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# Sounds and Structure of Electroacoustic Music: Investigating the Phenomenon of 'Key Sounds'

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This study concerns those sounds in electroacoustic music (EAM) that capture our attention, intrigue us and contribute to musical structure. The types of sounds that carry this weight are those with referential, semantic and particularly human qualities that have an immediate effect on the listener. It is suggested that these types of sounds operate on a surface level and act as signifiers, or a 'way in' to EAM. It is therefore appropriate to consider these as 'key sounds', for they 'unlock' the imagination, allowing the sublime to be revealed from the depths of 'abstract' language.

In framing this research I refer principally to one of Denis Smalley's nine *indicative listening fields* known as *behaviour*. This field, which is archetypal in nature, concerns the phenomenon of *dominance/subordination* that occurs naturally when sounds are placed within a context. Smalley (1996, p.87) defines the three attributes within this field as *spectromorphological activity*, movement within *space*, and most overtly, the *indicative impact* of the sound. Sounds containing such data inadvertently dominate over static or background morphologies. These attributes are often interleaved, operating concurrently in any given sound, and cannot be separated during the listening process. However, in direct comparison, sounds with primarily *indicative* traits will ultimately dominate over those with merely spectral or spatial activity.

The key sound phenomenon extends Smalley's theory by delving deeper, particularly into the *indicative impact* of sounds, whilst hinging on Nattiez's epistemological reasoning, (1990, p.9), that an object takes on meaning for an individual when it can be placed in the context of his/her lived experience. Whenever a referential sound is placed within a sonic texture containing more 'abstract' qualities, unconsciously the listener will place the abstract material in the background simply because referential sounds are difficult to ignore, largely because they carry immediately attainable 'meaning'. As soon as the referential sound ceases to dominate the musical texture, the abstract material comes back into the foreground of our perception and a relationship between the two sound types, often of an allegorical nature, is formed. Essentially, the supposed meaning of the abstract material will resonate in sympathy with the data carried by the referential sounds. This listening process, or course, operates along a continuum – the switch of focus is never a binary.

Key sounds also contribute significantly to the structure of EAM. Key sounds may be inserted at specific points during an abstract composition to signify changes in mood or thematic direction. Without the presence of key sounds, highly abstract EAM is in danger of alienating the inexperienced listener – not exhibiting enough *behavioural* data in the sounds to hold the listener's attention or contribute to structural elements of the work.

The key sound phenomenon raises a number of questions regarding the structural entities of EAM. What types of sounds are (retrospectively) most memorable for a listener? The term retrospectively is used here because music is most often contemplated and discussed after the listening experience. Do these sounds then play an active role as signifiers of 'meaning', in that event or perhaps the overall piece? These questions outline the problem to be addressed in this research, the purpose of which is simply to develop a construct, based on the listening experience, which may be reversed for use during the compositional process, particularly in periods of critical reflection.

This study was primarily spurred by my own creative practice, the development of which has remained at the vanguard of my thinking on this issue. Theoretical expansion and knowledge was gained from a literature review as well as a number of panel discussions involving lecturers and postgraduate students of EAM at the University of Auckland. To add rigor to these discussions, from which a useful construct could be based, a study was undertaken using Landy's listening test methodology from the *Intention Reception Project* (2006). In isolation, weak conclusions were formed from each paradigm. However, when combined, strong correlations were noted between the test results, literature and evidence from my own creative practice from which supportive conclusions could be made.

## Listening Test Methodology

Landy's methodology (2006, p.32) was specifically designed to compare the accessibility of EAM to listeners of different calibres (inexperienced, experienced and highly experienced), with special consideration of the composer's intention. My investigation, however, is not concerned with intention; rather, it focuses on the listener's response to the dominant or key sonic material, its effect and its role as a structural entity.

The pieces studied were Dennis Smalley's *Pentes* and John Cousins' *The Quarter*, both of which are distinguished EAM works. These pieces were carefully selected for their polarised musical discourses, in order to identify the extremities at which key sound phenomenon can operate. The Cousins work exploits referential and purely semantic data (in the form of human speech) in an episodic fashion between extended sections of contrastingly abstract sonic material. On the contrary, the majority of sonic materials exuded in the Smalley work do not allude to referential entities.

## The Questionnaires

This study utilised ‘real-time’ and ‘directed’ questionnaires to collect data. The ‘real-time’ questionnaire contains one simple direction: “please list any thoughts, images and/or ideas that come to mind as you listen to the composition”. The listeners simply take informal notes at their own discretion while listening. This documents the immediate reaction of the participants without hindering the listening process by having to answer specific questions. After the piece of music had been listened to, participants were then given fifteen minutes to complete the directed questionnaire, designed to probe a little deeper into their perception of salient sonic features – the dominance/subordination process taking place, which would hopefully demonstrate the key sound phenomenon in operation. The questions for this test were aligned as closely as possible with those used by Landy in the *Intention/Reception Project*, whilst adhering to the specific requirements of the key sound phenomenon.

To conclude each of the listening sessions, an informal group discussion was held. Participants were invited to contribute any thoughts or queries regarding the two works, a process which proved to be invaluable for the conceptual understanding of the works in question. Quotations were also taken during these discussions for inclusion in the results.

## The Participants

The total number of participants used in the listening tests was 11. While this number (by usual empirical investigation standards) is significantly low, the detail of the feedback in combination with the results from the other methods of the study, provided to be valid nonetheless. Three ‘types’ of participants used for this investigation (as stipulated by Landy’s methodology) was as follows:

- Inexperienced listeners (3) – having never heard EAM prior to testing with no ‘formal’ musical training
- Experienced listeners (3) – having a good understanding of ‘music’, with some prior knowledge of EAM
- Highly experienced listeners (5) – scholars, teachers and composers of EAM with a high level of musical understanding

## Results: *The Quarter*

100% of listeners from all three groups were able to identify at least two referential sounds in *The Quarter*. These were the ‘human voice’ and the inclusion of a short excerpt of popular music – *Father and Son* by Cat Stephens. When asked what this piece may be about, 88% of the inexperienced listeners replied along the lines of “a man going to Ireland to find his roots”. Both the experienced and highly experienced groups noted that the data contained within the narration and the musical excerpt alluded to “a difficult father/son relationship”. Since these two sounds were identified unanimously, they were clearly the most dominant sonic entities. The spoken text not only provided solid grounding for the work, but also a narrative to follow, particularly useful for the inexperienced listeners to grasp.

During discussions it was discovered that the abstract material either side of the spoken text also had a key effect. For one of the inexperienced listeners, apparently the ethereal tones at the beginning of the piece immediately brought on feelings of “comfort and euphoria”. The large “bass hit” that followed symbolised something “uncontrollable” and “terrifying”. After the bass fades away, a conversation emerges out of the texture. While the context of the discussion taking place is unclear at this point, 88% of the inexperienced listeners identified “something serious” – a tone no doubt brought on by the ominous effect of the “bass hit”.

The experienced listeners commented on the “episodic” nature of the work, particularly effectiveness of the “huge silences” to “build tension” between the conversations and the narrated text. Being from a compositional background, these listeners were able to recognise the recurrence of the “boom” as a signifier of “change”, which also brought on emotions of “distress”. 100% of the highly experienced listeners also noted similar emotive feelings. This group was more astute in relating the abstract musical material to the data contained within the referential sounds, and vice versa, with 66% of these participants identifying the ‘psychoacoustic’ effect of the ‘boom’ as well as its contribution to form.

For the inexperienced listeners, the inclusion of *Father and Son* was perhaps the most engaging sonic event. 66% had an affiliation with the song’s lyrical content. The listeners agreed that it added an overall tone of “sadness” or “nostalgia” to the piece.

Interestingly, the more experienced listeners did not find the inclusion of ‘*Father and Son*’ to be as engaging, on the contrary they felt it was unnecessary and almost “tawdry”. One participant mentioned that while it “worked”, he felt a little “uneasy”. The sudden inclusion of ‘popular’ material disrupted the natural flow of the language already established. Clearly more experienced participants, all being composers, were more concerned with the abstract musical aspects for *The Quarter*, particularly the successful structural elements. This reaction may be connected with notions of authorship/purity as well as their desire to be challenged.

## *Pentes*

The inexperienced listeners showed very interesting reactions to this piece of music. When asked what this work may be about, one listener experienced “small animals being eaten by bigger ones” in an “exotic jungle”. The creatures were then put into a “spacecraft” and “launched into space”. Another participant, who experienced “small animals” or “insects”, admitted that while she “didn’t quite know what it was about”, she felt very “scared”. The sounds described here as ‘bugs’ obviously carry referential data that is *indicative* of small living creatures. Also, the sensation of these creatures ‘flying’ was due to the spectromorphological and spatial change taking place over time.

From the group discussion it was found that the inexperienced participants were unable to identify a clear structure within *Pentes*. Despite this the group still felt incredibly stimulated by the sounds, and came to the conclusion that if there was a structure of any sort, the piece would be in two parts – the beginning containing sounds of “natural”, “insect-like” and essentially “living” things, while the later section was in contrast with more “mechanical” sounds.

The experienced participants also identified the dominant sonic images as “bugs” or “creatures flying around”, as well as the succeeding mechanical sounds. However, in contrast to the previous group, the experienced listeners gained far

less meaning or ideas of any possible narrative. 50% of the listeners admitted they had “no idea” what the piece may be about, while the other half could only suggest possible themes of “fantasy” or a “dreamscape”. This may come down to a question of their experience as composers – perhaps they were looking for a more traditional ‘musical’ form. Not surprisingly, the highly experienced group noted very similar sonic images as the former participants. In regard to the ‘meaning’ of this piece, one listener felt “spinning objects” could depict an idea of “madness”. However, unlike the inexperienced group, all of these listeners felt there was no evidence of narrative whatsoever. In fact, there was no need for one, as another participant suggested that the piece utilised “tonal and psychoacoustic devices [that] evoked various shifts in emotion”. In regard to the structural elements, it was found that “to be drawn in by this work, one needs to be an initiated listener”. Despite this, the highly experienced listeners found *Pentes* most engaging, largely due to the “complete sonic freedom” that Smalley exploits in the work, the “sophistication” of sounds and their power to “conjure archetypal images”.

### Discussion – Identifying ‘Key Sounds’

By observing the results on a macro level, many correlations can be drawn between the groups and their listening experiences. Data has been collated and discussed to draw conclusions on the operation of key sounds – specifically their irrefutable contribution to structure, and in their appearance – high levels of abstraction or absence of which, leads to the alienation of inexperienced listeners.

With regard to *The Quarter*, it was obvious from the strong correlations between results that the most salient key sound was the human voice. Pure semantic data from the narrated text was automatically absorbed. The meaning could be assigned to the more abstract sonic material of the work. The episodic occurrence of vocal samples also proved to be a successful structural feature. Another sound that was recognised synonymously was the large “bass hit” or “boom”. This morphology could also be considered a key sound, for it contributed to the structure by signifying change, as well as operating on a psychoacoustic level to portray an ominous atmosphere.

The somewhat controversial sample of *Father and Son* was yet another feature that dominated the work. While there seemed to be a divide between the groups regarding its appropriateness, there is no denying that it had a strong effect on some of the listeners. This sonic device operated on a very ‘autocentric’ (subject-centred) level. The composer relies on the experience of the audience in order for this to take effect. It was discovered through the group discussions that the only participants who were affected by this moment were those who had some prior affiliation with either the song itself or the feelings of nostalgia experienced by the protagonist. It therefore could be considered a key sound, for it functions as a referential entity that in turn provides a greater meaning to the abstract material to follow. Structurally speaking, it also acts as a pivotal point in the work.

After hearing *Pentes*, the majority of listeners identified with very similar sounds. These appeared to be either from a natural or mechanical world. With the absence of spoken text or clearly referential material, listeners had to rely on primitive reactions to the archetypal nature of the sounds in order to ascertain some sort of meaning. A common emotional response to the piece, particularly shown in the inexperienced group, was that of fear. This sentiment of fear seemed to be generalised by the group due to their inexperience in hearing the unusual sounds of the EAM palette and perhaps the lack of narrative. However, the uneasy emotions evoked by *Pentes* were also due to the effective employment of psychoacoustical principles.

The organic morphologies that many participants identified as “bugs” or “creatures” of some sort could be considered as key sounds. The fact that these sounds were described as ‘living’ shows an *indicative impact*. The spectromorphological change combined with the natural gestural implications of these sounds further solidified their dominance over background material. As humans we naturally empathise with apparent ‘living’ gesture, hence a relationship was formed between the listener and the ‘creatures’. This is perhaps the reason why some listeners felt ‘threatened’ or ‘fearful’ when larger, more abstract sounds appeared.

The majority of listeners identified the second section of the work as being ‘mechanical’. A mechanical sound is identified when the natural laws of attack-resonance-decay are broken, for machines, unlike animals or humans, have the ability to move in systematic and controlled ways. These sounds were structural entities for they clearly contrasted with the language established in the beginning.

*Pentes* exudes key sounds that are, paradoxically, of a highly abstract nature. In saying this however, the sounds referred to can not be truly ‘abstract’ to the listeners, who proved to assimilate all the sounds within the piece to ‘something’ from their lived experience. While the sounds were not literally ‘referential’, they refer more subtly to ‘living’ or ‘real’ things. Initially, I was led to believe (by my own hypotheses) that the utilisation of (so called) ‘abstract’ key sounds is at the risk of losing an inexperienced audience. On the contrary, it seems, that no matter how ‘abstract’ a sound may be, as Smalley has demonstrated, the subtle exploitation of *behavioural* qualities in his sounds, has the power to deeply stimulate listeners, to conjure images and emotions from the archetypes.

### Presenting the ‘Key sound Gradient’

The data obtained from the literature review, panel discussions and the listening tests has contributed to the development of the following construct (see figure 1 below). ‘The key sound gradient’ is a re-synthesis of Smalley’s dominance/subordination and abstract/referential continuums. The diagram depicts the sounds identified by the listening test participants in a hierarchical order – with the human voice being the most *dominant* due to its *indicative* (referential) impact and the more abstract sonorities with psychoacoustic effects less dominant. Note that sounds which are spectromorphologically or spatially *static*, with no indicative impact are considered to be *subordinate*. This model is a measure of aesthetic analysis, which could theoretically be reversed for use during the poetic process.

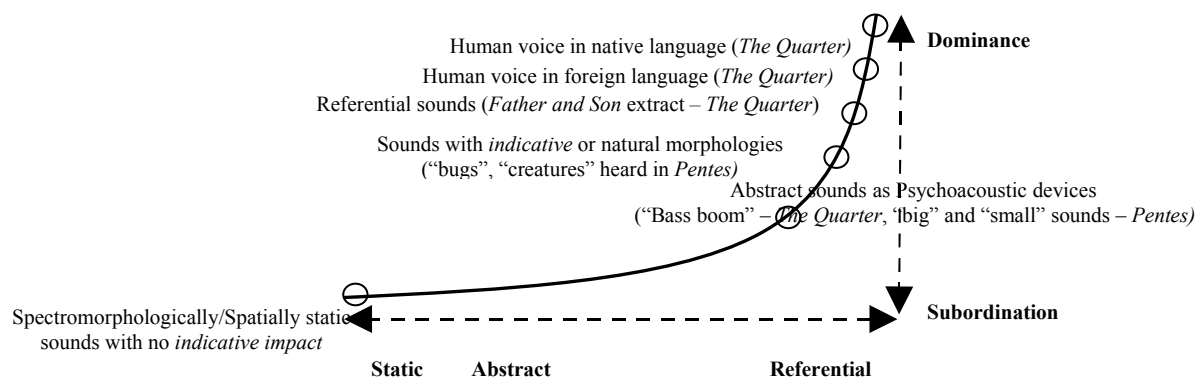


Figure 1: The 'Key Sound Gradient'

### Practical application of Key Sound Gradient

To demonstrate this paradigm in action and show how it has assisted my compositional process, I will refer to my latest EAM work – *Weals of Woe*. Firstly I shall define the area within the gradient where I believe my piece lies, in comparison to the two pieces formerly discussed (shown in figure 2 below).

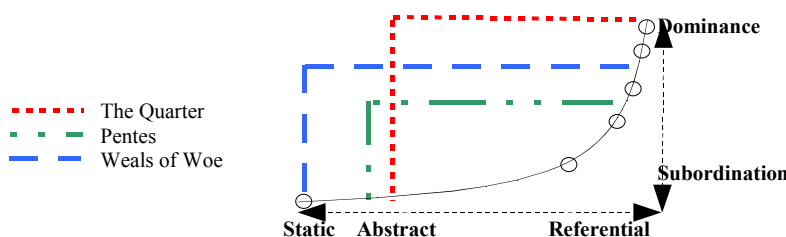


Figure 2: Diagram depicting where the works may lie on the 'key sound gradient'

My piece exists predominantly within the abstract realm – with most of the sounds displaying the attributes of the *behavioural* field. While there is no pure semantic data within the work, many of the sounds have indicative traits. Within the introductory section of my piece, I have identified a particular entity as a key sound for it has proved, for the majority of listeners, to be the most memorable aspect of the work. It displays a combination of all the behavioural traits that constitute *dominance*. Along with spectromorphological change and spatial movement, the sound to which I refer is indicative of some kind of mechanical device with very subtle human characteristics. The tones that ricochet as a result of its flailing actions are more abstract, although they still exude gesture that could be considered vocal or 'human' in some way. The tones in combination with the naturalistic movement could essentially suggest the machine is 'alive' – a concept which is predominant throughout the piece. This mechanical object also contributes structurally via its development and recapitulation throughout the work.

To demonstrate a region in my work that I believe fails to deliver, I refer to a section in the middle. After reaching the climax of the introduction, the listener is presented with a very sparse aural landscape, which focuses on a rather dormant sinusoidal tone. Over time, the droning tone begins to fluctuate in both pitch and dynamics. The intensity of this oscillation increases until a new sound, of a similar morphology to the mechanical device in the beginning, appears. According to my own retrospective analysis and feedback from informal workshop discussions, I have come to the conclusion that this section (spanning 3 minutes) feels 'too long'. This indicates that the sonic texture is lacking in any overt key sounds, or any spatially and spectrally active morphologies for that matter. It seems, that despite the fluctuations of dynamics and pitch, the tone does not display enough *behavioural* data, or undergo enough spectromorphological/spatial change, to hold an audience. This is the reason why I believe my piece falls so low on the gradient toward the *static* end of the continuum (see again figure 2 above). In light of my research I intend to alter this section by enhancing the sinusoidal tones so that they radiate more spectral change (via cross-synthesis for example), essentially load the sounds with more data in an attempt to push them further toward the referential/dominance area of the continuum.

From the above, it can be seen that this study has been of great benefit to my creative thinking and furthered my confidence as a composer. The key sound gradient is simply a framework that extends slightly on Smalley's

*behavioural* field and has essentially informed my intuitive practice. This paradigm may not necessarily be of use cognitively, in the creation of EAM; rather it is more effective as a theoretical construct. In light of recent findings, it has proved to be most useful for analysing and discussing my music in retrospect, which in due course will inevitably assist future compositions. In theory this construct could be utilised by all EAM composers alike – to aid in the understanding of our music and the particular roles of the sounds within.

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