landscape, through rural landscape, and to urban landscape), geophonies seem to be not affected, biophonies show a clear decrease, and finally anthrophonies increase

This behavior decreased in sharpness and intensity later in the season when breeding behavior was more demanding: the switch between episodes of feeding and singing was less definite as the breeding season advanced. Singing time at the breeding stage represents a way to affirm social cohesion and to transmit a focused message to the females.

### *1.6.3 Anthrophonies*

The anthrophonies are the results of the movements of artificial devices such as cars, train, airplanes, industrial machinery, and bells. This component of the soundscape is becoming intrusive and dominant in large parts of the Earth, associated with urban development and globalized trade. Antrophonies are the major cause of noise pollution, a phenomenon that has revealed dangerous consequences to all organisms and to human health also, producing relevant modifications of behavior in both human and nonhuman animals. In humans, high levels of noise can cause annoyance and aggression, hypertension, hearing loss, additional stress, tinnitus, hearing loss, sleep disturbance, etc. Long-term exposure to high levels of noise can contribute to cardiovascular pathology and to an increment in blood pressure. In Chaps. 5 and 6 are presented more details about the characteristics and consequences of exposure to noise.

Anthrophonies increase in importance moving toward urban areas and close to industrial and transport infrastructures (Fig. 1.3) such as highways, airports, and air corridors. Anthrophonies change according to the different structure and function of cities and the social and economic context. A sonic gradient across a city is intercepted by the economic value of houses, fixing their price.

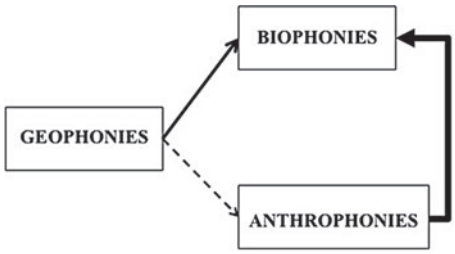



**Fig. 1.4** In the soundscape, geophonies are the sonic sources that have a direct influence on biophonies and secondarily on anthrophonies. Anthrophonies can strongly impact on biophonies

### *1.6.4 The Relatioships Between Geophonies, Biophonies and Anthrophonies*

The interaction between geophonies, biophonies, and anthrophonies determines peculiar patterns in the sonic environment. The geophonies represent the independent variable when compared with the other two sources; its influence is the main constraint especially affecting the biophonies (Fig. 1.4).

It is demonstrated that high levels of geophonies or anthrophonies depress the biophonies or modify the way in which organisms emit sounds (songs, calls, alarms, vocalizations).

For instance, a windy day depresses the song of most birds, and proximity to a heavily traveled highway prevents acoustic communication among the majority of vocal species living in the neighborhoods. Figure 1.5 shows a map of a soundscape created plotting recording sessions with sampling stations.

The depression in soundscape activity that is observable on the right side of the picture is coincident with the presence of a small river, whose noise masks or depresses the biophonies (mainly produced by birds).

Climatic events are important constraint for biophonies. The anthrophonies can produce severe changes in biophonies when these are of strong intensity, as close to an airport. Anthrophonies (ship engines, drilling platforms) have dramatic effects in both shallow and deep waters, affecting the survival of whales and other cetaceans.

In urban areas, the presence of vegetation in parks and along the avenues reduces the effect of traffic noise and noise in general, as well documented by Voichita Bucur in the 2006 book *Urban Forest Acoustic* (Bucur 2006).