

# The Extended Environment

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## Abstract

The potential in electroacoustic music to amalgamate sounds of natural real-world sources with the powerful signal processing and synthesis offered by computers makes possible interplay between different levels of sonic "reality" and "abstraction". A range of works are discussed in terms of this reality-abstraction continuum, suggesting ways in which articulation of the continuum, through mediation and juxtaposition, offering a useful level of structural interpretation in electroacoustic music.

## 1. Introduction: Defining the Continuum

The terms "reality" and "abstraction" are used in this paper as a way of describing extreme possibilities in the overall sound palette in electroacoustic music: from recognisable environmental or cultural sources to transformed or synthetic sounds which do not equate with normal real-world listening experience. However, in the acousmatic medium of electroacoustic music distinctions between "reality" and "abstraction" are not always clear-cut. Therefore, the seemingly infinite range of ambiguous states between these two polarities form a continuum, within which there are not necessarily fixed or absolute increments. The reality-abstraction continuum is moderated by the fact that our listening habits in normal real-world experience are strongly oriented towards assigning sources to sounds. At one level, this allows us to interpret these as "signs" denoting objects (animate and inanimate) or situations, while our apprehension of reality in these terms may be object-specific or context-specific. For instance, a closely microphoned studio recording of speech and a recording of people talking at a party present quite different aural images of reality. Contextualisation of sources, whereby a collection of aural cues aid overall recognition [Wishart, 1985] also plays a vital role in defining the "reality" extreme of the continuum.

But we are also able to make judgements about how a physical object is behaving in the creation of the sign. In this respect a further level of distinction is described by Denis Smalley as *source-cause*, [Smalley, 1993] differentiating between what we hear as the "source" (the actual vibrating physical entity), and the means by which the sound is initiated as the "cause" (application of some form of energy to the source). In musical terms, the real world may be alluded to at either of these levels independently, and this is one of the prime origins of ambiguity. For instance we might hear changes in a sound's spectrum which suggest the articulation of vowel sounds in human speech (giving the impression of the sound being controlled in terms of the resonances of the human vocal mechanism), yet superimposed on a spectral identity that does not equate with our knowledge of vocal sound.

In somewhat broader terms, [Smalley 1992] has also proposed nine *indicative fields* in an attempt to identify useful areas of analogy between perception of sounding materials in musical contexts and wider aspects of human experience. These fields offer a multi-dimensional way to distinguish between the medium's unlimited range of possible sounds, namely in terms of: gesture, utterance, behaviour, energy, motion, object/substance, environment, vision and space. As an example, the behavioural field describes with the way sound identities appear to interact, and the apparent nature of that interaction. But it may be that interaction is heard in terms of the spatial field, so that the indicative fields are "networked" in the full description of the aural experience. Allied to these indicative fields is the concept of *surrogacy*, a way of describing the electroacoustic potential to manipulate sounds so as to alter or weaken their perceived source-cause. *First order surrogates* are those where source-cause relationships are detectable and the direct effects of human gesture are sensed, while *second order surrogates* are more ambiguous with, for instance, traces of human causal gesture and sources that respond in ways difficult to define in terms of known physical models - although they may be based on them. *Remote surrogates* are those where physical cause is uncertain and will tend to be deduced by a psychological interpretation, where the listener may be drawn to matching certain aspects of a sound's morphology to known source-cause patterns, though these may be fleeting, hybridised or in state of constant flux. Where remote surrogacies dominate, listening focus will tend to be at a more abstract level, where distinctions and oppositions are heard in terms of spectral and morphological patternings and motions. This is a useful way of interpreting the "abstract" phenomenon - context-related and always subject to the prejudices of source-cause conditioning. Overall, the notion of surrogacy is applicable also to sounds which are of environmental origin, as our absorbed knowledge of the real world allows us to make judgements about source-cause relationships in wider environmental contexts.

The tendency towards source recognition is an important perceptual thread linking this range of surrogates. Everyday experience provides a basis of known sounding objects and situations against which we can judge the likely sources and causes of any sound event, while "abstraction" is a measure of

the psychological distance between a sound which displays source-cause ambiguity and a surmised source-cause model. Furthermore, the acousmatic nature of the electroacoustic medium means that source-cause relationships have no visual verification, so that while a listener may still be disposed to attempt recognition of sources, the potential for ambiguity is increased. The extremely open potential for timbral manipulation with computers further emphasises this as the familiar sounds of culture and environment continue to open to extension towards the realms of abstraction.

## 2. Articulation of the Continuum

At this point I wish to suggest that there are two basic methods by which the continuum between reality and abstraction can be tangibly articulated in electroacoustic music, namely through *mediation* and *juxtaposition*. Mediation is achieved through gradual shifts in surrogacy level, which may be heard in terms of a progressive interchange of a number of distinct sound identities, or where a specific identity is heard to change surrogacy level as a *transformation* along the reality-abstraction continuum. Transformation in electroacoustic music is itself capable of definition at a variety of levels and in a range of contexts, as outlined by [Smalley, 1993]. Juxtaposition involves the direct combination of sounds of typically quite polarised orders of surrogacy, (either sequentially or simultaneously), or through the combination of real-world sounds such that a "surreal" effect is created, thereby suggesting a physical environment which is at a remove from known physical reality. In musical contexts these articulations are not mutually exclusive. Our attention may be shifted freely from one type of articulation to another within the same work.

Bernard Parmegiani's *La Création du Monde* (1982-84) provides an elegant example of the handling of abstraction-reality continuum on a large-scale, particularly in the third movement "Signe de vie" which, taken as a whole, is marked by transition towards realistic sounds out of materials of remote surrogacy. For example, in the second section of this movement ("Aquatisme") a sound identity first heard at 0'32" oscillates between abstraction (in the form of rapid and very regular quasi-pitched iterations) and realism (as water droplets). This creates the aural effect of a substance which forms and deforms in and out of a realistic state, yet retains a coherent overall identity (strongly defined by correlations in morphology and relative pitch - as though the droplet "pulses" were condensed into an iterative state). The fifth section ("Expression 2") - which contains oblique reference to vocal sources that never cohere into distinct utterance (0'37"), and extended attackless envelopes which suggest the pitched resonances of breath through a tube (1'07") - builds to a considerable climax of continuous multi-layered resonance that eventually devolves at (7'09") into a downwards

glissando of pitch (possibly of vocal origin), to the final section ("Réalité"), where we are presented with an open space environmental scenario, defined by wind-noise, buzzing of insects, cicadas and distant birdsong, with some kind of animate movement perceptible the space, though too amorphous to identify a specific source-cause. This scenario emerges essentially as a juxtaposition, but one which is heard quite possibly as an organic resolution of the fragmented hints at reality in the previous sections. Overall then, the reality-abstraction continuum is harnessed as a metaphor for "creation" - as sound materials progressively form and deform from abstraction towards recognisably naturalistic states.

Denis Smalley's *Tides* (1984), is a work in two movements, each of which focuses on different aspects of analogy between water and sound. The first movement "Pools and Currents" is mostly concerned with mixtures of second order and remote surrogacies, the former relating clearly to the spectral and morphological characteristics of bubbling water - initially from 50" to 3'39", with brief references at 6'44" and 11'43", as a textural underlay to inharmonic resonances at 12'05" (where the discrepancy between levels of surrogacy approaches a juxtaposition), and at 13'25", where the bubbling morphology is heard as a band of mid-range frequencies and shifts in more sustained resonances, while at 14'35" low frequency components help relate this back to the spectral character of the "original" sound. (From 12'45" there are further contextualising water morphologies of delicate flow and droplets.) While the similarities in morphology between these elements do suggest a transforming identity, their function is that of a more general mediation between areas of remote surrogacy and the known qualities of a real-world sound source. Ambiguity of source is a chief feature of this piece. The very opening gestures with their attackless low frequency band sweeps of noise are more indicative of breath envelopes than water, yet the pitched elements that progressively emerge as residue of the gestural energy might be thought of as analogous to the play of water - such as the complex subsidiary motions and patterns that emanate from the motion of an object through water. Though the surrogacy level remains remote until the first water-like textures at 50" emerge, even here the pitched resonance peaks of these are too stable in pitch and granular in texture to indicate a "real" water source. In general the emergence of sounds which we relate clearly to the "reality" side of the continuum have an important role in mediating between the patterns and motions of the remote surrogates and our acquired real-world experience of water sounds, thereby allowing a focused interpretation of the piece in terms of the water-sound analogy.

Trevor Wishart's *VOX-5* (1979-86) is concerned with transformation between different recognisable sound sources, with heavy emphasis on vocal material. These transformations are spread over varying time-lengths, depending on the actual

nature of the transformation [Wishart, 1993], and frequently put the listener in the position of having to judge the degree of "reality" in the perceived sound. In the opening of the work, out of an initial "environmental" scenario (with wind-noise and the approach of a flock of crows), we become aware of a new sound identity at 32" which, is sufficiently distinct in spectrum from the prevailing "wind noise" and "bird" sources to be heard as a new identity. Different source-cause interpretations then present themselves. Does it indicate the presence of some new source-cause in the context of the environment in which we have been placed (such as oddly resonant wind noise or even another type of bird call)? Or does it indicate that the environmental scenario (in the virtual acoustic space before us) is being undermined in some way? Either way, there is a strong inclination to direct attention to the internal details within this new sound in order to establish more clearly a source-cause relationship (at 48" a mid-high frequency band of "wind-noise" tends to temporarily prevent us from hearing such detail, enabling our source-cause query to be temporarily suspended). At 54" increased proximity of this identity reveals a "bubble-like" morphology, while by 1'14" it is clear that the environmental image has been eroded, as the previously separable identities become fused into a more dense spectral mass rapidly evolving towards a short voice-like attack at 1'17" followed by a continuous ululations of possible vocal origin, leading to the first distinctively vocal sounds of the piece at 1'34". In this case it is the slow spectral changes, analogous to shifts in vowel formants, suggesting vocal sources as an underlying reference. So while this opening sequence does not settle on an abstract state, source-cause ambiguity temporarily hints at abstraction, and heralds the overall context of unstable source identification and metamorphosis between signs so characteristic the piece. Of interest is the way this propels musical time forward in *VOX-5* - the transformations do not appear as reflective musical extensions of sound but as forward moving progressions which we expect to lead us somewhere to a new realistic identity. The process of human utterances mutating and reforming in environmental contexts (as well as "out of" and "into" the environment itself) could be taken at this level as a metaphor for a unity between human presence and environmental phenomena.

*Tense Test* (1985-86) by John Cousins is a work which exploits distinctions within the reality-abstraction continuum, while focusing on a very specific social issue. The piece sprang from a portion of an interview made with the composer in which the "male role society" is being discussed - in particular whether or not men are able to achieve a personal integration of intellect and emotion. At one level, this topic unifies sounds that span a range of surrogacy orders, while the piece also relies heavily on semantic meaning for projection of its message. The process of question and answer is taken up in the piece, as the attempt is made to reveal the full implications of the topic. *Tense Test*

falls into two main sections in the second of which we enter an extended interplay between apparent "reality and "abstraction". The question/answer process is continues in a range of domestic scenarios such as lawn mowing and telephone calls, as the interviewee "thinks aloud" belated responses to the whole issue. This section of the piece is also underpinned by a continuous low-pitched resonance which functions in two ways. Firstly as a malleable identity into and out of which recognisable sounds are made to transform (at 13'08" a rotary telephone dial sound blends into the resonance, and merges into a lawnmower sound, initiating another of the domestic scenes). At another level, this resonance is able to create musical tension in more abstract terms. For instance at 16'20" subtle increases in amplitude, internal modulation and pitch level alone create an expectant tension, possibly because the implication is that the sound may again begin a process of transformation to a new identity. In this way, *Tense Test* contains examples of both simultaneous-juxtapositional and transformational articulations of the reality-abstraction continuum. As a result, further interpretative conclusions are possible, namely that the realistic material presents the outward expression of the subject's reaction to the topic, while the abstract material is analogous to the emotional turmoil that is clearly generated.

Juxtaposition of materials with different levels of surrogacy is therefore able to produce the effect of parallel states of reality and abstraction. This is achieved sequentially in Jacques Lejeune's *Deux aperçus du jardin s'éveille* (1983) providing a further example. The initial recognisable sound of a camera shutter and motor drive is followed immediately by a pulsating pitched resonance, with no distinctively real-world origin. Subsequently heard mixed with this material are more realistic sounds (especially birdsong, with the "most realistic" version at 4'45", and a somewhat mechanical type at 5'55"). The distinctive and recognisably "real" camera sound highlights for us the reality-abstraction continuum and the camera becomes a metaphor for "observation" of the "environment" that is formed before us.

### 3 The Spatial Dimension

Distinction between reality and abstraction need not be confined to the orders of surrogacy of sound-objects themselves. As soon as sounds are articulated in a tangible three-dimensional spatial field, an important aspect of environmental reality has been analogised. A good example of this is in the opening Denis Smalley's *Valley Flow* (1992), a work in part inspired by contemplation of environmental space and scale. The work begins with gradual accumulation of spectral layers around the textural properties of an opening granular resonance that pans across the stereo space. The slight pitch instability of the initial sound and its faintly granular quality could be taken to suggest that there are aspects of detail within the sound that

we are yet to hear. These are emphasised as fluctuations in spectral spread (perceived as layers) over the first 1'30", is associated with occasional increased prominence of iterations within these layers, until at 1'48" one such layer (which emerged at 1'40") is propelled to the very front of the stereo space "exploding" as a multitude of short fracturing morphologies. This creates the sensation that iterative detail, always latent within the sounds has been revealed as a result of the sound's trajectory towards us. In this way, the sound obeys one of the laws of perceived space, that the closer we are to it, the more we hear of inner detail. Although the sound itself is not specifically from a particular environmental or cultural source, it nevertheless serves to define a "realistic" acoustic space, and behave as though it were a physical entity, capable of being observed from different vantage points.

In terms of spatial articulation, the practice of multi-loudspeaker sound diffusion should also be mentioned. Whilst in any large performance space this becomes an essential way of ensuring that composed spatial dimensions are clearly conveyed, it can also articulate the way both realistic and abstract events are perceived. For instance, an environmental scenario might be presented as though "observed" by the listener on a frontal plane, or can surround listeners giving the sensation of being "in" the environment.

#### 4. Links with Performance

The combination of live performance on conventional instruments with electroacoustic music naturally adds a dimension of visual correlation between physical action and sound, otherwise left to the imagination in purely acousmatic music. This is able to impact on the way the reality-abstraction continuum is perceived and can suggest theatrical exploitation of the mechanics of performance, or the interaction between player and instrument. I attempted an integration along these lines in a work for tuba and tape *Inside Out* (1991). The instrumental writing in this work was aimed at a gradual evolution from discrete pitch-based material to unpitched material (a transition through the continuum of note-to-noise). Because of the nature of the instrument, this could be done by the player breathing through the tuba to produce bands of filtered noise, in effect amplifying the breath. By mounting a small loudspeaker inside the bell of the tuba, pre-recorded breathing sounds are then interpolated with the player's breathing. The resulting ambiguity of source (is it the player or the instrument?) is further enhanced with a prepared tape of transformed breathing sounds diffused over loudspeakers surrounding the audience and submerging the sounds of both player and "tuba". Transposition of these breathing sounds enabled an expanded, surrealistic breathing texture to be created, building on the theatrical context in which the normal "reality" of player/instrument interaction

becomes separated, and transferred to an enlarged view of the the initiating human energy source of the instrument - the breath.

#### 5. Summary

The reality-abstraction continuum provides a broad framework within which it is possible for the composer to forge distinctions and oppositions between the totality of possible sound sources in electroacoustic and computer music. The continuum functions through one of the most fundamental of normal listening modes, that of source-cause recognition, thereby potentially drawing on a listener's overall set of cultural and environmental listening experiences. As a whole, the works discussed in this paper show that the reality-abstraction continuum can be taken as a wider metaphor for relationships between physical "states" of matter (*La Création du Monde, Tides*), or relationships between the human and environmental world (*VOX-5*). It may also be used to imply different levels of human awareness by virtue of the polarity between as signs from the real world and more abstract materials which project an "other-worldly" nature. This can draw attention to our tendency to observe nature (*Deux aperçus du jardin s'éveille*) or, where content is specifically focused on some aspect of human awareness, suggest analogies for the interaction between the outer world of action and signification and inner emotional states (*Tense Test*).

While the reality-abstraction continuum is but one broad area of distinction between materials in electroacoustic music, it is one rooted in the the way we perceive and interpret the world and ourselves, making it one of the most "human" of structural levels in the medium.

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