Space Within Space:
Report on a Concert

James Andean

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I - INTRODUCTION

i) The project

This paper is a report of and reflection upon a concert entitled *Space Within Space: An Evening of Acousmatic Music* which took place in Leonora Hall at Kallio-Kuninkala in Järvenpää, Finland on the 2nd of November 2008, which I programmed and hosted, and for which I designed and performed the diffusion.

Work towards this concert fell into several distinct categories. These included:

- the programming of the concert;
- the composing and creation of a new original acousmatic work for presentation in the concert;
- research into diffusion systems, methods and practice;
- the planning of an appropriate loudspeaker arrangement;
- the preparation of diffusion plans/scores for each of the pieces;
- rehearsals; and,
- the concert itself.

Each of these will be discussed in the following pages.

It should be noted that the bulk of the rehearsals took place in a different space than the concert itself, due to limited availability of the hall, with a fairly restricted amount of time available in the days immediately before the concert to prepare in the hall itself. This inevitably resulted in significant changes to both the set-up and the

diffusion plans, the reasons for and results of which will be presented and considered. Also to be discussed is the presentation of my own original work at a second concert, two days after the Kallio-Kuninkala concert, which ironically took place in the hall in which the bulk of the rehearsals had taken place. As a result there will be some observations made on some differences between these two concert experiences.

ii) Some comments on the approach

There are some key characteristics of both acousmatic music in general and diffusion in particular which are important to note before proceeding; therein lie both the charms and frustrations of both the genre and the practice. Both tend to be intuitive, subjective, and perceptually-based, and, partly as a result of this, neither has been clearly nor sufficiently mapped out or pinned down in the literature. These are somewhat nebulous areas, with much discussion and debate surrounding them, but lacking definitive rules or procedures. The following pages are no different. Much of the discussion relates directly to my own personal reactions and subjective responses – observation and analysis of these responses, and a discussion of their consequences. This is entirely appropriate for a genre which grounds itself so firmly in the subjective, immediate perceptual response of the listener – the performer and composer being simply two particular categories of listener - and in fact these subjective, empirical impressions are the primary territory for research into the subject. As a result we are less concerned here with finding concrete answers and

absolutes than with finding the right questions to ask of ourselves; the goal of this paper is to ask some of these questions, and thus specify and open up avenues for further, continued consideration and research.

II – PROGRAMMING THE CONCERT

I was invited to host this concert by the producers of Sibelius Weeks, an annual concert of primarily classical music produced by the city of Järvenpää in cooperation with the Sibelius Academy. Their proposal was that a local composer host a concert of electroacoustic music, in what was intended to be the first of an annual inclusion in the festival.

i) Scope

I was given a free hand to program the concert in any way I saw fit. It seemed appropriate to devote this inaugural concert to acousmatic music, not only as 2008 was both the 60th anniversary of musique concrète, as well as the 50th anniversary of the founding of the Groupe de Recherches Musicales, but also because acousmatic music is my central field of interest. As acousmatic music is somewhat under-represented in the Finnish musical landscape, I thought it preferable to present a kind of introduction to the genre, rather than attempting a more narrow focus. However, it would be rather difficult to adequately represent the entire spectrum of acousmatic activity and history in a single introductory concert; also, as such opportunities are somewhat rare, I was unwilling to deny myself the pleasure of stocking the program with some of my personal favourites of the genre. As a result, I decided to combine examples from several categories which suggested themselves as priorities:

- works by important pioneers of the genre;

- works by Finnish composers of acousmatic music;

- works from among my personal favourites; and

- an original work of my own.

Within these categories, I felt entirely at liberty to select my own preferred pieces, rather than, for example, choosing the most renowned works from important pioneers - selecting Schaeffer's *Étude aux son animés* rather than *Étude aux chemins de fer*, for example. Also, as this was intended to be an introductory concert and so should offer as broad a range as possible within reasonable time limits, I made the decision at an early stage to include single movements excerpted from larger works. While this may not represent the composers or works as fully and satisfactorily as including only full-length pieces might, it allowed me to program a wider range of pieces, especially considering the daunting length to which full-scale acousmatic works sometimes run – often twenty to thirty minutes, occasionally stretching further still. Although many masterworks of the genre fall into this category, including them full-length in the concert would have quickly reduced the program to a mere three or four pieces, assuming the ideal total concert length (and the limit of the attention span one might expect from an average concert audience) to be somewhere in the range of eighty to ninety minutes (plus intermission). Thus it was determined that excerpted movements from such larger-scale works would be included, and I did my best to program these works such that they made sense within the overall program.

ii) Some observations on acousmatic music

To prepare the concert program, there was a period of very intensive listening, during which a significant number of acousmatic works – many already familiar to me, but also a number that were new to me - were explored and considered in fairly rapid succession, in a fairly condensed timeframe. As a result of such intensive listening to such a large number of pieces in such a short period of time, and especially as I was in essence 'rating' them, considering my qualitative responses to the works with an eye to selecting some of my favourites for the concert, there were some interesting observations to be made regarding my responses to the works. A number of trends began to emerge that had perhaps not previously been as clear to me in my own tastes, responses, and aesthetic judgements and preferences.

One of these is that, in the acousmatic genre, I respond less enthusiastically to more traditionally 'musical' material – material which contains more pitch-information, and pieces which are more clearly structured using such material - even extending as far as works which focus more on harmonic spectral material and motion. My interest is much more strongly triggered by more traditionally 'concrete' material, gestures and transformations. I am also drawn to pieces which make predominant use of bold, active, often rapid, gestures. This is perhaps noteworthy because, as a composer, I seem to be primarily drawn to the crafting of longer, more slowly-evolving gestures which unfold at a more leisurely pace over a longer stretch

of time. This disjunction between my responses as listener and my tendencies as a composer, between the esthesic and poietic acts, strikes me as being inherently interesting, and a subject to be returned to in the future. In a broader sense, these questions regarding the attraction towards such materials is perhaps relevant to the diffusion experience, as the physical, active strength of more concrete gestures is closely tied to both movement and performance in diffusion, and to the sense of space such gestures outline.

More germane, however, may be my reactions as a listener to what I experience as a sense of 'space'. The word is here in quotes as it is intended in a manner somewhat extended from the usual understanding of the term. Over the listening period, it struck me that it was this sense of space which drew me most strongly to a given work, and that works which perhaps exhibited a lack of this sense of space did not spark my imagination to nearly the same extent. One has then to consider the works in question more carefully to determine exactly what characteristics were important in building and sustaining this sense of space. A cursory examination finds the elements one might expect to create such a sense of space: use of a range of depths, of foreground and background planes, detailed and varied use of the lateral plane, and the combination of such placements and movements with subtle shifts in amplitude and frequency which together evoke a broad and palpable sense of space. More interestingly, the perceived identities of the

sources of the sounds carry with them a sense of space[1], for example using planes or birds to evoke a sense of height. The spectromorphological[2] content of a sound can also imply space and movement, for example by using upward or downward spectral motion (Smalley 2007). Variety in some or all of these categories creates the cumulative effect of a sense of extended space or spaciousness.

Despite these (sometimes) quantifiable associations between various concrete characteristics of the works and the resultant sense of space, one is left with the feeling that there is more here to be discovered – more than meets the ear, as it were. One senses that there are further connections between the materials themselves and this sense of spaciousness than can be accounted for by the more directly linked qualities described above, although these of course play a significant role; consideration of such further connections will provide an interesting avenue for future exploration. Diffusion can be a valuable tool in this regard, as it provides a forum in which to not only experience this sense of space in greater detail, but also to manipulate it directly, and thereby to see how changes to given parameters, characteristics or qualities affect the results. It also provides a further opportunity to extend and support these spatial cues so carefully crafted by the composer.

[1] See Smalley 2007 for a more detailed discussion.
[2] See Smalley 1986, 1997.

iii) The selections

By the end of this intensive listening period, the following works had been chosen for inclusion in the program:

- works by important pioneers of the genre: Pierre Schaeffer's *Étude aux son animés* and Part 2 of Luc Ferrari's *Visages V*;
- works by Finnish composers of acousmatic music: Patrick Kosk's *Distrak-Sillalla* and Jukka Ruohomäki's *Viiltoja*;
- works from among my personal favourites: Dennis Smalley's *Sandar*, Francis Dhomont's *Thème de la fuite* from *...mourir un peu…*, Gilles Gobeil's *Le vertige inconnu*, and Robert Normandeau's *Rumeurs (Place de Ransbeck)*; and finally,
- my own work *Outgribing*.

Ricardo Climent's piece *The Last Castrati* was considered for potential inclusion in the concert, depending on the total length of the program (dependent on the final length of my own composition, which was unclear until quite close to the concert date); in the end the piece was left off the program, as the total length without it was considered ample. Other pieces which were close contenders for inclusion in the program included Francis Dhomont's *AvatArsSon*, *Espace/Escape*, and the *Allegro* from his *Frankenstein Symphony*; Pierre Schaeffer's *Étude aux objets – Objets*

rassemblés, or an extract from Schaeffer and Henry's *Symphonie pour un homme seul*; and Bernard Parmegiani's *Entre-temps* (part 2 of *Plaintemps*).

iv) Formats

I had previously assumed a greater proportion of pieces would exist in multitrack form for diffusion purposes, and was surprised to find that in fact all of my program choices were intended to be diffused from the final stereo mixes off of the commercially available compact discs. In fact, of all of the material I went through for consideration for inclusion, only the material from Normandeau's *Tangram* cd was made available (as the second disc of a two-cd set) in a separate mix intended for diffusion. The possibility of such alternative mixes for concert diffusion will be discussed in due course.

Zvonar too seems surprised by the use of commercially available stereo recordings – in reference to a 1999 diffusion of Pierre Henry's *L'Apocalypse de Jean*: "The source recording in this case was actually the commercial CD of the work!" (Zvonar 2004 p.8)

v) Ordering the pieces

Having determined the program material for the concert, the difficult task of ordering the pieces remained. There were a number of difficulties in this regard. Central among these was the combination of longer, larger-scale works, such as Normandeau's *Rumeurs*, and shorter pieces, sometimes more modest in scope, for example Smalley's

Sandar or Schaeffer's *Étude*. These needed to be combined in such a way that the shorter, more modest pieces weren't entirely eclipsed by the more imposing works. Other problems included the dramatic shift in sound quality between the older and more recent works, with the older works again at risk of being overshadowed by the broader frequency and dynamic potential of the newer pieces. My own piece posed its own particular problem, in that understandably it is not of the same calibre as the other program pieces, and thus was at risk of sounding rather foolish by comparison with whatever might come before or after. Finally, a couple of pieces - Ruohomäki's in particular - were sufficiently powerful that it would be difficult to place anything after them. *Viiltoja* for example is so saturated, presents such a sustained level of energy in both frequency spectrum and dynamics, and is such an exhausting listening experience that it was placed last in the program almost by necessity. However this is a perfectly welcome placement, as it in many ways provides an ideal climax to the program.

Perhaps the trickiest was the first of these issues - combining the smaller pieces with the larger works. On the one hand, an audience is perhaps more willing and able to tackle a longer work early in the program; this is also perhaps the ideal time to make a strong statement, when the audience is perhaps at its most receptive. These considerations were eventually sacrificed in favour of early placement of some of the shorter works, in order to raise their profile within the program, in the hopes that a

more attentive audience early in the concert would perhaps approach these works with greater concentration, while the larger-scale works would hopefully be sufficiently imposing in and of themselves to command the necessary attention. This ordering of works also creates an arc across the concert which slowly builds, beginning with smaller works and moving towards larger, more grandiose works like *Rumeurs* and *Viiltoja* towards the end. Gobeil's *Le vertige inconnu* was chosen to end the first half due to the power of its primary gestures, providing a strong cadence before the intermission, and avoiding the difficulty of following-up its powerful closing phrase.

Dennis Smalley's *Sandar* was chosen to open the concert as a sort of prelude or prologue - a soft, slightly mysterious way to gently lead into the evening. Initial plans were for a bolder opening, but this was a more satisfying choice, in part because it allows for the delicate textures of *Sandar* to be carefully savoured in a way that would be less likely following almost any of the other program pieces, by which such gentle colours might be rather overshadowed. I also envisioned a diffusion plan which would use the form of the opening sections of Sandar to introduce the different sections and speaker pairs of the diffusion orchestra, but this will be discussed in more detail in the relevant section.

Ferrari's *Visages V* follows as a more or less complete contrast to Sandar; the aggressive gestures and movement of *Visages* are intended as a shocking jolt after the gentler *Sandar*, perhaps serving as the true opening of the concert after the soft

prelude of Smalley's piece. This contrast serves to increase the notice this piece receives, considering its modest duration and the reduced dynamic and frequency range due to its early date of composition.

After these two shorter, wildly contrasting pieces, I chose to present Dhomont's *Thème de la fuite*, which I consider to be one of the program's primary standard-bearers of the acousmatic genre. While it is not one of the longer pieces from the program, it is slightly larger in conception than the two opening pieces, and is perhaps the most demanding of this first half of the concert. Patrick Kosk's *Distrak-Sillalla* follows - the longest piece of the first half, thus acting as the peak in terms of the movement from shorter to longer pieces, but at the same time, being a rather slower, more languorous, slightly static piece, offers a period of relative calm after Ferrari's and Dhomont's much more active pieces, and before the power of Gobeil's *Le vertige inconnu*, which, as mentioned above, was chosen to close the first half.

I selfishly chose to place my own piece immediately after intermission as perhaps the most advantageous position. In this way it doesn't come directly after a clearly superior piece, and it would not support the weight of being placed first in the entire program. The problem of what should come after my own composition without overshadowing it was solved by following it with the Schaeffer piece; while this has certain affinities with my own work in terms of a reduced-listening[3] approach, the shift in sound quality and treatment that results from the pieces having been created

[3] Schaeffer's "écoute réduite" (Schaeffer 1966).

fifty years apart makes an unfavourable comparison with my own piece slightly less likely.

Robert Normandeau's *Rumeurs (Place de Ransbeck)* follows as the second-last piece on the program, and is intended as more or less the climax of the concert, followed only by the rather explosive cadence of Ruohomäki's *Viiltoja. Rumeurs* is the longest piece on the program, and is also in many ways the fullest statement, many of the other pieces having been either excerpted from larger works, or smaller-scale pieces, and *Rumeurs* being a recognised and representative masterwork of the genre. In some ways it was tempting to place this work early in the program, both as a strong statement to introduce the concert, and as it fully deserves the audience's concentrated attention for its full duration. Such a placement posed many problems however, as the strength of the piece made it rather difficult to follow up.

This problem is easily overcome by using *Viiltoja* to close the concert. *Viiltoja*'s monolithic grandeur imposes itself with ease, and its single, massive sound block is sufficiently far removed from the dense interplay of sound objects in *Rumeurs* to hold its own.

III – THE COMPOSITION OF *OUTGRIBING*

i) Genesis

My original piece composed and created for this concert went through a long and rather arduous birthing process. An initial conception, based on combinations of previously prepared material, was quickly discarded as the sound qualities and sonic properties of the materials were found, after preliminary investigation and transformation, to be somewhat questionable. A search for new material to replace rejected material slowly grew into a long process of exploration of a fairly extensive catalogue of previously recorded material, which was considered, transformed, and combined in various ways before eventually coalescing into what would eventually become the formal outline of the final piece.

ii) Form

The piece falls broadly into two main sections, envisioned as a first section of slow, somewhat leisurely phrases which slowly build towards the rather monolithic stasis of the second section, built from pulsing spectral material, the entire second section acting as a vast, extended climax to the piece. A transitional section was intended to combine the significantly different sound-worlds of the two sections.

An initiatory gesture opens the piece, followed by a series of building gestures based primarily on the sound of crickets, eventually adding cicadas, which slowly build, adding filtering, reverberation, and stereo doubling. These phrases are

interrupted by short gestures of passing cars, trailed by a faint spectral 'ghost', coupled with small, delicate sound objects which pose a marked contrast to the rather brusque power of the traffic gestures. There are four such phrases, each increasing in intensity; the first cricket/cicada phrase is interrupted by a single passing car, the second by a truck, the third by a flurry of time-compressed traffic gestures, and the fourth and final phrase by a longer, untreated traffic passage which serves as the climax of the section.

This final traffic phrase is closed by a gesture of a plane passing overhead, coupled with an untreated version of the time-compressed geese sound object which closed the piece's opening gesture. This plane-geese combination closes the opening section and introduces the transitional material, which is centred on phrases taken from recordings of a tam-tam, using microphone movement to generate spectral gestures. This material grows out of the airplane passage, with which it shares a similar spectromorphology, and proceeds in a number of shaped phrases, combined with new, short, foregrounded gestures built from secondary material. The timbral qualities of the tam-tam are intended to prefigure and introduce the spectral sound-world of the piece's second half.

The transitional section continues with the introduction of the rhythmic escalator material which will be important to the second half of the piece, and includes a reappearance of the crickets, this time building in waves of downward

glissandi which result from delay sweeps. These are intended to relate to similar glissandi towards the end of the piece. This transitional section closes with a time-stretched version of some of the material from the annunciatory gesture from the beginning of the piece, which here announces the second of the piece's two main formal sections.

The primary material of this section is taken from a recording of a suspended sheet of tinfoil[4], passed through various stages of filtering, then through a flanger with maximum feedback, which was performed in real-time and recorded. This material was then edited, layered, and treated with further filtering, delays, and reverberation. An additional foreground layer appears and disappears throughout the section, constructed from a close recording from the top of an escalator. This provides an insistent repetitive rhythmic element against the steady, shifting timbral backdrop.

The piece is closed by a final gesture which once again presents the geese gesture, this time slightly more distant, and the crickets, which appear softly and slowly fade away to end the piece.

iii) Critique

Outgribing, though not without its qualities, is flawed, and I do not consider its current state to be definitive. While the first section is complete, the second is not, requiring more careful attention to the crafting of both the timbral material and the

[4] The recording was made using laser technology to monitor small-scale vibrations as the sheet moved and drifted with surrounding air movement. See Smirnov 2006.

rhythmic material. More significantly, in its current version the formal construction is not successful. The transitional material in this piece is crucial, as it builds a bridge between the two very different main sections of the work – different both in material, and in the manner in which the material unfolds. While the use of this transitional material had been planned in advance, the details of the manner in which it would unfold were dictated by the material itself, and were only revealed once the section was more or less complete. The process of acousmatic composition is often a question of following where the material leads, and the final destination is often surprising. Such was the case here: in following the natural progression of what I had intended as transitional material, I found that instead the material was winding itself down, and slowly drawing the piece to a premature close through a gradual slowing and release of the tension I had tried to build earlier in the piece. As it stands, the piece has not recovered from this surprising shift of direction. I was unwilling (and unable due to time constraints) to sacrifice this natural progression of the transitional material; however, my attempts to correct its course and set things back towards a build-up to the second half proved to be largely unsuccessful and thoroughly unconvincing. As a result of this failure to maintain tension in the transitional material, the energy is lost, and the connection I was trying to establish between the materials of the first and second sections is not felt. This results in a major formal failing which prevents the piece from functioning as a formal whole. The time lost trying to resolve this problem

prevented me from satisfactorily crafting the second half of the piece, which as a result remains entirely unpolished – fully sketched out, but yet to be finessed into its final shape.

Unfortunately, I do not believe the piece's formal flaw can be overcome, and the way forward may require that the piece be split into two separate pieces. For this, a more convincing development section would need to be created to follow on from the current transitional material, which might concentrate on elements culled from the opening gesture, and build towards a more imposing final gesture. Hopefully this would generate enough formal weight for this new piece to stand on its own. A second piece would retain the second half of *Outgribing* as its primary material, but would require a significant introductory section which would gradually introduce, explore and develop this material, or closely related material.

iv) Materials

The choices of sound sources for the piece should be discussed from a further perspective. In most acousmatic music, one is operating simultaneously on two levels – the spectromorphologies of the sounds, and the sources or perceived identities of the sounds. While the phrasing and unfolding of the piece is clearly based on spectromorphological considerations, the choices of sounds are often guided by particular themes which began to emerge in the work. In *Outgribing* one can distinguish two main thematic groups: the 'natural' sounds – the crickets, the cicadas,

the geese, other birds, etc. – and the sounds of various modes of transportation – the cars and trucks, the plane, the subway, perhaps also the escalator. Often, compositional choices are guided by these two levels – spectromorphology and source identity - simultaneously, and inextricably; for example, the combining of the crickets and cicadas makes sense on both levels, and the interruption of the cricket/cicada phrases by the traffic gestures (hopefully) resonates on both levels. The use of a combination of a sound from each of the two thematic groups – the geese and the plane, obviously linked through the idea of flight – to close the first section, which was dominated by the one thematic group imposing on and interrupting the other, again hopefully resonates all the more strongly as a result of this simultaneity of the two levels.

v) Composing for the concert context

The opportunity to both program the concert and create a new work for inclusion in the concert presents some interesting possibilities which were not properly explored in this case. For this concert, as described above in the section discussing the programming of the concert, I decided early on to focus on choosing individual works based only on their own merits, rather than designing a larger-scale concert arc, or selecting works based on a predetermined vision for the concert as a whole. This approach also extends to the creation of *Outgribing*. The work was composed freely, based only on its own needs and whims, with no preconceived intentions which would

have entailed shaping the piece to fit the concert, or to complement the other program material. Such considerations, however, offer intriguing possibilities, both in terms of programming a concert and composing a piece with a given concert in mind. A range of possibilities and approaches present themselves in this regard, which I intend to explore in future concert projects.

IV – THE ART OF DIFFUSION

i) A definition

Diffusion is the performance practice which has grown up surrounding the concert presentation of music on fixed media, often referred to as ‘tape music’. It is the performance of compositions on fixed media over an arrangement of multiple loudspeakers in a hall or other listening space or area for a live audience. This usually involves the design and implementation of an arrangement of a certain number of loudspeakers – usually anywhere from four to fifty or more – in a manner suited to the particular concert space and to the material being performed, and the mixing, distribution, placement, and movement of the music and its component parts in, around and through the loudspeaker arrangement by the performer, generally referred to as the diffuser, diffusionist, diffusion performer, diffusion artist, or sound projectionist. Diffusion can also involve working directly with the sound using any of a number of treatments, filtering, delays, and reverberation being among the most common.

ii) Background

In the early 1950s, when tape music was its infancy, the concept of concert diffusion was deployed for a number of reasons; while some of these continue to hold true, some priorities have changed slightly over the course of the evolution of diffusion as a performance practice and its continued use. One of these was the need to address

certain technical considerations - to either correct, improve, or extend the quality and conditions of the material which result from the technical limitations and requirements of the media on which works were created and stored and from which they were played, according to the expanded possibilities afforded in performance. There were several main considerations in this regard. One of these was dynamics: as the dynamic range which could be stored and reproduced at the time with any semblance of fidelity was quite limited, the capacity to extend this significantly in performance through controlled amplification was of great benefit to the musical quality of the works. This called for someone to attentively and creatively increase and decrease the volume levels in performance to appropriately follow, match and extend the dynamics of the recorded material. Another key element was the ability to extend the limited number of tracks to a greater number of loudspeakers in the concert hall. This required that strategies be invented by which the source tracks could be multiplied and/or distributed and moved, to make use of the full collection of loudspeakers, and a performer to manage and execute these strategies in concert.

These practical considerations, however, were only part of the equation which led to the birth of diffusion performance. There was also the desire to exploit the new possibilities for the movement of sound through space, and to create a range of real and fantastic sound images in the concert hall – ideas which continue to drive the genre, and which continue to delight listeners. Another concern was more conceptual,

and was an important part of the new art form's quest for identity. In the early days of *musique concrète*, there was a general feeling that the issue of concert performance constituted something of a crisis for the new genre. This was due to the fact that, for the first time, the music was not actually produced or generated live before the concert audience's eyes, but rather beforehand in the studio, and the lack of a personal, physical, active human presence, now replaced by the impersonal immobility of the loudspeakers, was seen as a major problem. This continued to be a much-discussed issue for decades[5], a debate which continues to some extent to this day. While the relevance of the concert paradigm to the new genre of tape music might have been debatable, its primacy in the history of instrumental music made it appear to be an essential proving ground for a new music trying to stake its claim as part of the new musical landscape.

The proposed solution was the creation of the role of the diffusionist. Thus, in the early years and decades of the genre a greater emphasis was placed on creating a performance method which would provide a relationship between the performer's gestures and their impact on the music heard which would be clear and visible to the audience members, and a visual, human locus for the audience to focus upon.

[5] See for example the round table discussions transcribed in the GRM's *Le concert: pourquoi? comment?* (1977).

iii) Evolution

The intervening decades have altered these initial priorities somewhat. As the identity of the genre is now firmly established, and its validity as a musical form is no longer in question (no longer to the same extent, at any rate), the difficulty of adapting to a performance without a performer is no longer the obstacle it might once have been, although it does of course continue to be a topic for consideration and debate. In addition, many of the technical limitations which needed to be addressed in early performances are no longer so significant a problem, such that by and large current compositions can be reproduced without active intervention with a degree of fidelity which is satisfactory for many musical contexts. Yet diffusion as a performance practice is as vital and flourishing as ever.

This is because, as the culture developed, this practice discovered an important role for itself, and shaped itself to fill a critical gap which slowly became apparent as the genre evolved, which saw diffusion grow to its current level of sophistication primarily during the 1970s. The electroacoustic – particularly perhaps the acousmatic - composer labours to craft very precise movements and spaces, the perception of which are often, even usually, essential to the piece. These are designed in the studio, often with similar listening conditions in mind – either headphone listening, or the small, relatively dry acoustic of the average home listening environment, conditions which differ enormously from those found in the average concert hall. While the

concert remains a vital cornerstone of electroacoustic culture - for a number of reasons, some social, some linked to the superior power and acoustics generally possible in the electroacoustic concert situation – the interaction between a work and an unknown concert hall is a variable which can have a major impact on the work and its perception and reception, and can easily distort or completely destroy the movements and spaces which the composer so painstakingly crafted and which form so critical a part of the work.

This is where diffusion steps in. Diffusion is seen by some as a performance tool with which the performer valiantly defends the concerns and intentions of the composer against the transformations imposed by the interaction between the work and the acoustics of the concert space. In slightly less hostile terms, the diffuser's role is to adapt the work to the space, and the space to the work, such that the living presence of the work in the space presents a faithful delivery of the piece the composer intended, with movement and spatial relationships intact; or – better still – such that the presentation of the work in the space extends the composer's ideas and concerns in accordance with the expanded capabilities of the concert hall and diffusion apparatus. It is in this latter role that a talented diffusion artist truly shines, and in which we see the diffuser in the role of the performer presenting an inspired interpretation of a work.

There is, however, much suspicion towards this performance practice on the parts of composers[6] concerned that the actions of the diffuser will alter their work in unintended ways. Thus the role of the diffuser is a very delicate balance between a number of elements: between a performer's interpretation and the faithful representation of the composer's intentions; between the work on tape and the new possibilities offered in performance; and between the work and the space.

It must also be kept in mind that the diffuser's responsibilities are not only to the composer, but also – possibly even primarily – to the audience. A key consideration in this regard is an attempt to plan a loudspeaker design, prepare the space, and perform the works such that as broad a section of the audience as possible enjoys the best possible experience of the sound. Perhaps the most difficult quality to achieve and maintain is the clarity and localisation of the sound image, which is easily shifted or lost, especially when working with stereo images, as one moves out from an ideal central location, or should part of the audience be too close to an individual loudspeaker. Other aspects of the sound which are important and remarkably variable depending on position in the room include sense of immersion[7], balance of reverberation, frequency response, dynamics, etc.

[6] In practice, of course, works are often diffused by the composers themselves; these two performance situations – the diffusion of one's own work as opposed to the diffusion of the works of other composers – will be considered in later sections of our discussion.

[7] Immersion will be discussed in greater detail below.

iv) The composer's role

There are a number of possible approaches a composer can take in anticipation of eventual diffusion scenarios. Some composers create different mixes of a given work, one for home listening, which will typically contain more reverberation and other spatial elements, which can be expected to sound unimpeded in private listening, and a second intended for use in concert diffusion, which will potentially be significantly less reverberant, such that the hall's own acoustic might perform this role without contradicting spatial cues already embedded in the piece. Further mixes of the piece are also possible, geared towards a variety of possible diffusion situations which might be more or less reverberant and incorporate a greater or lesser number of loudspeakers.

Another avenue through which a composer can anticipate the eventual diffusion of a work is through the possibility of multitrack versions of a work. The two extremes in this regard are, on the one hand, the diffusion of the stereo mix of the work, which leaves the responsibility of the expansion of the work to fill the loudspeaker arrangement and the concert space to the diffusion artist; and a fully-formed multitrack mix which includes a separate track for each loudspeaker of a predetermined arrangement, in which all movements between points and shifts between spaces have already been fully fleshed out by the composer, thereby limiting or even eliminating the role of the diffuser. Of course there is a full range of

possibilities between these two poles, with the degree of movement and spatial detail already finalised by the composer on the multitrack version of the piece, and the extent of the role of the diffusion artist in shaping and performing the mix and the music, varying widely.

The number of tracks of a given work has a significant impact on how the diffusion of the piece is likely to be approached, and is often a key indicator of the composer's intentions, although the manner in which the tracks have been used in composition must also be carefully considered. A stereo work for playback over a multiple-loudspeaker arrangement generally calls for an active diffusion performance, and implies a stereo-based arrangement[8]. Works for a greater number of tracks often imply the intended use of a circular or otherwise surrounding loudspeaker arrangement.[9] This is not a given, however; for example, multitrack mixes of stereo-centric pieces may be prepared for concert diffusion in order to preserve the diffusionist's ability to move multiple stereo images, containing different sound objects, phrases, or layers, through the hall simultaneously, or to otherwise treat – for example through equalisation or reverberation – individual elements of the music separately, without impacting other elements or layers. Such works might also be prepared in multitrack formats in order for the composer to more tightly control

[8] As is commonly the case with acousmatic works.

[9] Stereo-based and circular loudspeaker arrangements will be discussed below.

movement and spatialisation, leaving less of these aspects to the diffuser's discretion, as for example with much of Robert Normandeau's recent output. (Bouhalassa 1999)

Certainly there are no set rules regarding the number of tracks or loudspeakers. One could posit a bare minimum of three loudspeakers, with a more common minimum of four, and an average arrangement involving somewhere between perhaps eight to twenty loudspeakers. Many of the best-known diffusion systems[10] have many more, often involving forty or fifty loudspeakers; the maximum number of loudspeakers is limited only by practical considerations such as cost, space, transportation and maintenance. While a minimum number of three loudspeakers can perhaps be imagined – for example, left, right, and one in the rear – it is much more common for smaller arrangements to include one loudspeaker in each of the four corners of a room. The use of the word 'diffusion' for concerts employing such small-scale arrangements is perhaps called into question, depending on the manner in which the arrangement is used. A four-track piece which is intended for playback over four loudspeakers generally denies the possibility of an active diffusion, and suggests either a four-corner speaker arrangement[11] or a diamond arrangement[12]. This can perhaps no longer be considered diffusion, as it lacks the performance element

[10] For example the BEAST system (Harrison 1999) and the Gmebaphone/Cybernephone (Clozier 2001).

[11] For example many of Stockhausen's electroacoustic works, such as *Gesang der Junglige.* Although this piece was initially for five channels, including a fifth loudspeaker suspended over the audience, it was remixed by the composer to the final four-channel version. (Zvonar 2004)

[12] As used for example for early performances of Stockhausen's *Kontakte.*

entirely, and could perhaps better be termed ‘spatial reproduction’. If a four-loudspeaker arrangement is used for playback of a stereo work, on the other hand, which is actively distributed and moved between front pair, rear pair, and a combination of these, thereby creating senses of movement and shifting impressions of space, this would certainly fall into the realm of diffusion, albeit of rather modest scope.

There is a large grey area however, and much uncertain territory. For example, can the performance of a sixteen-track work over a sixteen-loudspeaker arrangement, in which all movements, spaces, timbres, etc. have been fully elaborated by the composer, thus necessitating no further intervention on the part of the diffuser, still be considered diffusion? Some might argue that it cannot, as there is no longer any performance element whatsoever; others would consider the design and implementation of a loudspeaker arrangement for the given work and the given space to be sufficient for the term ‘diffusion’ to apply, despite the lack of an active performer.

While emphasis on the performance aspects of diffusion does not necessarily reflect the general consensus of the electroacoustic community, in my view, the performance element, and the quality of interpretation, in whatever degree, that the diffusionist brings to a work, are key to the concept of diffusion. We will discuss the

role of interpretation, and possible strategies and consequences, in greater detail in the section detailing my diffusions of the concert works.

v) The performer's role

Thus, we will continue to assume that diffusion requires more than simple playback; that it requires a performer, who actively works with the sound in any of a number of ways. Most often this involves moving the sound between the various speakers, speaker pairs, or groups of speakers of the arrangement, or adjusting the balances between these speakers, pairs or groups. It may involve a variety of other possible means of affecting the sound, such as equalisation and filtering, reverberation, delays, or any of a number of other possible sound treatments. These treatments are usually, but not always, limited to factors relating to the experience of the piece in the given space, and generally stop short of processing which significantly alters the sounds beyond these parameters, or in a manner which deviates dramatically from the intentions of the composer, or which alters the sounds beyond recognition. Once again, however, this is a question of accepted practice, and not of hard and fast rules.

Another, often overlooked, aspect of the diffuser's role is the preparation and treatment of the concert space. This involves not only the careful consideration of the number, placement, and arrangement of the loudspeakers, but also potentially efforts to control or alter the acoustic characteristics of the space, such as reflections and reverberation, to better suit the works to be diffused. This might include, for example,

the use of curtains or absorptive baffles to muffle reflections and reverberation in a given location, or the use of reflective baffles to increase them. Often both of these techniques are deployed in different areas of the concert space in order to better control not just the overall acoustic conditions, but the performance of the loudspeaker arrangement as well, for example by increasing the directionality of the front loudspeakers, decreasing directionality from the rear, or improving the conditions necessary for the activation of the space.[13] The aspects of the space which the diffusion artist should consider are not only negative, however; there are many possible ways for particular acoustical properties to be taken advantage of in diffusion. This is fairly obvious in terms of the overall properties of the entire hall – reverberation time, frequency response and spectral characteristics, etc. – but it can also be true in a more localised manner. Such microacoustical properties – areas with particular qualities of reverberation or colour – can be used to good effect by an experienced diffusionist.

vi) Goals of diffusion

The goals of diffusion vary somewhat from performer to performer and performance to performance. Primary diffusion goals tend to include:

- the highest quality of sound possible, in terms of frequency response, dynamic range, clarity of sound and image, etc, for as much of the audience as possible,

[13] This will be discussed in greater detail in the section covering immersion; see below.

and thereby the fullest and most faithful possible delivery of the material of the work;

- 'shaping' the sound to the performance space, or translating the spaces inherent in the piece - which are often crafted with close stereo or headphone listening in mind - such that they behave in their intended manners in the larger performance space;
- The highest quality of sound and possible, in terms of frequency response, dynamic range, clarity of sound and image, etc, for as much of the audience as possible;
- extending the gestures and phrasing of the piece with spatial gestures and movements in, through, and across the performance space;
- supporting imagery through appropriate placement, movement, and spatialisation of the sounds;
- extending the dynamic range of the piece, and extending and supporting the dynamics of the gestures and phrasing.

These primary goals tend to focus on the attempt either to faithfully reproduce the work as the composer intended it, or else to extend the composer's gestures to suit the expanded scope of the concert setting.

Francis Dhomont lists some possibilities for supporting a composer's gestures, which provide examples from several of these categories: "For example to reinforce

the forte and attenuate the piani, to underline certain movements or trajectories, to accentuate the low or the highs through equalisation, to animate an accumulative sequence by aleatorically spreading it through the whole space, etc." (Basque and Watson 2004a)

More active roles for the diffusion artist are also possible, including acting creatively on the sound and the piece, for example by manipulating the colours and timbres of the piece and its constituent parts, elements and sections. This is more common in situations in which a composer is diffusing his or her own work, and risks being viewed as unacceptably presumptuous or an imposition where this is not the case.[14]

vii) Paradigms

On considering these many goals and practices, it begins to become clear that there are perhaps identifiable trends therein, which suggest differences in approach. It is not uncommon for these to be summarised as two contrasting methods, one which is primarily concerned with the arrangement of multiple layers of stereo loudspeaker pairs and the creation of a sense of space, and the other with movement in and around a circle of discreet loudspeaker points. This is perhaps an oversimplification, one which is inspired in part by the general desire to break things into concise and easily manageable dichotomies, and in particular by the somewhat reductive tendency to

[14] Even with the composer behind the controls, this approach to diffusion is not necessarily the most common.

view the history of electroacoustic music as a singular struggle between the two poles of Paris and Cologne, with in this instance the stereo approach on the Paris side, the circle of points on the side of Cologne. While there is certainly some degree of truth to this[15], it can be argued that approaches with little in common are sometimes grouped together to suit this easy dualism.

I would be tempted to extend this slightly, and propose that diffusion practice includes a third stream, and that each of these streams implies a particular compositional preoccupation and demands a particular set-up and diffusion strategy.

Two of these streams we have already mentioned. The first is concerned primarily with space – with the creation of a sense of space, and shifts between different spaces. This is generally pursued through the spatial imaging made possible by the use of stereo pairs of loudspeakers, or by spatial systems such as ambisonics or wave-field synthesis[16], and is well-suited to works which involve sound sources, objects and spaces taken from, or related to, the real world, and thus is one of the primary methods of the acousmatic genre. Clozier summarises this approach rather succinctly: "It is not a question of putting the music into motion, but of allowing the spaces contained within the music to unfold and be revealed." (Clozier 2001)

The second is concerned primarily with motion – taking a specific sound, phrase or strand, or a number of these, and moving them at will along identifiable

[15] See the examples mentioned above regarding the use of stereo-based arrangements in much acousmatic music and Stockhausen's use of the four-corner arrangement.
[16] See for example Barrett 2002 and Malham 2001.

lines, axes or trajectories. The arrangement of choice for this tends to be a circle of loudspeakers surrounding the audience. This is an attractive arrangement for composers with, for example, structuralist, parametric or algorithmic approaches, as such movement is readily organised, determined, or calculated in very precise and determinate paths.

The third stream is concerned primarily with timbre – the treatment, adjustment, manipulation, arrangement and grouping of different sound colours, tones, timbres and textures. This is often seen as a form of 'orchestration' of the sounds, with the loudspeaker arrangement referred to as a 'loudspeaker orchestra', organised in groups of loudspeakers with similar colours or timbral characteristics, which are then spread across the stage or listening space in a manner sometimes seen as similar to the arrangement of the instrument groups of an orchestra. Systems such as François Bayle's acousmonium[17], or some of Pierre Henry's set-ups (Henry 1977), would fall into this category.

Of course, in practice, a given performance, arrangement, diffusion or composition often does not fall cleanly into a particular category, drawing instead on two or several to suit the needs of the moment; however, one often finds that a performance will focus to a greater extent on one of these three concerns – space, movement, colour. In practice it is often the compositional strategy which is the

[17] The term 'acousmonium' appears to refer variably either generically to the loudspeaker collection/arrangement used as an instrument (see for example Vande Gorne 2002), or specifically to François Bayle's instrument/arrangement

determining factor; a set-up which on the surface appears geared towards a particular paradigm may in fact shift to a different paradigm according to the requirements of a given piece. For example, one often sees circular loudspeaker arrangements organised in left/right stereo pairs, narrowing to the front and back and reaching maximum width at the sides; if used in this way – shifting stereo material between these pairs - this would be a particular instance of the stereo paradigm, rather than the movement-oriented circular paradigm. Stereo pairings in circular arrangements are more often, however, between speakers 180 degrees opposite to one another, which, while sometimes effective in various ways, may be less successful at providing a sense of space or immersion, as our perception of phantom imaging from stereo sources depends ultimately on left-right cues which are diminished as the pairing angles away from the left-right axis, eventually collapsing completely in the case of a front-centre/rear-centre pairing.

A layered stereo configuration can also be used selectively to circulate pinpoint sounds around the audience, for which one would normally expect to use a circular loudspeaker arrangement; under such circumstances, the stereo configuration is behaving as a slightly irregular example of the circular paradigm. In the case of the November 4th concert presentation in the Sibelius Academy Chamber Hall, several acousmatic works were presented, the majority of which called for a frontally-biased stereo-pair arrangement, but one of which involved rapid movement between eight

speakers in a circular arrangement. This latter was in fact performed, quite successfully, by selecting eight of the speakers from the primary stereo arrangement - front distant, front near, sides, and rear - which, although not technically in a circular arrangement, very effectively communicated the movement of the piece.

At times the stated priorities of a given installation do not correspond to its actual characteristics or behaviour. Circular arrangements are often considered ideal[18] for creating a three-dimensional sense of immersion in the sound, the assumption being that this is the natural consequence of being surrounded by the sound on all sides; this ignores, however, the holographic qualities of stereo[19] or other spatial imaging. In describing the acousmonium concept, Bayle describes the concert space along planes and areas very much in keeping with the stereo-spatial paradigm – distant front, near front, sides, rear, with a frontline of 'soloist' speakers[20] - and stresses the need for stereo pairings and groupings (Bayle 1977). A glimpse at some of its installation plans[21], however, generally shows there to be little consideration for the stereo qualities of the speaker pairs, often placing the two loudspeakers of given pairs close together, these pairs then being distributed throughout the stage and space in an arrangement based on tone and colour. Vande Gorne, in describing arrangements focussing on the use of 'illusion space'[22], instead describes systems

[18] For example in Vande Gorne 2002.
[19] See for example Rossing 1990.
[20] In hindsight, this description almost perfectly matches the set-up for the *Space Within Space* concert.
[21] Bayle 1977 and 1993, Vande Gorne 2002.
[22] Vande Gorne's four spatial categories are discussed below.

arranged by a listed range of timbres and frequency responses, in which stereo placement is given limited, if any, consideration. She states this herself in describing the acousmonium, still under the supposed category of 'illusion space': "It is thus an instrument of perception, of staging, of highlighting rather than spatialising." (Vande Gorne 2002, my translation) This appears to contradict somewhat the stated objective of 'illusion space'.

In contrast, the Gmebaphone/Cybernephone tends to be described in terms placing it squarely in the orchestral paradigm; a glance at diagrams of the arrangement[23], however, shows a very clear and consistent maintenance of stereo pairs of a variety of widths, divided down the centre of the hall, which is more in keeping with the stereo paradigm.

viii) The role of the loudspeaker

It is interesting to note that the role of the loudspeaker varies significantly depending on the paradigm in question. For some composers and some diffusers – particularly those working within the orchestral paradigm – the loudspeaker is an instrument, each being chosen for its particular sound, characteristics, and colour, primarily as a result of its frequency response. The loudspeaker's role is then to impose its particular characteristics on the sounds it projects. This is in direct opposition to the role demanded by most other diffusion methods, in which, rather than choosing a loudspeaker specifically in order to alter or affect the sound in a given way, the

[23] See for example Clozier 2001 and Vande Gorne 2002.

challenge is to find loudspeakers which will least impose their own characteristics on the sound – which will reproduce the sounds as faithfully as possible, with the most limited deviation possible.

Rossing lists the following conditions "to achieve realism in reproduced sound"[24]:

1. The frequency range of the reproduced sound should be sufficient to retain all the audible components in the source sound, and the sound spectrum of the reproduced sound should be identical to that of the source.
2. The reproduced sound should be free of distortion and noise.
3. The reproduced sound should have loudness and dynamic range comparable to the original sound.
4. The spatial sound pattern of the original sound should be reproduced.
5. The reverberation characteristics (in space and time) of the original sound should be preserved in the reproduced sound. (Rossing 1990, p. 503)

The first three of these are the responsibility of the loudspeaker; in concert diffusion, the fourth and fifth elements are among the primary tasks of the diffusionist, though with the possibility for creative extension of these qualities. Thus, the actions of the

[24] Rossing is here considering the properties of loudspeakers for home high-fidelity stereo use, but we will discuss them here in more general terms.

loudspeakers and diffusionist combined should provide the widest possible frequency response and dynamic response, the most precise possible sound localisation (when required), and the fullest, most detailed sense of space possible (when required).

ix) Immersion

The sense of space is closely tied to the sense of immersion, which is a key element of diffusion practice, and an important consideration in designing an effective loudspeaker arrangement. Immersion is the impression that the listener is 'inside' the sound, as opposed to witnessing a frontal panorama of sounds or being surrounded by a periphery of sound. It is the impression that the sound fills the space, and that the listener is therefore fully 'immersed' in the sound; this is often achieved through 'activation' of the concert space – the use of multiple speakers which, with the help of reflections and reverberation from the hall acoustic, build up an immersive experience of the sound. While this sensation is not necessarily desirable at all times or for all pieces, it is a very important part of the diffusionist's toolkit, and the effective creation of this sense of immersion is in some ways the holy grail of diffusion: it is often very difficult to achieve to the desired extent, but is extremely effective when it is. Unfortunately, the sense of immersion is in a precarious balance with the clarity of the sound image and localisation, and an increase of either of these is generally to the detriment of the other, as immersion requires multiple sound sources from multiple directions, which tends to significantly blur localisation, which is at its most precise

when created by a single source, or through the stereo imaging of a single loudspeaker pair. For this reason the shifting between immersion and clarity, depending on the needs of a work, passage, or phrase, is an important, and gratifying, part of the diffusionist's toolkit.

x) Vande Gorne's four categories of space

Vande Gorne distinguishes between four different categories of space in diffusion, which are closely related to the three diffusion paradigms discussed above, and to the sense of immersion. This breakdown provides an interesting insight into a composer's particular approach to space. Each of the four assumes a different set of compositional goals and entails a different approach to the design of a loudspeaker arrangement. They are, in Vande Gorne's terms:

1 – ambiphonic space, which "plunges the listener in a sonic 'bath'";

2 – source space, which "localises the sounds";

3 – geometry space, which "structures a work in planes and volumes"; and

4 – illusion space, into which category works focused on stereo image primarily fall, and which, "consciously or unconsciously, is the goal of works in stereophonic format, which creates the illusion of a depth of field on the screen of two loudspeakers". (Vande Gorne 2002, my translation.)

xi) Frontal bias

One of the central debates surrounding loudspeaker arrangements concerns the

emphasis on elaborate frontal arrangements in both the spatial and orchestral paradigms versus the better surrounding of the audience by circular systems. Chion defends the frontal bias, central to arrangements such as Clozier's Gmebaphone and Bayle's acousmonium, against circular speaker arrangements, on the grounds that our senses favour frontal pick-up - that we are more attuned to the front to spatial details and sonic qualities, in terms of both frontal depth and panorama, and that circular arrangements give up a significant capacity for subtlety and richness by trying to make all directions of equal priority. (Chion 1977)

Some practitioners have found other ways to attempt to avoid the frontal bias; for example, Ferreyra suggests a focus on lateral movement instead of a frontal array (Courchene 2001). Some criticise the tendency, sometimes seen in all three paradigms, for loudspeakers to be placed either singly in the four corners of the room, or in pairs or groups which tend to gravitate towards the corners, and attempts have been made to move away from this tendency. Rolfe mentions that Keller and Newby, for instance, prefer a circular seating arrangement for the audience, thus not only avoiding the frontal bias, but also subverting the front-back/left-right dualisms (Rolfe 1999). For the first concert of *musique concrète* in 1951, Schaeffer used four speakers, but arranged them front left and right, rear centre, and one overhead (Zvonar 2004).

One of the most obvious possibilities to move away slightly from the four-

corners approach is the diamond arrangement, which employs a single centre-front speaker and a single centre-back speaker, used as a pair which, combined with the side speakers, offers a 'cross' configuration (Harrison 1999). While on first consideration this does little to get away from the square configuration, simply rotating the corners of the square by forty-five degrees, it is possible that the perceptual shift may be rather more significant, due to the direct, centered front-back movement and the removal of the frontal 'panorama' perspective.

xii) Points of debate

We have already determined a number of points of debate regarding diffusion practice; we should perhaps consider several more which are of interest to our discussion. The very notion of diffusion is a somewhat contentious issue, both as a term and as a concept. For some it is a vibrant and exciting performance art, which brings a further, invaluable level to a work, while for others it is merely a necessary evil, or even an undesirable distortion of the work which must be limited or avoided altogether.

Generally speaking, beyond the broadest of outlines, there is no general consensus regarding the details of diffusion, nor even a basic definition. In fact one regularly finds outright contradictions in the principles laid out by various authors in the literature on the subject. Some object to the use of the word 'diffusion', arguing that terms like 'sound projection' more accurately describe the process and its role

(Basque and Watson 2004c; Wyatt 1999). One sometimes finds the terms ‘diffusion’ and ‘spatialisation’ used somewhat interchangeably; the latter is rather a broader term, however. There is an important distinction to be made between spatialisation as a compositional strategy, and as a performance practice; ‘diffusion’ as a term only relates to the second of these, and spatialisation is only one of the diffuser’s many tasks.

Thus far, we have considered only the performance of music on fixed media; diffusion can also, however - at least in theory - be applied to music for tape and instrument(s), or even to live electronic works. It could be argued that these are perhaps extensions of the term, and will remain outside the scope of this discussion.

While some consider a supportive room acoustic to be an essential *sine qua non* for a good diffusion – Vandenbogaerde for example recommends more reverberant concert halls for diffusion than for music (Vandenbogaerde 1977) - which therefore makes outdoor diffusion a particularly difficult situation, others list the driest possible acoustic as the ultimate goal, with Vande Gorne going so far as to consider outdoor diffusion to therefore be the ideal condition in this regard (Vande Gorne 2002).

Another such contrast is that, while most consider a variety of loudspeakers types, brands, makes, and sizes, exhibiting a variety of characteristics, colours, and dynamic and frequency responses, to be at least ideal, if not essential, for a successful diffusion design, Robert Normandeau prefers all his speakers to be identical and of

the exact same brand and model. This though should be considered in light of the fact that his recent output is in multitrack format, with detailed movement between multiple positions already carefully built into the composition, thus limiting the diffusion act. It is thus the composer's intention that the diffusion set-up should simply present the multitrack piece as faithfully as possible, rather than creatively crafting the sound *in situ*. (Bouhalassa 1999)

xiii) The mixing console

Interestingly, more attention is generally paid to the organisation and arrangement of the loudspeakers than to the performer's interface or tools for control and performance. By default this tends to be a mixing board, with an array of faders for primary dynamic control, generally with potentiometers for panning and equalisation and punch buttons for muting or soloing tracks. The advantages of using such consoles is that they are ubiquitous - readily available in practically every hall, performance space and studio - and also relatively intuitive, visually straight-forward, and already familiar to most prospective diffusion practitioners. In many ways, however, the mixer is less than ideal as a performance tool. As Harrison points out, fader configurations, while effective for front-back movement, are poor for circular/circulating movements or specific trajectories (Harrison 1999). Certainly any performer's tools will tend to guide their performance along the paths most convenient for the given tool; thus fader arrangement guides and directs the diffuser's

thinking about the diffusion possibilities and about the music itself, and has had a significant, often unseen, impact on the development of diffusion performance practice.

xiv) Control

In 1951, for the first diffusion performance, by Schaeffer and Henry, the 'potentiomètre d'espace' was used, which involved dramatic arm movements through large induction coils to control movement between the speakers (Zvonar 2004). It is fascinating that from the very birth of the genre such emphasis was placed on diffusion as performance, the diffuser as performer, while in the years that followed this avenue faded significantly from view. Possible tools for diffusion performance remain largely unexplored territory even today, in an age in which a variety of technologies are readily accessible which could perform such control of spatial movement with relative ease. Exceptions include the Buchla Lightning and Surround Traffic Control's infrared conducting interface (Zvonar pg 9).

xv) Figures and placement

Having now discussed the goals, technical apparatus, and general approaches of diffusion practice, we should consider diffusion techniques in greater detail. Curiously, discussion of this obviously essential aspect of diffusion is largely absent from the literature, which tends to focus either on technical considerations, or more often on only the broadest strokes of intention and approach. One striking exception is

Annette Vande Gorne's article *L'interprétation spatiale: Essai de formalisation méthodologique* (Vande Gorne 2002), in which a number of instances and examples of movement, position and placement of sound in diffusion are discussed. These are worth enumerating here.

Vande Gorne discusses some typologies of possible interpretive 'figures' in diffusion, and the ability to stress a given aspect of the work by the choice of such figures. Figures listed include:

- 'le fondu enchainé' – slowly shifting from one pair to another, or through a series of pairs;
- 'le démasquage' – from a large number of loudspeakers, slowly reducing to a single loudspeaker or pair;
- 'l'accentuation' – highlighting a particular loudspeaker or pair;
- 'le scintillement' – rapid, often random accentuation throughout a number of open loudspeakers;
- 'l'oscillation' – rapid alternation between two loudspeakers or groups of loudspeakers;
- 'le balancement' – the same, but slow;
- 'la vague' – there-and-back-again movement through a series of loudspeakers or pairs;

…as well as a number of others, including rotation, spiral, rebound, insertion/rupture,

appearance/disappearance, explosion, accumulation, and invasion.[25]

Aspects of a work which can be stressed by such figures include iconicity or image, movement, demixing of polyphony, phrasing and variations, subjectivity, and the material and its properties. (Vande Gorne 2002, my translation.) Efforts to highlight each of these can be found in my own diffusions.

None of these should be considered rules, per se, but rather as observations of the perceptual effects various placements and movements have on the listener, effects which can be instinctively sensed and understood in the diffusion space. Thus while some critical examples of the literature concerning diffusion only came into my hands after the concert experience, the extent to which the tendencies described therein correspond with my own diffusion plans is remarkable.

For example, Vande Gorne lists the impacts on the listener of placing a sound in various room positions:

- in front: representation, the story, the solo;
- in front, distant: the horizon, the distant, the escaped, the inaccessible;
- behind: menace, danger, disappearance, the fall;
- on the sides: presence, stability, persuasion;
- in the audience: proximity, confidence, the murmur or the reinforcement,

[25] Examples of most of these are can be found in the section dedicated to my concert diffusion, with the exception of the fastest of these actions, and of movements such as rotation and the spiral, which are perhaps more suited to the movement-based diffusion paradigm and thus were not included in my diffusion plans, except perhaps as the occasional by-product of a front-back diffusion gesture combined with left-right panning in the source material.

insistence.

Again, there are many instances which will be seen in the descriptions of my own diffusion which instinctively match up with this perspective.

This, then, has hopefully presented us with the necessary background regarding the goals, tools, and techniques of diffusion; we will now proceed to consider the preparations for the diffusion of the *Space Within Space* concert.

V – DESIGN, PLANNING AND REHEARSALS

i) Timetable

After an initial day of basic planning, rehearsals took place over four separate days at the Chamber Hall of the Sibelius Academy, Helsinki, as well as one day in the hall in which the concert was to take place – Leonora Hall at Kallio-Kuninkala, Järvenpää – two days before the concert. The day of the concert I had access to the hall beginning three hours before the concert.

This was less than ideal for a number of reasons. Having the bulk of the rehearsals in a different hall than the concert is extremely problematic, as diffusion is extremely dependent on the details of the space – a fact borne out by my experience preparing for this concert. As a result, the three rehearsal days in the Chamber Hall were used primarily to get an idea of the basics of diffusion as a concept, as this was in essence my first proper diffusion experience, and to develop general strategies for the pieces, while the one day in Leonora Hall would have to be used to adapt my set-up to the new space, hopefully leaving a bit of time to rehearse the pieces in the new space and make any necessary adjustments to the diffusion scores. Unfortunately this proved to be nearly impossible; the entire day in the new hall went to attempting to craft a functional loudspeaker arrangement, with further adjustments made in the hours before the concert. In the end there was roughly an hour, immediately before the concert, to try the pieces in Leonora Hall.

As the rehearsal days were spread out over a period of roughly two months prior to the concert, and there being no serviceable permanent installation in the hall, the entire set-up had to be built up at the beginning of each day of rehearsal and dismantled at day's end. Taken together this set-up and tear-down time totalled between two and three hours each day – a rather substantial block of time. The weight of such practical needs is surely one of the reasons that diffusion is not a more common practice than it is: a permanent installation is prohibitively costly, and considered undesirable by many halls for a variety of reasons; but without such an installation the practical requirements to set up a full diffusion arrangement are daunting. These hours also cut significantly into the time that could be spent rehearsing; however, there is a limit to the amount of time that can be spent in diffusion rehearsal in one block before one's ears become 'saturated', as it were, and one ceases to be effective.

The first day in the hall, as mentioned, went to basic planning. The concepts and goals of diffusion were considered[26], and the basic outlines of a possible loudspeaker arrangement; this was then set up in a basic form. The first day of rehearsal went entirely to trying out, moving and adjusting the various elements of the arrangement, and by the end of the day this was in the final form it would maintain for the duration of the rehearsals.

[26] This day was spent under the expert guidance of Dr. Andrew Bentley, who acted in the role of advisor for this project.

The second day of rehearsals went to learning to use the system and attempt to become familiar with the basics of diffusion in practice. A detailed score for Schaeffer's piece was prepared on paper.

The third day of rehearsals – the final day in the Chamber Hall – was spent preparing diffusion plans for the rest of the program. It was decided early in the day to mark these directly onto the ProTools session, as it was difficult to follow the session running on the laptop, the score on paper, and my actions on the mixing board simultaneously.

The day in Leonora Hall was entirely spent setting up, trying out the system in the new space, and trying to make the appropriate adjustments. The final adjustments were made the day of the concert, leaving only about an hour for actual rehearsal, immediately before the entrance of the audience.

ii) Equipment List

Rehearsals:

8 X Nexo PS8 passive speakers, with crossover controllers and amplifiers

4 X Genelec 1029 active speakers

4 X LS400 subwoofers

Crest XR20 mixer

Concert:

6 X Nexo PS8 passive speakers, with crossover controllers and amplifiers

4 X EAW passive speakers

4 X Genelec 1029 active speakers

2 X LS400 subwoofers

2 X EAW subwoofers

Crest XR20 mixer

iii) The loudspeaker plan

The decision to use a set-up focused primarily on the use of space was made very early on, and was both an aesthetic and a practical one. As discussed above, the spatial diffusion paradigm is generally more appropriate for acousmatic music than is the circular, movement-based paradigm; while it is possible to make bold and creative use of this arrangement by making strong use of moving gestures, this being my first full diffusion performance I was unwilling to attempt a performance approach with so significant an impact on the shapes of the pieces. The timbral, loudspeaker-orchestra approach was also dismissed, partially through personal preference, partially through lack of time and resources: such arrangements require a good number of substantially varying loudspeakers of different characteristics, from the very small to the very large; in preparing for my work there were really only perhaps three different loudspeaker models from which to choose, and, perhaps more importantly, a limited number of channels from which to mix. However, even without such limitations I would still almost certainly have chosen a similar approach to that which was actually

employed.

iv) Frontal zone

The basic plan for the loudspeaker arrangement is very similar to the basic elements of systems such as Bayle's acousmonium (Bayle 1977) and Harrison's BEAST system (Harrison 1999). As neither the rehearsal hall nor the concert hall was particularly large, the spaces, planes, and diffusion 'zones' needed to be carefully considered. It was determined that, in keeping with the general frontal bias of this approach to diffusion, a certain amount of space would be used to create a frontal zone with more than one layer of frontal depth, while a single rear pair and side pair would suffice. In the rehearsal space, this frontal zone was divided into planes consisting of a distant pair, widely spaced and fairly high; a near pair, more narrowly spaced and somewhat lower; and a close array of smaller loudspeakers, in a line quite close to the audience and lower still, only slightly above the head level of a seated audience member. As these smaller speakers were intended to highlight certain sounds, and to help focus sounds and bring them closer, rather than to be primary carriers of the sound, they were equalised to cut the lower frequencies and raise the high frequencies. This helped them to provide clarity without obscuring the images of the main front pairs.

v) The reference pair

The distant front pair was chosen to act as the 'main pair' or 'reference pair' of the

system, to act as the primary pair for the bulk of the diffusion; it needed therefore to be placed and balanced as carefully as possible, in order to be the primary provider of the sounds and images, and to act as a reference pair for the other loudspeakers. The reference pair needs to have the best possible frequency response and clarity of image, and so must not only be the loudspeakers with the best performance available, but must be very carefully placed to ensure the clearest possible image. This generally involves carefully determining the ideal distance from the audience, as well as the acoustic environment surrounding the pair – for example the covering of walls and other reflective surfaces – such that the direct sound should arrive at the audience unhampered by first reflections and reverberation. Unfortunately the Nexo loudspeakers used for this pair were found to be much too dark, and rather indistinct, even with significant equalisation. As a result, in the rehearsal space the equalised Genelec array needed to be used more or less consistently in order to correct the frequency response of the frontal image. In the concert space, however, the EAW pair did not suffer from this problem, which freed up the Genelec array to be used more liberally as solo or effect speakers. Despite the distant front Nexo pair no longer acting as the reference pair in the Leonora Hall arrangement, precautions were still taken to dampen the reflections at the very front of the hall – by pulling curtains across the side walls of the area in front of the audience – in order to improve the ratio of direct to reflected/reverberant sound from this distant front pair.

vi) Subwoofers

In the rehearsal space, a pair of subwoofers was placed at the feet of the main pair. The placement of subwoofers is yet another issue on which there is a notable lack of consensus. It is often claimed that localisation is impossible at such low frequencies, that as a result the placement and location of the subwoofers is of limited importance, and that stereo subwoofers are unnecessary. Others - Dennis Smalley and Robert Normandeau for example - insist that, in accordance with personal experience and observation, localisation is still possible, and they therefore insist on stereo subwoofer pairs. Interestingly, for a concert diffusion at the Ritarihuone in Helsinki in 2008, Smalley used a single, centre subwoofer at the front, and a stereo pair of subwoofers at the back.

vii) The rear pair

The rear pair was placed to roughly form a square with the front main pair, perhaps slightly more widely spaced, at a similar height (approximately two metres – the maximum height of the stands used). As this was to be the only rear pair, it was to be placed at medium-to-close distance from the last row of the audience, such that it would provide a distinct rear presence without making the nearest audience members uncomfortable nor providing too distant, and therefore dull or indistinct, an image. This rear pair was also accompanied with a subwoofer pair.

It is not uncommon for the signal going to the rear loudspeaker pair to be

delayed by twenty to thirty milliseconds[27]. The rear loudspeakers are critical in achieving a sense of immersion, as opposed to simply a frontal panorama; thus a healthy volume level from the back pair is maintained a significant amount of the time. Giving a volume level to the rear pair similar to that of the main pair, however, has the undesirable consequence of causing listeners in the back half of the audience to localise the sound as coming from the rear, due to greater proximity. Delaying the sound sent to the rear pair relocalises the sound to the front, even for listeners at the back of the hall, thanks to the difference in timing cues. Without this delay, in order to avoid this rear localisation the levels of the rear speakers would need to be kept too low for them to be useful. I chose a full thirty millisecond delay for the back pair in order to maximise the effectiveness of this localisation, while I found that delays any longer than that immediately became perceptible as a very close echo or stutter.

viii) The side pair

The placement of the side pair proved to be quite tricky, both in the rehearsal space and the concert space. As a rule these were kept as high as possible and as wide as possible, as this pair is intended to build up a resonant, ambient sound in the sitting area of the room, as opposed to providing a near, localisable point source. Unfortunately this was not entirely feasible, particularly in the concert hall, which was relatively long and narrow. The rehearsal hall was not symmetrical, posing something of a problem for the side pair. An initial attempt at placement had the speakers

[27] Also witnessed in Smalley's 2008 Helsinki concert.

pointed towards an angled section between the wall and the ceiling, at very close range, in the hopes of achieving a more diffuse sound through its reflection and dispersal; this proved to be unsatisfactory, the resultant sound being rather weak and ineffective. These speakers were then moved to be pointing directly up towards the ceiling of the hall, as high as the stands would allow – approximately two and a half metres, which left several metres between the loudspeaker and the ceiling. This proved much more effective, creating the desired effect of a full, unlocalised presence of the sound in the room, and very nicely activated the listening space.

ix) Adjustments

This, then, was determined to be the basic form of the set-up, which was tweaked and adjusted over the coming days of rehearsal, and partially re-engineered upon moving to the concert hall. Initial adjustments included:

- moving the distant front pair all the way to the back wall, in order to get better bass response from the subwoofers;
- increasing the level of the subwoofers;
- detailed testing of different widths for the distant front pair;
- placing the inner Genelec pair close to the near front pair, such that they might be used separately or in combination as a timbral control for the same localisation, which proved to be largely ineffective;
- placing the inner Genelec pair wider than the near front pair, to extend,

brighten and clarify the image from the near front pair;

- extending the outer Genelec pair to maximum width, to widen and bring the sound forward, which proved very successful;
- extending the side pair to maximum width, to limit localisation from these loudspeakers and maximise their diffuse quality;
- moving the side pair further back into the hall, to help differentiate them from the frontal zone; and
- moving the rear pair further back and raising their levels somewhat to provide a larger sense of space without increasing rear localisation.

x) Amplifier levels

The levels of the amplifiers were adjusted so that the subjective levels in the room would be roughly the same from pair to pair. In the rehearsal space, this meant raising the levels of the rear speakers slightly, of the distant front speakers somewhat, and of the side, up-facing speakers significantly. In Leonora Hall, however, it meant lowering the levels of the side speakers due to their proximity, despite being turned away from the audience towards the walls. Adjusting the volume levels at the amplifiers makes the diffusion performance somewhat easier, as the perceived volumes at a given fader level will be roughly the same for all speakers, avoiding the need to remember or calculate different levels and adjust accordingly.

xi) Leonora Hall

The move to Leonora Hall necessitated several significant changes, both positive and negative. Perhaps the most important difference was the inclusion of the hall's loudspeaker installation in the diffusion arrangement. This consisted of four EAW speakers, a front pair and a rear pair, suspended against the side walls at ceiling height. Luckily, these were not in the corners of the hall, which was quite long and somewhat narrow, but rather a number of metres in from the ends of the hall to cover the seating area in a more satisfactory manner. The manner of their suspension, as well as time constraints, were such that it was deemed impractical to move them from their installed positions to better suit my own needs.

The better frequency response and power of these speakers made the front EAW pair a better choice to act as reference pair. The disadvantage of this is the height, and particularly the width, of their placement; if the main pair is already at maximum stereo width, it is impossible to extend that width for effect in diffusion. Their inclusion granted me an additional layer of frontal depth, as both of the Nexo pairs could be used as a further distinct frontal plane; the success of these layers was initially uncertain, however, as the greater power of the EAW main pair easily obscured or obliterated the more distant images of the two Nexo pairs. In concert, however, this was easily adapted to, and effective use was made of these frontal layers. In fact, the reduced high-frequency response of the Nexo loudspeakers

compared to the EAW pair helped support the sense of distance for which these two front Nexo layers were used. Also, as mentioned above, the greater power and frequency response of the EAW pair allowed the Genelec array to be used to much greater effect, as they were no longer needed to blend with and help balance the Nexo pairs, and as they could now be used at much higher volumes before becoming disturbing or overly localised.

The rear EAW pair was at an appropriate distance from the back of the audience, and while they were again higher and wider than my initial intentions for the back pair, this was not found to significantly impact the sound, and in fact may have been an improvement. As the rear Nexo pair were already on site and in place before the decision to use the four EAW loudspeakers was made, the rear signal was split off such that the channels were doubled by the Nexo pair, in a more distant but slightly narrower and lower position, to fill out somewhat the slight gap caused by the width of the rear EAW pair.

In addition, the hall's subwoofers were also taken into use, providing better support for the lower frequencies than had been possible in the rehearsal hall.

The other significant change to the diffusion arrangement was to the side pair. As this hall was significantly narrower than the rehearsal space, I could not get the necessary distance between the audience and the side loudspeakers for them to be effective in their chosen role; the ceiling of this hall was also somewhat lower. As a

result, there was significantly less distance between the audience and the speakers, as well as between the loudspeakers and available reflective surfaces, as a consequence of which the sound from these speakers was much more direct than I would have liked, and the reflections much less diffuse. For the concert, these side speakers were hung from the ceiling, directly facing the wall, in an attempt to limit the direct sound as much as possible; they were then used at reduced volume levels, again in an attempt to use them for diffuse or ambient hall sound, rather than close, precise localisation. This was effective only to a limited extent, and the use of this pair had constantly to be adjusted and reconsidered during the concert performance. Better use of the side loudspeakers in this position could most likely have been made had this been their position when the diffusion scores were developed and during rehearsals. It is a valid positioning of the loudspeakers, but perhaps better suited to sound placement at and movement along the sides of the halls than to the building up of an ambient, resonant hall space.

xii) Diffusion notes

In my diffusion notes, which were developed in rehearsal, 'Mains' refers to the distant-front Nexo loudspeaker pair. This might create some confusion, as in the concert set-up, the closer, wider EAW pair came to be considered my main pair. In the concert I adapted variably by either using this EAW pair to perform actions assigned to the 'Mains', or by using the distant-front Nexo pair, or else by

improvising a different approach to the use of the frontal arrays. ‘F’ and ‘B’ refer to ‘front’ and ‘back’. There is the possibility of occasional confusion over the use of the word ‘back’ – this can mean either the rear of the hall, or a return to a previous position. Thus it is possible one might come across the instruction ‘Front – Back – Back again’, meaning a move from front to back and returning to the front. I considered this possibility for confusion when making the notes, but determined that the priority was that the notes be immediately clear to me, rather than to an eventual interested party; and they were, indeed, clear to me in performance.

xiii) Possibilities for improvement

While of course greater resources would have allowed for a more complex and possibly more effective set-up, this proved to be a perfectly serviceable basic arrangement. Should greater time and resources have been available, the additional element I would most have liked to have included would have been an overhead loudspeaker, pair of speakers, or high-frequency tweeter clusters such as are included in the BEAST system. These would have allowed for a better sense of sound immersion in the room, greater subtlety of control of this aspect of the sound, and more detailed movement and placement above the audience. In the set-up used, such movement could only be implied, or occasionally feigned, by careful use of the side pair combined with the rear speakers and perhaps the outer pair of the Genelec array. Additional frontal layers and rear layers could be effective, as could the use of a

central front and rear speaker. A more detailed use of height might also have great potential; while a greater number of loudspeakers would certainly assist in this, there is likely much more that could be explored in this regard using even a fairly basic system such as the one employed here. While height was considered in arranging the speaker placements, these decisions were made quickly, and I look forward to a more considered examination of the effects of different speaker heights in the future.

Despite the diversity of planes and volumes available due to the multiple stereo pairs, this loudspeaker arrangement used still falls somewhat into the square/four-corners stereotype, with left-right movement inherent in the stereo source material, and front-back movement the main source of movement in the diffusion performance. The piece whose diffusion most noticeably strays from this in this concert, as we will see, is Ferrari's *Visages V*, for which the channels fed to the rear speakers were flipped, as a result of which front-back fader moves, thanks in part to the strong left-right separation of the stereo mix, created diagonal movement across the audience (a front-left sound moves to back-right, and front-right to back-left, and the equivalent crossings from back to front). However, while these trajectories do break the otherwise maintained left-right perspectives of the originals, they do not expand beyond the square, four-corners paradigm – on the contrary, by sketching a further approach to movement between the corners, they in fact reinforce this paradigm.

xiv) Fader arrangement

As there was no splitter box available, the need to find ways to split the stereo input off to multiple outputs was a limiting factor in the set-up design. This was achieved by using two separate stereo tracks in ProTools, as well as two stereo auxiliary outputs. The first, primary stereo file was output to mixer channels one and two, and was also sent through ProTools busses to the two stereo auxiliary tracks. These were output to mixer channels nine through twelve, which were sent via their direct outputs to the four speakers of the Genelec array. The remaining stereo audio track was delayed by thirty milliseconds and sent to mixer channels five and six, from whence it was sent to the rear speakers. The first two mixer channels, which received their input from the main ProTools audio track, in rehearsal were sent through the four group outputs and thence to the two front speaker pairs, as well as to the main outputs, which were sent to the side pair. In the concert venue, however, the hall's own main front pair was added to the configuration, thus necessitating a second pair of inputs; this was achieved by patching the outputs of channels one and two to the inputs of channels three and four, which were then sent to the side speakers, while the main outputs were used for the new main front pair. The outputs to the rear pair were split off to simultaneously drive both the rear EAW and Nexo pairs.

A possible advantage of such an arrangement might be the ability to thereby control all three front speaker pairs using only the single fader pair on channels one

and two. This was not ideal in this set-up however as these faders would also lower the levels of the side pair. No use was made of this possibility for controlling multiple speakers using the first two faders, with the exception of the final fade-out of the final piece of the concert. It is possible that, with great preparation time, use of these faders might have been beneficially integrated into the performance plan.

A baseline set of levels was determined, to approximate the maximum use of the full collection of loudspeakers, which could be returned to, deviated from, or referred to as necessary. These were based on the levels used in the peak sections of *Viiltoja*, as these were among the rare moments of the concert program to make full use of all the available loudspeakers at full volume. These levels were:

- main pair, distant front pair, and rear pair at full volume (i.e. a fader level of 0, which still offers significant gain for accentuating a given pair for a given passage);
- side pair at full volume in rehearsal, but somewhat lower, around -10, in the concert hall due to increased proximity;
- near front pair at -5; and
- Genelec array at -7.

xv) **Playback**

It was decided very early on to play the pieces from a Macintosh laptop running ProTools rather than from compact disc. There were two vital reasons for this: first, it

allowed for a single stereo output to be split off within the software to the audio interface's eight outputs, as described above, as well as allowing for the signal to the rear speakers to be delayed with ease; and second, it offered a running view of the waveform of the piece. It is extremely useful to have such a visual display of the waveform – which generally has sufficient visual cues to be able to follow and anticipate events – as it can act both as a guide to the current position in the piece during performance, and as a diffusion score, using notes marked out in the 'comments' bar. Having the diffusion instructions written directly onto the playback display is extremely convenient, as it reduces the number of places one needs to be watching and monitoring during the performance.

A small but frustrating detail was encountered in this regard, in that the version of ProTools being used (LE 7.4.2) did not allow for continuous scrolling; as a result it was left to scroll page by page, i.e. running through the passage displayed and then jumping to the next view of the same duration. This was quite unfortunate, as there were often cues immediately upon shifting to the next page view, for which I would not have been prepared; and as one could not be sure of where the page changes would occur – depending on variables such as changes to zoom and play marker location, which would change regularly during performance – I had to constantly move the view forward manually at regular intervals. This was an unwelcome addition to an already busy list of diffusion actions.

VI – THE DIFFUSIONS

i) General trends

Looking back over my diffusion choices, it is easy to see a number of trends – various criteria which determine where I am likely to place a sound, or how I am likely to move it. These tend to be directly linked either to the spectromorphology of the sound, or the nature of the sound source, in fairly transparent ways. A plane passing shifts from the rear, through the high side speakers, to the front, or vice versa, to simulate its passage overhead; a car passes frontally from one side to another – such examples, in which the movement links directly to our experience of an identifiable sound source, needs no explanation. Movements or placements motivated by spectromorphology, though in theory a more abstract connection, in fact also tend to be directly linked to experience and perception. For example, sounds which fade, which drop in dynamic, are generally moved to the outer speakers – either the rear pair or the distant front pair. One often finds further indications in this direction, such as an increase in reverberation over the course of the gesture simultaneous with the drop in dynamic, indicating a movement away from the listener, which it is natural to support with an equivalent diffusion action. Of course it is possible that the composer may have included a cue contradicting this moving away – for example, with a decrease in reverberation and an increase in high-frequency detail, indicating perhaps a sound which is getting quieter while moving towards the listener. Again, the

supporting diffusion action is relatively clear: a shift to either the near-front pair, the main pair, or the Genelec array, depending on the situation.

There are some gesture types which call intuitively for a given diffusion action in which the connection is perhaps less immediately obvious, despite being an instinctively immediate choice. For example, considering the same fading sound gesture, should the gesture drop in pitch, I will tend instinctively to move it out towards the rear of the room, whereas should it rise in pitch, or hold steady, I will tend to move it out towards the distant front. This relates perhaps to a reduction in high-frequency content due to blockage from the rear by the listener's head; it is also possible that it relates to specific real-world sound sources which are not perhaps immediately obvious.

Another consistent diffusion choice is to use the side speakers primarily for textural, as opposed to gestural, material. As the side pair are the primary actors in bringing the sound into the room, in placing the audience inside the sound, this seems to be more sensible with longer textural phrases than more active gestures which call out for more rapid movement, which tend not to stay still long enough for this sense of immersion to build up. The sides were also occasionally used in the concert performance as an effect pair, to highlight a given sound with startling proximity, for example with some of the sound objects in Normandeau's *Rumeurs*. This however was the exception to the rule; and while this allowed their use in this manner to be

effective and surprising, I would single out the more extensive use of this pair for more diverse purposes as an avenue for further exploration and development of my diffusion skills.

ii) Rehearsal vs. concert

Michel Chion makes the following astute observation regarding concerts and rehearsals: "...We prepare, if we are organised and conscientious composers, learned diffusion strategies (on scores) which we will eventually abandon, at the time of the concert, in favour of capricious tactics inspired by the grace of the moment." (Chion 1977, my translation) This is doubly true in our case, as the changes in performance space and loudspeaker arrangement between rehearsal and concert further necessitated such deviations. As a result, I have divided my comments and observations regarding my diffusion of each piece into a discussion first of my diffusion scores and plans determined in rehearsal, and then of my actual diffusion choices and actions in concert, as preserved in the concert video recording, taken from over the mixing console, from which my manipulation of the faders etc. can be duly observed.

Two time references will be given when referring to specific points in the piece: the first refers to the time elapsed from the beginning of the piece, and can be used when referring to either the audio file or the ProTools session for that piece; the second refers to the aforementioned mixer video. Video start points are given below

after the title for each piece. Keep in mind that the video is taken from the concert performance; as a result there will be discrepancies between actions described in the rehearsal sections of the following discussion and the actions seen on the video. These will be discussed in the sections discussing the concert performances.

1) Dennis Smalley's *Sandar* (0:00:25)

i) Rehearsal

As this was to be the first piece of the concert, the diffusion plan made use of the form of this piece to slowly open up and introduce the various elements of the speaker arrangement to the audience. While this might have been something of a compromise if one considers only the needs of this piece alone, and the most ideal possible presentation of the piece, it made sense in the context of the concert as a whole.

Much of the piece focuses on very detailed, close rustling sounds, presented in remarkable, rather granular detail. Rather than present the piece at maximum volume, which would allow for a maximum appreciation of the details of the textures and which is likely the intention of the composer, this piece was presented at lower volumes, in limited speaker pairs, which build in number and volume over the course of the piece. *Sandar* unfolds in long, shuffling phrases, with sudden spectral interjections. I chose to make use of this form to dramatically introduce the various sections of the diffusion arrangement, introducing and moving between some

speakers over the longer phrases, and suddenly introducing new, or shifting between, pairs on the sudden spectral objects.

The piece – and concert – begins with only the distant front speakers for the opening phrase, presenting a somewhat hushed, frontal stereo image – the most basic of speaker set-ups, and the one audience members are most likely to be familiar with, if not from previous concert experience then at least from home listening. At 0:18(0:0:43), on the first spectral object, the rears were suddenly raised, thus moving suddenly to a quadraphonic arrangement – which, after simple frontal stereo, is the next arrangement audience members would likely be familiar with from concert experience, and which represents the next most basic level of the diffusion arrangement. This holds for the following phrase, which continues the rustling/shuffling textures already introduced and adds a water element. On the next spectral object, at 1:06(0:1:31), the near front pair is suddenly introduced, dramatically bringing the sound closer to the audience and introducing the layering of frontal foreground and background, of near-field and distant-field, which is central to this approach to diffusion and to my diffusion of many of the pieces to come. Again, this is held for the duration of the following shuffling-rustling phrase.

From 1:52 to 2:00(0:2:17 to 0:2:25) several instances of the spectral object are presented, but in a stuttering, slightly fractured form; the diffusion continues to hold over these, hopefully building a bit of tension rather than repeating the now-expected

pattern of introducing new pairs with every instance of this object. Instead, the side speakers are slowly raised over the long, low growling texture which begins at 2:02 and ends around 2:40(0:2:27 and 0:3:05). The rising fader gesture peaks at around 2:18(0:2:43). This brings this rather ominous passage slowly into the room, as the side speakers are the most effective of the various pairs at activating the audience's listening space, placing the listeners 'inside' the sound, as it were, and thus hopefully makes this an eerily dramatic passage.

Chimes are introduced beginning around 2:36(0:3:01), along with slow spectral swells; gentle front-to-back motion – raising one while lowering the other and back again – roughly follows these swells, gently introducing the notion of front-to-back movement which, again, is a centrepiece of this approach to diffusion, and which is a good example of using diffusion to follow and enhance the inherent spectromorphology of a passage.

The swells peak with two crests at 3:43 and 3:44(0:4:08 and 0:4:09), which are specified in the diffusion notes as being nearly fully at the rear and then the front, respectively to capitalise on the drama of the moment. From 3:48(0:4:13) there is a long passage which moves from a sputtering tube sound through a rising of the chime sounds and a swelling up of the spectral material, which drifts off somewhat into the distance before swelling up again in the low frequencies with a faint rustling of the opening material. This passage is followed with a long, very slow drifting of the

sound from front to back, which peaks furthest back at the point – around 4:28(0:4:53) – where the spectral material has reached the quietest point of its drifting away, followed by a slow return to the front, reaching its destination around 4:48(0:5:13), thus bringing the low-frequency surge forward and bringing the close rustling sound back to the front. This places the climactic passage from 4:46 to 5:10(0:5:11 to 0:5:35) back to a full use of the space with a frontal focus. The sputtering passage from 5:10 to 5:18(0:5:35 to 0:5:43) shifts to the rear; the large spectral swell at 5:19(0:5:44) thus begins in the back and swells towards the front. The subsequent swell, which shifts from higher frequencies to lower and back again, moves from front to rear to front again, following the shifts in spectrum; and finally, beginning at 5:34(0:5:59), the piece follows the long, slow fading of the spectral material with a similarly long and slow move to the rear speakers, such that the piece disappears from view (!) off in the distance behind the audience.

ii) Concert

As the hall's front pair was now acting as the main front pair of my own set-up, I used a combination of the distant-front speakers with the near-front Nexo pair (effectively now acting as a 'narrow-stereo' pair, compared to the much wider but more powerful main pair) at a lower level to open the piece, and brought up the front hall speakers at 1:06(0:1:31).

Unfortunately, the new fader arrangement made smooth front-back movement

possible only if using either the main pair or the Nexos, but not both, as the group output faders (for the Nexos) and the main output (for the EAWs) were not easily accessible with one hand performing a single gesture. This had been much more feasible in rehearsal, before the inclusion of the EAW pair, when only the Nexos on the group faders needed to be adjusted simultaneously with the right hand. (The Genelec 'solo' array was rarely used as part of primary front-back gestures.) While the Nexos had been included from the start of the piece, they are still up when the front-back movements begin around 2:48(0:3:13). I begin these movements using the main front pair, and, when I come to realise that the four Nexos, still being up, are inhibiting the sense of front-back movement, I can be seen rather suddenly bringing down the four Nexo faders in an attempt to correct the situation. This is a good example of the manner in which I was forced to adapt to the new speaker/fader arrangements over the course of the concert itself; luckily I believe I adapted fairly quickly – such problems were largely encountered early in the program, and were then taken into consideration for later pieces.

By the climax at 4:48(0:5:13) I have recovered and adapted. This is the peak of a movement from back to front; I can be seen raising first the distant-front Nexo pair, then the near-front Nexos, and finally the main front pair, which rides the crest of the gesture, in what is thus a fairly smooth and sensible transition. For the front-back movement of the final phrase, and the closing front to rear gesture, I have brought the

Nexos and the Genelecs down to near zero, and operate using only the rears and the main pair. While this is a sensible thing to do and a practical solution, in hindsight it might have been preferable to have used the Nexos instead, shifting the frontal image into the further distance, or even to have shifted back from the main pair, through the near-front Nexos, to the distant-front Nexos. Unfortunately this level of subtlety would have been impossible to operate simultaneously with a front-to-back gesture using the given fader arrangement.

The equalised Genelec array was maintained at a low level throughout much of the performance; these were valuable in helping retain some of the focus and detail of the rustling-shuffling sounds.

2) Luc Ferrari's *Visages V* Part 2 (0:07:25)

This piece is noticeably different from the other pieces of the program. It is extremely fast-paced for much of its duration, and space is less of a central concern than the rapid-fire pace of the gestures. This difference is reflected in my diffusion strategy.

A central change is that this is the only piece for which I chose to cross the rear speakers, such that the signal going to the front left was sent to the rear right, and that for the front right was sent to the rear left. This is not an uncommon arrangement, but it demonstrates a focus on movement rather than space, as this crossing of the rear channels would disrupt the sense of space across the room. Thus it was deemed

inappropriate for the rest of the program, but desirable for this piece. The rapid gestures of the piece are supported by strong and quick left-right movement on the tape; the primary manner in which I might support these gestures and movements would be with matching front-back movements. Without crossing the rear channels, a certain percentage of the movements were relegated to the edges of a square around the audience, leaving the listener somewhat outside the piece; crossing the rear channels allowed for a greater percentage of the gestures to cross diagonally across the audience, thus making for a more vivid and invigorating experience.

i) Rehearsal

The piece begins with a busy gesture which slowly fades in and then out again. I followed this by having the piece open in only the rear speakers, slowly move to the front (including the centre pair of the Genelec array, for maximum clarity and proximity), and then back again. The rear speakers were not dropped in this gesture, so it is more a case of the sound coming into the room and back out again than a strict back-front-back movement.

The strong, quick, almost comic-book gestures which follow are supported with sudden shifts between the main front pair and the rear speakers. While a few of these are movements from one pair to another across a given gesture, most are sudden changes between the pairs.

The pace changes briefly at 0:48(0:8:13) with a longer building gesture, which

begins with the front pair up, then a slow raising of the rears to fill the room as the gesture builds. The Genelec array is brought up suddenly for the quick bursts which peak this gesture at 0:57(0:8:22) for maximum impact through clarity and proximity; these are brought down and up over the coming passage following similar shifts in the material – spectral swells out in the room, quick bursts front and clear in the array.

A longer, slower instance of the spectral swell acts as the centre of the piece, beginning at 2:00(0:9:25). For this the side pair were brought up to bring the sound into the room and to the audience, thus highlighting it as the longest phrase, and one of the most significant phrases, of the piece. As this gesture builds in frequency and intensity, peaking with very high frequencies, it shifts from the sides to the Genelec array, again for maximum focus and to exaggerate the screeching of the high frequencies, then back out to the side speakers as the gesture subsides.

A truly chaotic passage begins at 2:54(0:10:19), and while I had marked out fader movements for the rapid gestures earlier in the piece, this section, faster still, is sufficiently chaotic that it would be difficult or impossible to attempt to follow specific individual gestures, and so I have left the passage open for improvisation of similarly wild and sudden movements.

This activity continues as the piece eventually fades, for which all near speakers were dropped, leaving the final moments to drift away at the edges of the room.

ii) Concert

My diffusion of this piece in concert contained the only identifiable 'mistake' of the concert. This results from the fact that I accidentally begin a gesture other than that which had been planned, and rather than follow the gesture through, I immediately switch to the planned gesture. This switch, near the beginning of the gesture, cuts completely across the sound object in an awkward, jarring and noticeable manner, and clearly demonstrates that, once begun, a performance gesture *must* be followed through, regardless of whether or not it is the planned or intended gesture. This is a known and recognised rule of instrumental performance, particularly of improvisation; it is no less true of diffusion, as this example proves. It occurs at 0:48(0:8:13) – the beginning of the first longer gesture, after the rapid front-back movements early in the piece. The longer gesture was intended to move from front to back; however, when the gesture begins I find that I have finished the previous movements at the rear. While it would have been perfectly acceptable to turn the intended gesture around and move the sound forward, in a moment of confusion I suddenly switch from back to front after this longer gesture has begun. As the diffusion of this piece was far more vigorous than that of any of the other pieces of the concert, this is the likeliest place for such an event to take place.

From 1:26 to 2:00(0:8:51 to 0:9:25) there is nothing planned in my diffusion notes; in the concert performance I use this passage to improvise sudden shifts

between the side pair, the near-front Nexo pair, and the distant-front pair. This was perhaps a good choice, as the original diffusion plan did not make use of shifts between front foreground and background.

The chaotic passage of the end of the piece once again posed problems due to the inability to group the front faders under one hand, making it impossible to bring the front speakers down together. As a result, I would have had to either use only main front pair/rear pair shifts, now perhaps too familiar from earlier in the piece, or shifts between different pairs including the various frontal pairs. I opted in performance for the latter option; however, this renders the movements rather less dramatic, as there are fewer strong shifts between different ends of the room, and more rather subtle shifts between the different frontal zones. The final result, however, was not unsuccessful.

3) Francis Dhomont's *Thème de la fuite* (0:12:20)

i) Rehearsal

One immediate difference between the diffusion plan for this piece and most of the others is that, while the Genelec array was usually equalised with the low frequencies cut and the high frequencies boosted, in keeping with their role as 'solo' speakers to highlight sounds, clarify them, and bring focus and better localisation, this equalisation was not used for this piece, as in rehearsal it was found to be unnecessary

and even detrimental. After a certain amount of experimentation with varying degrees of equalisation it was my conclusion that Dhomont's exquisite balance and shaping of his materials is sufficiently detailed, subtle and perfectly crafted that it requires no such assistance from equalisation in diffusion, even in such limited and purpose-specific use. As a result any equalisation tended only to detract from the work.

A similar effect was found when planning the diffusion movements. The quality of the piece is such that, even in its simplest stereo presentation, it provides a very complete listening experience. This includes its qualities of space and movement. Dhomont's objects and gestures are so well crafted, and so carefully selected, that they provide an absolutely complete sense of wholeness between sound, space and gesture. Space is carefully and holistically considered at all levels of the work; it is present not just in the space around the sounds, but in the deployment of the sounds, and, perhaps most strikingly in this case, in the choice, nature and identity of the sounds themselves.

As a result of this remarkable subtlety and degree of perfection, I found there was very little that I needed to do in diffusion to support the already extremely strong shapes, spaces and movements of the piece; in fact, to a significant degree, I found it wisest to simply let the piece run, and allow Dhomont's craftsmanship to stand on its own. As a result, my diffusion for this piece was limited to a significant degree to front-back movements, as this is the one motion which it is impossible for Dhomont

to have included in the stereo work. Even here, however, Dhomont's mastery of his craft is such that these front-back movements are implicit in the work; I needed only to follow the gestures as he had laid them out. Some of the other primary elements of diffusion – shifting between foreground and background, left-right motion, shifting between speakers of different timbral qualities, etc – could be used only to an extremely limited degree with this piece, as all of these elements were already perfectly controlled in the source stereo recording.

This experience suggests the possibility that, the stronger the work, the more limited the possibilities for diffusion. As with Dhomont's work here, a first-rate acousmatic piece tends to be so perfectly crafted that one can only follow along and enjoy the incredible grace of its movements. Ironically perhaps, this does not necessarily provide the most satisfying or fulfilling experience for the diffuser; with a lesser piece one is perhaps freer to improvise, to contribute, to shape the piece through the diffusion.

Thus, the bulk of my diffusion plan involves front-back shifts which follow the discrete gestures of the piece. In fact it is not until 2:30(0:14:50) that I stray from these slight contributions, to emphasise this long, high-frequency texture by bringing up the side speakers and thereby bringing this texture into the room, in contrast with the previous gestural material; these speakers are used in a similar manner later in the piece with similar material. At 3:55(0:16:15) the near speakers are dropped, and

brought back again at 4:09(0:16:29), to acknowledge the contrast between this hovering spectral material and the close-up rolling ball which precedes it and the tight, metallic gestures which follow.

These however are the rare exceptions. Most of the diffusion movement of the piece involves shifting material which appears to be moving away from the listener generally to the rear speakers, and focused material to the front. Not very adventurous perhaps, but it seemed unwise to tamper with the mastery of space and movement already so apparent in the piece.

ii) Concert

The airplane gesture from 1:10 to 1:27(0:13:30 to 0:13:47) is ignored in my diffusion notes, but in concert the sides are slowly brought up, then the main front pair, to move the plane overhead from back to front – a gesture which one suspects would have been more successful had the rear pair been brought back down as the front pair was raised, a move which should have been possible considering the close proximity of the faders for the side pair and the rear pair, which would have allowed me to lower them, either simultaneously or staggered, with my left hand while raising the main pair with my right.

For the first two and a half minutes of the piece, the two front Nexo pairs – the distant-front and right-front speakers – are left untouched and unused; movement to and away from the front is effected using only the main front pair, with the centre pair

of the Genelec array present at a low level for additional presence, as are the side pair, at a still lower level. The side speakers are brought up, as planned, at 2:30(0:14:50) to bring this spectral glide into the room; in the concert this is followed and supported by a raising of the distant-front pair, further extending the sound. As a shift to the back of the room was planned, I can be seen manipulating the main pair and the Nexo pair simultaneously for the first time, a sign of adaptation to the difficulties of the new fader arrangement for the frontal speakers. In fact, while the gesture begins with both pairs of faders coming down, I turn the main pair around and, continuing the same gesture, bring the distant-front pair down with my index and middle fingers while bringing the main pair back up with my thumb, while the left hand controls the faders for the rear speakers. A simple enough move perhaps, but the first time we see me making such a combined move of non-consecutive faders (in this case, one pair above the other) with one hand.

Around 5:00(0:17:20), the distant-front Nexo pair is once again brought in to support a gesture that begins with a raising of the side speakers. At 6:30(0:18:50) they are called into service once again, this time to add some variety towards the end of a long spectral passage for which slow front-back shifts have been used, primarily using the main front pair. Finally they are used to open the long final spectral phrase, before shifting to the front main pair for the peak of the spectral surge, before subsiding to the back and sides.

With these relatively rare exceptions, then, for the bulk of the piece my hands are kept primarily on the main front pair and the rear pair, executing front-back shifts to support Dhomont's gestures. While I think this relatively conservative approach to the diffusion of this piece was wise under the circumstances, a more advanced and experienced diffuser would likely have chosen more vigorous movements to underline the piece's vivid gestures.

4) Patrick Kosk's *Distrak-Sillalla* (0:21:55)

i) Rehearsal

I found this piece slightly difficult to prepare. After a carefully crafted opening couple of minutes, the piece proceeds in several shifting layers of only a few different sound textures, creating something of a sense of stasis, with limited spatial variation – generally between close, dry sounds in the extreme foreground, and slightly reverberant sound somewhere between the near and middle-distance. The diffusion strategies most commonly used elsewhere in the concert were not so effective here, due to a limited amount of clearly gestural material and limited shifts in spatial perspective, and because all but the most slow and restrained diffusion gestures tended to contradict the sense of stasis and throw the work into a certain degree of confusion. The primary tools upon which I intended to rely were, firstly, the use of the equalised Genelec array to highlight the extreme foreground shuffling material, and

secondly, occasional sudden moves to bring the side pair in and out to highlight shifts between busy, foregrounded textures and broader, more spectral textures. In many ways this piece would be ideal for a more adventurous diffusion: the sound material, though not particularly varied, remains rich, and there are long stretches of such material with which to explore more varied or elaborate diffusion moves and strategies. However I did not feel confident at this early stage attempting too bold a diffusion plan.

The diffusion plan for the opening phrases of the piece perhaps deserves closer scrutiny. The first gesture begins with a strong impulse, rolls out into wider stereo and greater reverberation, then returns to announce the chiming texture which is one of the central themes of the piece. The impulse is presented in the full speaker arrangement, shifts to the back as the sound image widens and grows more reverberant, then back again to present the chime theme in full strength in the full arrangement. At 0:28(0:22:23) there is a break and several seconds of rapid, close, dry movement, for which the near-front pair and Genelec array were to be employed; followed by a sudden hit at 0:34(0:22:29), for which the sides were brought down and the mains raised for a sudden frontal impulse. From this point on the diffusion plan is dominated by the aforementioned shifts in the Genelec array and the side pair. Some elements of the diffusion plan no longer seem the most logical choice – for example, the decision to shift the first presentation of the shuffling texture, another of the piece's main

themes, to the rear, or the failure to support the significant chordal gesture at 1:24(0:23:19).

ii) Concert

The use of the Genelec array to highlight certain material proved to be extremely successful in concert, and helped to lend greater layering and depth to the piece than that which is present in the source stereo recording. The array served not just to highlight the desired material, but in fact to separate it entirely into its own foreground layer, placing it individually in a differentiated foreground space separated from the rest of the material, which remained further back in a second, more distant layer. This results from the relative lack of high frequency information, attacks, and impulses in the distant layer, meaning that only the shuffling texture was highlighted by the equalised array. This texture, already close and dry, was brought closer still by the additional focus, clarity, and localisation brought to the attacks of the granules of the texture. Once this separation into two distinct layers was achieved, it was possible to perform movements using only this foreground layer, leaving the more distant layer untouched. This added greatly to the listening experience, and was for me a particularly fulfilling element of the diffusion experience.

With this piece it appears I am perhaps growing more comfortable with both the changed speaker and fader arrangements and with the diffusion as a whole. I make more elaborate and considered, albeit improvised, use of the increased frontal layers,

and more freely extend or add to the planned diffusion moves.

More extensive use is made here of the two front Nexo pairs, which allows for the main pair to be used to emphasise particularly strong gestures; this increase in variety in frontal dynamics is, I think, a welcome and useful extension of the piece. For example, the main front pair is left down for the opening gesture, and instead is raised and lowered in a swell for the stuttering gesture from 0:22 to 0:28(0:22:17 to 0:22:23), adding a variety of shifts in space to match the changing textures. The pair is then brought up suddenly for the sudden impact at 0:34(0:22:29); its absence from significant gestures, such as that of the piece's opening, allows it to be extremely effective at moments like this. This marks something of a change in approach: generally this speaker pair is treated as the main pair, with the other frontal pairs used to provide variation, special effects, or contrast to this main pair, whereas here we see this turned around, with the two Nexo pairs as the primary frontal actors, and this EAW pair providing contrast and special effects.

At 2:10(0:24:05), with the separation of the two textural layers described above established, we see me cross fingers across the fader pairs of the Genelec array, in order to pan the foreground shuffling across the array. Thus far the array has been treated in the same manner as the fader lay-out – as two distinct pairs, an inner pair and an outer pair. Here the left of each pair are manipulated by the fingers of one hand, while the right are controlled by the fingers of the other, requiring that the

fingers of the two hands be interleaved. This allows me to more fluidly effect panning across the four faders. In the last minutes of the piece, this pulsing crossed-finger panning is combined with a slow reduction of overall levels to maintain left-right movement in the array while simultaneously fading them out. For increased variety, elsewhere in the piece these faders are once again used as separate inner and outer pairs, such that the front textural layer expands and contracts, rather than constantly panning left and right.

At 4:30(0:26:25) we see shifts between the side speakers and the outer Genelec pair, again in an attempt to increase the spatial and tonal variety. These two pairs, while serving very different purposes, are still fairly close perceptually; shifting between them is not a strong gesture, but rather a more subtle pulsing between side presence and immersion on the one hand, and a very broad, slightly forward presence on the other, with increased intensity due to the equalisation of the array. This proved fairly effective at keeping these passages vibrant and interesting without particularly drawing attention to the movement.

5) Gilles Gobeil's *Le vertige inconnu* (0:34:00)

i) Rehearsal

The opening phrases of *Le vertige inconnu* are interesting territory for diffusion, in that the gestures are strong and clearly laid-out, but do not immediately demand a

specific movement or spatialisation. It is clear that these gestures should be supported by diffusion actions, but the sounds, sources and spectromorphologies do not strictly relate to a particular movement through the diffusion space, leaving the diffuser a great deal of freedom. There is something of a paradox in this, as one might assume that more nebulous material, with less clear or well-defined gestures than those we find here, would allow greater freedom of diffusion; but, as seen with *Distrak-Sillalla*, this is often not the case. One might assume that Gobeil's strong, bold, clear gestures, with such strong phrasing, would present a strong, solid identity, which would not easily be altered by the supporting diffusion actions; on the contrary, however, these actions had to be very carefully considered, as I found that, in fact, slight variations in the diffusion changed the relationships between these gestures, and to a significant degree determined their structural roles. This is perhaps partially due to the pacing of these bold gestures – they come in a linear sequence, fairly closely spaced, but with each allowed to unfold before the next begins, thus allowing changes in placement and movement between one gesture and another to be noticeable and thereby to affect their relationships with one another. More important, perhaps, are the qualities of the sounds themselves. The gestures are strong, the actions they evoke are clear, the sound objects resonant, but without ever being directly linked to a real-world source that might carry with it specific spatial cues. We experience impacts, sweeps, rumbles; we sense the movement of metal, of wood, of air, all as a very visceral

experience, which seems particularly vivid, concrete and physical – and yet without being tied to real-world objects or events. This is, I think, a significant accomplishment, and it is this which makes this piece particularly interesting for diffusion. These gestures provide evocative material for movement through the diffusion space, and the decisions one makes in diffusion help to shape the roles these gestures play.

The opening moments provide an able example. The first thirty seconds unfolds as two long phrases, each of which is made up of several gestures, and each of these composed of several objects – impulses, rolls, creakings. While these phrases are very bold and clearly and cleanly cut out, one finds that it is in fact quite easy to shift the hierarchies of these events through diffusion decisions, by emphasising certain gestures, or certain objects within the gestures, through particular placements or movements, or by making connections between chosen objects or gestures by spacing or placing them similarly. I enjoyed the process of shaping these opening phrases a great deal, and finally chose to perhaps slightly subvert the expected phrasing for this passage. Rather than highlight the first gesture as the annunciatory opening of the piece, I presented this gesture using primarily the nearer-field speakers, delaying full strength not only to the second gesture, but in fact to the chugging object which comes after the main impulses of this second gesture. This has a significant impact on the identity of these opening phrases; what might easily have been experienced as an

antecedent-consequent relationship, with the first gesture dominating and the second gesture responding, instead becomes a series of introductory objects and movements which announce the chugging action, which is emphasised to become the climax of what is now a single opening phrase. The long, tense build from 0:32 to 0:56(0:34:32 to 0:34:56) is used to introduce the side speakers and bring the sound into the room, building tension to the dramatic broken gesture at 0:54(0:32:54), the identity of which again is shaped significantly by diffusion choices. An obvious choice would be to have the first half of this gesture in the front, then suddenly appear in the back after the remarkable pause; instead, I present the first half somewhat to the front, then bring the rears back to full volume for the second part of the gesture, which is followed immediately by an impact. What would otherwise have been a sustaining of tension which climaxes with the impact, instead connects the second half of the broken gesture directly with the impact which follows, making them a single climax which suddenly breaks the silence.

The piece creates drama by contrasting these incredibly powerful gestures with longer passages of sustained tension; I support these, as elsewhere in the concert, by concentrating on the frontal arrangements plus rear pair for the gestures, and using the sides to make the sustained passages activate the room, placing the listener inside the sound and thus increasing the tension in anticipation of the next burst.

The piece also makes use of sudden shifts to the foreground, suddenly

introducing dry, close, smaller movements to contrast with the larger-than-life qualities of the main gestures – again, this creates tension by building our anticipation of the next burst. As elsewhere, these are highlighted by shifting them forward into the Genelec array, thereby exaggerating both their proximity and their fragility, compared to the full power of the main gestures. Again, the array is used as an inner pair and an outer pair, to occasionally broaden or narrow the sound image.

There are also a number of sudden shifts away from the foreground, from clear, active material which suddenly drops away to leave a broader, more reverberant sound field, giving a sense either of greater distance or of greater space. These I try to support by dropping out the main front pair simultaneously with the foregrounded material, and bringing up the side pair and possibly the rear and distant fronts, such that there is a sudden shift from localised frontal sound to a fuller, more diffuse sensation. This occurs for example at 7:35(0:41:35), as the opening of the final, cataclysmic gesture. I follow this gesture through as it rises in intensity and frequency by slowly bringing up the near-fronts, then the mains, simultaneously dropping down the Genelec array to give a sense of a growing, broadening scope, sacrificing the focus and clarity of the array for a sense of massive size.

This is a piece of extreme contrasts and effects, and as a result is a fine example of a situation in which diffusion can be used to exaggerate the composer's gestures, in this case the dynamics. Gobeil has used the available dynamic range to maximum

effect; it is clear that this should be supported in concert diffusion, where the focus and concentration of a concert audience will allow quieter lows to be heard, and where more powerful amplification allows for the possibility of much louder peaks. Again, as a result of this exaggeration and slight redeployment of the composer's dynamic strategies, the diffusion affects the relationships between the various forms and gestures, so the relative levels for these peaks and dips in dynamics must be carefully considered.

In general, I try to keep the strongest, most focused impulses either to the front, or filling the entire space - perhaps still with a frontal bias - as I find this maximises their impact, compared for example to placing such impulses to the rear, which somewhat dulls their impact. This however does have a rather jarring effect on the listener, and so is maintained as a possibility for this particular effect.

One of the challenges of this piece is to try to find a variety of ways in which to support the many dynamic, somewhat explosive gestures. They demand fairly vivid supporting diffusion gestures and movements, but there are a limited number of such movements available to me without going too far afield and thereby counteracting or otherwise detracting from the spectromorphology of the gesture. Front-back motion is a primary possibility, as is near-field/far-field, but these are soon explored fairly fully. Thus an attempt is made to extend the possibilities here somewhat by using some of the resources slightly differently from my usual approach. An example of this comes

at 1:48(0:35:48), when a dramatic, impulsive surge is brought to the side speakers. These are normally used in my diffusions, as previously described, to activate the room for longer textures; normally I might, for example, have chosen to begin this gesture in the back, and sweep it forward to peak at the front. This movement however has already been employed a number of times in this piece. Taking the sound suddenly to the side speakers hopefully has a startling effect of bringing the swell abruptly to the listeners; the spectral nature of the particular swell makes this gesture a likely candidate for such an attempt.

At 2:02(0:36:02) a long, somewhat subdued passage takes place which is perhaps more identifiably source-bonded[28] to a recognisable real-world scenario, through the nature of the sounds and their treatment, primarily with reverberation. The details are unclear, but one imagines a large work truck arriving, stopping, performing some sort of action – unloading, for example. The reverberation suggests one of several options: either distant-front, rear, or an engagement of the full room by prioritising the sides. I chose to shift this passage to the back to play with this quality of identifiable source-bonding – the sounds are recognised, but unseen, as they are behind the listeners. Hopefully this acts as something of a spatial tease, albeit a brief one.

[28] "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 1994)

ii) Concert

In concert I appear to have followed my diffusion plan to a significant degree, with elaboration once again in the use of the various frontal layers, and in occasional details, such as slight expansion-contraction between the inner and outer pairs of the Genelec array at 1:36(0:35:36) to complement the raising of the array as a whole.

Some gestures, understandably, miss the mark somewhat in performance, noticeable perhaps in a piece such as this one, whose vivid gestures suggest an equally vivid diffusion. At 1:48(0:35:48) for example my plan calls for the rapid raising of the sides to match the subsequent gesture; in performance this is executed rather too soon and too quickly, peaking early in the gesture's build-up, and thereby somewhat counteracting the desired effect by reaching a maximum of diffusion intensity well before the intensity of the gesture has peaked.

While some improvised use is made of the frontal layers – for example at 3:00(0:37:00), where the main pair is dropped out to leave this more subdued phrase as a more distant and diffuse layer – more subtle and elaborate use of these layers could, I think, have been made had I been aware of them at the rehearsal and planning stage, or had I had more time with the new hall and configuration. There is much material in this piece which suggests a frontally-biased perspective, and a variety of layers of intensity and space, which would make this sort of diffusion support attractive.

Again, I run into problems here – for example between 4:55 and 5:55(0:38:55 and 0:39:55) – with being unable to satisfactorily bring down all three front pairs simultaneously with one hand, making it difficult to execute front-back movement, which requires that my left hand be used for the rear pair, if all three front pairs are in use. These gestures ended up being somewhat halting, as I move back and forth between manipulating the rear pair, the main pair, and the two Nexo pairs on the group faders. This is again a problem on the final gesture, on which I would like to raise most of the faders simultaneously, but am unable to do so; as a result the final impact does not reach the desired intensity – for example I have not had time to get the main pair to the desired volume. Problems like this might be a valid argument for digital programmable mixing desks, in which case multiple faders could temporarily be assigned to a single master fader; this could easily address my problem with the six faders for the frontal arrangement. However I also suspect these issues could easily be overcome with greater experience; for example, use might have been made of the two input faders, rather than attempting to raise all of the frontal pairs simultaneously.

As a general comment, I find that often, at the start of gestures which are intended to move to the back of the hall, the rear speakers are already at what is nominally full level, leaving the bulk of the gesture to be performed by a reduction of the levels of the front speakers, which is obviously less than satisfying. This oversight is due, at least in part, to an unconscious prejudice towards the front speakers, upon

which a perhaps undue amount of my attention in performance is focussed. This is a performance flaw which would need to be considered and addressed in future performances and development, either by simply remembering to bring the rear levels down adequately when the focus shifts to the front, or by including such reductions in the diffusion instructions and notes.

6) *Outgribing* (1:00:20)

i) Rehearsal

The diffusion plan for this piece was not fully prepared, nor was the piece fully rehearsed, beyond the testing of individual sounds and sections and their impact in the hall. This was, firstly, because the piece was not ready in the version in which it was to be performed until immediately prior to the concert, and secondly, due to a limited amount of rehearsal time. Being my own piece, I was of course intimately familiar both with every moment of the piece, and with my intentions regarding space and movement; thus it was not necessary for me to prepare notes for myself, or to rehearse the diffusion, in the manner clearly necessary for the works of other composers. The only two comments noted in advance were a general volume level for the start of the piece, and a reminder to keep the main pair down for the early cricket gestures, to allow for a more realistic, diffuse image.

It is amusing at times to observe my hand movements in the diffusion video for this piece; while most of the time during the other pieces, thanks to the detailed diffusion plans my movements are guided and directed, generally moving directly towards specific faders, in this video you can occasionally see me 'thinking with my hands', as it were – my fingers move from one pair to another, linger here or there, before deciding on a given action. This doesn't so much give an impression of indecision as of being able to see my thought process acted out in real-time.

ii) Concert

This was a unique experience for me in the context of this concert, as obviously I had a significantly more profound level of familiarity with this piece than with any of the others, and also because I was in the situation of supporting my own compositional strategies through diffusion, rather than adapting my diffusion strategies to someone else's compositional agenda, and vice versa. Also, as some sections of the piece had not yet been crafted to my satisfaction, I found I was able to address and even correct some of these failings in diffusion.

This is primarily true of the second half of the piece, which is dominated by a single, broad, shifting spectral texture, with a rhythmic, rolling, mechanical pattern overtop taken from close recordings of an escalator. These were inadequately crafted, lacking significantly in details of shaping and placement, and as such became quickly repetitive and somewhat boring when drawn out over such a long period. As with

Distrak-Sillalla, however, I found that I could very successfully separate these two layers by using the equalised Genelec array to pull the escalator layer closer and forward into the room, leaving the spectral texture out and around the room. As a result I was very effectively able to shape the escalator gestures by raising and lowering the array faders, and to move them across the frontal left-right panorama, both with left-right gestures and expansions-contractions as previously described, although in this case the perceptual result of shifting from the inner array pair to the outer was more of the sound moving closer and wider, as though the audience were moving towards and through the sound, due to the qualities of this particular sound source.

I was also able to improve the shapes of gestures throughout the piece by emphasising their dynamics, raising and lowering the levels in the room accordingly. While this was generally one of my diffusion goals throughout the concert, I was able to achieve this in much closer detail here due to my more intimate familiarity with every detail of the piece.

In the first cricket phrase, which begins at around 0:10(1:00:30), I begin in the outer ring of speakers as described above, then raise the inner Genelec pair to emphasise the shift from natural to processed sound as the phrase builds. In the second phrase, this movement is extended and continued with a shift from the inner pair to the outer pair, in keeping with the broadening effect of a louder dynamic and

increased reverberation. In the third phrase the full array is used, accompanied by a raising of the side pair.

Looking at it now, there are moments which appear to be missed opportunities. One such example is the series of clearly-phrased gurgling gestures which run between 4:25 and 4:55(1:04:45 and 1:05:15). These cry out for supported movement, and could potentially be separated away from the background by using the equalised Genelec array to pull them forward as described previously; however, my hands remain still as these phrases unfold. The closing phrases of the transitional section which follow benefit greatly from diffusion; the phrasing is made much stronger by controlling the fader levels, and a shifting use of the space helps a great deal in creating identity for a passage which remains somewhat vague and uninviting in the original stereo. Curiously, however, the gesture which transitions into the second half of the piece, which doesn't achieve the desired power in the stereo version, is unsupported by the expected raising of faders; although perhaps the behaviour of the sound in the room was such that none was needed, as it seems impossible that this was an accidental oversight at so obvious a moment in the piece.

The diffusion strategy for the piece's second half is twofold: on the one hand, to maintain a maximum presence throughout the hall, and a maximum activation of the space; and on the other hand, the shaping and movement of the foregrounded escalator passages, as described above.

The closing gesture is dominated by a raising of the main front pair and the Genelec array to bring the accelerating subway gesture forward towards the audience, and then a dropping of the same faders to move the dissipating geese and cricket phrase out and away from the audience, with all front speakers dropped for the last, quietest tail of the crickets, left in the side and rear pairs at low levels, to keep them present as they fade to nothing.

7) Pierre Schaeffer's *Étude aux son animés* (1:11:59)

i) Rehearsal

As one of the older works in the program, one of the priorities for the diffusion of this piece was to assist in overcoming some of the technical shortcomings of the medium. Primary among these is a more limited dynamic range, which is easily extended in diffusion. Another is a more limited spatial palette, compared to the resources and tools readily available to composers in more recent times. This also left me greater freedom to direct the sounds at will through the hall, without risking contradicting spatial cues already embedded in the piece by the composer.

An example of the first of these two considerations is the inclusion of a crescendo in my diffusion instructions at 0:04(1:12:03). This is one of the few instances in the entire concert where such a dynamic marking is indicated; generally

such crescendi and diminuendi are an implied part of spatially-motivated instructions for particular fader groups.

As a result of the more limited inherent spatial cues of this piece, I am able to make greater use of the various frontal layers. Much of my diffusion plan involves shifts, often quite rapid, between the distant-front pair, the near-front pair, and the inner and outer pairs of the Genelec array (keeping in mind of course that the main EAW pair used in the concert was not part of my rehearsal set-up). Interesting examples of this include the passage from 1:36 to 2:18(1:13:35 to 1:14:17), in which a series of metallic bangs and scrapings are to be moved between the main pair and the Genelecs; the rolling ball gestures that begin at 2:18(1:14:17) which are to be panned from left to right across the Genelec array; the instruction at 2:49(1:14:48) to continue raising and lowering the outer Genelec pair, in order to simultaneously bring forward and broaden the swelling textures of this passage; and the near-final phrase at 3:49(1:15:48), in which a creaking gesture begins in the near-front pair, followed by a raising of the outer Genelec pair, then the inclusion of the inner pair for full frontal proximity, and finally a dropping of the Genelecs to keep the final gesture large and out in the hall.

This piece also includes points at which the sound object is noted, rather than the intended diffusion action. This occurs occasionally throughout the concert, but is not common. These are points at which I have deemed to leave the ultimate decision

as to the choice of action free, to be determined in performance. Such points include the reverse-delays at 3:11(1:15:10), and the piece's final swooshing gesture – although the previous instruction to bring the array faders down could suffice for this.

ii) Concert

Again with this piece I am faced with on-the-fly decisions regarding the new frontal arrangement; particularly so in this case, as my diffusion plan relies heavily on detailed shifts in this zone. In the opening gesture, intended originally to shift between the distant pair and the near pair, in performance I use these two pairs in tandem, shifting between these and the EAW main pair. The front-back shifting which is indicated for the long droning phrase which follows is performed, first using the main pair with the other two pairs down, then through a raising of the distant pair, then of the near pair, and continued shifting using these two Nexo pairs while the main pair stays up. The side pair is called into service beginning around 0:42(1:12:41) to assist with this shifting, eventually being used in parallel with the rear pair, using the left hand to raise and lower them together while the right hand handles the fronts.

At this point we again see the two front Nexo pairs being used together in a shift between these and the main pair. In this instance, not only does this effect a perspective shift, but the gesture is also intended to modulate the colour and timbre of the sound, the Nexos being in general somewhat darker than the main EAW pair.

There is confusion at 1:36(1:13:35) - the passage described above calling for shifting between the Genelec array and the front main pair - as I find myself with all three front pairs up and unable to effectively perform this shifting using all three. Finally I opt to ignore my previous instructions, and instead drop the two Nexo pairs completely and concentrate on creating movement using the Genelec array, first shifting between inner and outer pairs, then panning across the array. At first I try performing this one finger at a time, using, from left to right across the faders, middle finger left hand, index finger left hand, index finger right hand, middle finger right hand. This proves unsuccessful however, and I quickly shift to the crossed-hand technique described above, in which one hand controls the left speakers of both pairs, and the other the right speakers.

I find this an interesting point to note, as a pianist and prospective diffusion performer: I found it difficult or impossible to 'perform' pinpoint, linear movements across the space by a sequence of single-finger fader moves. This being, I believe, something of a stock gesture in diffusion practice, I look forward to future attempts.

Unfortunately, by using this left-right panning in the Genelec array for this previous passage, the use of this same movement for the rolling ball gesture which follows loses its impact.

For the reverse-delays, mentioned above, I opt to perform shifts between the distant-front pair and the near-front pair. Eventually these are combined with a raising

of the rear speakers, which requires that I use the index finger of my right hand to control the distant pair, and the middle finger to control the near pair – simple enough perhaps, but a move that was not immediately successful in rehearsal.

Unfortunately I stumble somewhat in the final phrase of the piece, appearing slightly disoriented. At 3:48(1:15:47) a raising of the outer pair of the Genelec array is indicated, followed by a further raising of the full array at 3:59(1:15:58), then a dropping of the array for the final swoosh. In performance appear to believe that I have fallen behind – I rush to bring up the outer Genelec pair, then abruptly drop the array far too early. Realising my mistake, I slowly bring the array up again, and drop them again at the correct spot, and finally bring the sides and front pairs up for the final impacts. This makes this last gesture building up to the final impacts rather confused - unfortunate considering its importance in ending the piece. I suspect this could have been avoided by being more clear in my notes – instead of a single instruction stating 'AllGensThenDown' at 3:58(1:15:57), this could have been broken up to indicate only 'AllGens' at this point followed by 'GensDown' around 4:04(1:16:03), which would, I suspect, have made the unfolding of this passage more clear in the heat of performance.

8) Robert Normandeau's *Rumeurs (Place de Ransbeck)* (1:16:45)

i) Rehearsal

Rumeurs is a very rich piece, and one which requires careful crafting of the diffusion. Again we have a piece in which the movement and especially the changes in space have been crafted with extraordinary care, detail and subtlety by the composer; thus once again we are faced in diffusion with the difficult task of supporting and extending these elements without accidentally contradicting them, confusing them, or otherwise getting in their way.

My primary diffusion tools for this piece are by now familiar: shifts between frontal speaker layers to underline shifts in foreground/background focus in the source material; use of the sides to activate the space and bring the sound into the hall for more textural passages; shifts to the equalised Genelec array to exaggerate sounds for additional close-up focus; use of the outer Genelec pair and the side pair to broaden or widen the image and space; and shifts between front and back as the main source of movement for phrasing, or 'movement for movement's sake', as is sometimes the case.

This piece was both a pleasure to diffuse, and a challenge. *Rumeurs* flows forward in a series of graceful gestures, many of which readily indicate a likely diffusion choice, either through phrasing or source-bonding. Many of the sounds are

readily identifiable, and these sources provide direction as to where to place such sounds and how to move them.

The detailed use of space demands careful and painstaking attention in planning the diffusion, but also often provides clear direction as to how to distribute the sounds in the hall. There are, however, some highly virtuosic passages composed into this piece – in terms of both gesture and space – which throw down a serious challenge to the timid diffuser. Consider for example passages such as that beginning at 11:00(1:27:45), in which we are presented with a rapid and constantly changing sequence of doors – opening, closing, locked, unlocked, slammed, creaking, etc. – in a constantly changing series of spaces. One is almost tempted to see this as a deliberate and knowing challenge from the composer to the prospective diffusion performer; how can one possibly tackle such a passage adequately? This flurry of changing images, locations and spaces seems impossible to keep up with, yet they seem to cry out each for their own unique placement and treatment. Unfortunately, a diffuser as inexperienced as myself is not up to this particular task, and so I attempted to side-step the challenge somewhat. I chose to alternate primarily between the main front and rear pairs – thus limiting my options for movement from gesture to gesture to a readily manageable minimum – while keeping the Genelec array raised throughout. Although there is a fair range of possibilities in varying the amount of front-back shift, this choice takes the emphasis off the need for individual placement and places

the sequence of doors in a single, constantly changing space. This is due primarily to a rather lovely effect encountered when these door-slamming impacts – full-bodied, with a dynamic envelope and a wide frequency spectrum – are placed simultaneously in the rear pair and the equalised Genelec array. This creates a beautiful, shifting, frequency-dependent image, which pulls the high-frequencies towards the array, and the low frequencies to the back of the room. The resultant image is very dynamic and rather larger-than-life; it was used very occasionally in the concert, and seemed a satisfying approach to these larger-than-life doors, and hopefully provided a sufficiently interesting, shifting space that my avoidance of a more complicated plan for this passage might be forgiven.

Many of the phrases in this piece, however, are a gift to the diffuser, allowing satisfying movements across the piece's many graceful gestures. Consider the lovely, sprawling phrase that begins at 0:22(1:17:07); I chose to start this narrow, in the near-fronts and centre Genelec pair; to slowly broaden the image out to the outer Genelec pair; then shift the image to the rear; and finally forward into the hall using the side pair for the start of the next phrase, which is slowly brought back to a full presentation. The phrase that follows is equally rich, beginning near once again, again broadening out, then moving to the array as the close, focussed detail increases around 1:54(1:18:39), dropping to the fronts as the focus decreases and the reverberation rises, back to a frontal bias as a rolling gesture moves in, and finally

dropping the fronts again as this rolling dies off into the rear distance. These are long, rich, multi-layered phrases, full of detail and constant change, which allow so much room for the diffuser to move. The sounds and phrasing seem to make constant suggestions for possible diffusion actions without ever insisting. Consider for example the final seconds of the rolling gesture, beginning at 2:30(1:19:15); the choice of direction in which to have this peter off seems open, but in careful listening – especially with headphones – one already has the unnerving impression that the object is rolling off behind the listener.

Consider, too, the passage beginning at 2:36(1:19:21), in which a series of doors appear in the distance – low and reverberant – then appear to move closer and closer, building to a final, loudest and simultaneously more reverberant door, which suddenly swells out into sea and birds. This is very tantalising material for anyone lucky enough to be behind the diffusion console. I chose to let the early stages of the phrase run its own course, then to bring the main pair in suddenly for the final impulse, and then follow the swell out into the room with the side pair. A slow shift to the front as the following phrase builds moves eventually to the back in keeping with a darkening of the tone colour and a rise in reverberation; the phrase is closed with a short swell that brings us back to the front. Many of the other longer phrases in the piece similarly allow for the diffuser to freely use their imagination to find movements which poetically elaborate the phrasing and gestures of the piece.

Some passages are particularly anecdotal, and these need to be treated carefully – they contain their own space and movement and must be dealt with accordingly. The passage beginning at 4:02(1:20:47) is an ideal example, in which a fly buzzes from left to right while someone approaches through wooden rooms or hallways from the middle-distance. The listener is clearly placed inside the space, with the fly nearby; thus the main front pair was to be reduced slightly to avoid a cinematic image and ensure that the listener remains 'inside' the sound. Unfortunately, I have failed to take into account that the rear and side pairs had been brought down a couple of gestures earlier, and have not yet returned; as a result of this oversight I scramble somewhat in concert to get the rear speakers up in time to make this passage effective. In hindsight it might have been nice to play a bit further with the dual image and two spaces – fly vs. footsteps – by raising the Genelec array, which should have the effect of having the fly move to and fro in front of the audience while the footsteps approach and the hall resonates.

Another such example comes with the sudden flushing of a toilet at 8:52(1:25:37), quite close at hand; I tried to emphasise this by suddenly dropping the side, rear, and distant-front pairs, thus making the image and the space suddenly small and close in the near-front pair and the Genelec array, in keeping with the source image.

Yet another anecdotal image - of a train passing through - begins around 6:06(1:22:51). Unless one wants to directly contradict the gesture, one can really only choose between movement towards the front or towards the rear; and as the frequency content shifts downward dramatically, partly in an emulation of the Doppler effect, a movement from the front to the back seems quite clear.

At 5:06(1:21:51) we have a long passage in which faint, ghostly music is heard (or almost heard) while a high-pitched siren-like sound shifts from side to side; these qualities were exaggerated by bringing them close using the Genelec array, and following this left-right pulsing with an equivalent shifting between the inner and outer pairs, hopefully adding a further layer of contraction and expansion to this phrase.

This piece has so much possibility for diffusion – so many passages which offer a wide range of options and possibilities, and others which suggest as detailed and complex a series of precise moves as the diffuser is capable of performing – that it seems a strong choice for repeated performance. It is a piece one could explore with constantly changing diffusion plans and strategies, and in which I suspect one would always find something new.

ii) Concert

Again, as ever, with this piece I was faced in performance with the task of translating my plans for the frontal layers to the new arrangement. Generally this meant shifting

placements designated in rehearsal for the near-front pair either to the same pair in the new arrangement, or to the new main EAW pair, depending on the degree of emphasis required, with placements designated for the distant-pair (considered the 'main pair' in rehearsal and therefore in the diffusion plan) accordingly either remaining with that distant pair, or coupled together with the near-front Nexo pair. This latter is the case in the piece's opening moments: the second and third phrases are noted to be placed in the near pair and the main (i.e. distant) pair, respectively; in performance, the main front EAW pair – together with the Genelec array – is used for the first of these, and the two Nexo front pairs – near and distant – for the second.

I choose to extend my intentions for the phrase beginning at 0:22(1:17:07) – to begin narrow and slowly broaden out – with a slow move into the room from the front distance, moving to the front-nears, to the mains, to the inner Genelecs, then the outer Genelecs, to the sides, and finally to the rears, before dropping back down again.

For increased variety in treating the placements of the doors, some of the placements are somewhat more extreme than usual; for example, at 3:40(1:20:25) the rear and side pairs are brought all the way down, to present an entirely frontal image. This is relatively rare in this concert; the rears are often left at a nominal level, lower when the image is intended for the front of the hall, but rarely dropped altogether. The regular successions of doors in this piece, however, call for the greater variety which

becomes possible if one extends the limits of the spatial range in which one is placing the sounds.

For the sequence of doors at the end of the piece, however, my movements in performance were much more conservative, tending to return to the same lower and higher positions with the rear and main front pairs; wider variety and more extreme shifts might have been valuable. Perhaps to make up for this lack of variety, I shift from this planned action to movements between the three front pairs as this sequence continues.

In general with this piece I follow my diffusion plan fairly closely in performance, partly due to the complexity and subtlety of the piece, partly as the plan had been worked out in reasonable detail. On the occasions when I do stray from it – outside of obvious changes such as the incorporation of the altered frontal arrangement – my reasoning is not always clear. Some are possible performance mistakes; some are almost certainly in response to the behaviour of the sound in the room at that particular moment, making a planned movement inappropriate or suggesting a stronger option. It is impossible to know for certain without being back in the given space at that particular moment.

One such moment occurs on the phrase beginning at 4:14(1:20:59), in which I ignore my instruction for shifting front-back movement. I am uncertain whether this is simply because I missed the ‘F2B’ at the end of the series of instructions for this

passage, or perhaps because it took me too long to prepare the other fader positions, or because I felt this would interfere with the evolution of the sound in the space.

Another occurs at 5:05(1:21:50), in which I completely readjust the main image, by raising the side and distant-front pairs and lowering the near-front pair, before proceeding with my instruction to alternate between the inner and outer pairs of the Genelec array. It seems fairly clear in this case, however, that this is a conscious attempt to adapt to the situation and correct an unsatisfactory image before continuing.

9) Jukka Ruohomäki's *Viiltoja* (1:29:40)

i) Rehearsal

Viiltoja is a fairly unique piece from a diffusion perspective. It presents a single, long mass of shifting sound, with generally extremely long phrases, and almost no discreet events, with the possible exception of the occasional sequence of metallic beating. As a result the goals for diffusion are somewhat different: firstly, to attain, and maintain, an adequate degree of sheer volume and saturation, as per the composer's instructions and intentions; and only secondly, to perhaps use the various pairs to shift the emphasis within the sound mass, according to the slow spectromorphological shifts inside the mass itself. As a result, almost no sudden movements or discreet localisations were used. The equalisation used elsewhere for the Genelec array

(except for *Thème de la fuite*) was taken away here, as the high-frequency emphasis, excellent for highlighting the clear, brittle high-frequency elements of attacks and impulses, was of little use in this spectral mass. As a result these speakers were simply used as an additional spatial layer, raised in level on occasion to bring the sound slightly further into the foreground.

This was also the only piece in which I considered a diffusion choice that would alter it – however slightly – from the form in which it had been composed. The proposed change was to fade the final gesture of the piece earlier than the manner crafted by the composer, as I found the last moments to be slightly unsatisfactory, leaving a last high-frequency squeak which appears in a somewhat odd manner immediately before the sound disappears. It is possible that such a fade by the performer was a part of the composer's intentions; the matter was not discussed. In the end the alteration was felt to be sufficiently minute as to be within the acceptable bounds of a performer's discretion.

Due to the characteristics of the piece – a lack of sudden movement or changes, the slowly evolving phrases, and a fairly homogeneous sound-world – I determined that there was no need to prepare a detailed diffusion plan beforehand. This was especially true as the diffusion for this particular piece would be entirely dependent on the behaviour of the sound at full volume in the space during the performance, and thus could not necessarily be accurately predicted. The waveform of

the piece is also fairly transparent and legible, clearly displaying as it does the shifting amplitudes of the sound mass, and thus making it that much easier to forego a detailed plan. The piece was therefore run through in rehearsal, to get a feel for the approach, but beyond that left to be moulded live, in a largely improvised manner. This makes it somewhat unique as a diffusion experience in this concert, and thereby particularly valuable for me.

ii) Concert

As described above, my diffusion of this piece concentrates solely on slowly shifting the space of the piece inside the space of the room. Some of the primary strategies for achieving this are by now thoroughly familiar: use of the side pair to bring the sound into the room; use of the various frontal layers for greater proximity or distance; use of the Genelec array – without equalisation this time – for maximum proximity. The rears are generally maintained throughout the piece, as there is rarely call for a frontal image; the entirety of the piece is concerned with immersion in the sound, and not with the sound image in a panoramic sense.

There is still variety in the manner in which the sound masses are allowed to unfold. Prime among these is a possible distinction between phrases and blocks of sound, although these tend to evolve one into the other and are rarely easily distinguishable. These two tendencies allow for slightly different approaches to diffusion. Phrases are often kept further out towards the peripheries of the room,

where they are allowed to shift with their own inherent stereo shaping, and benefit from an ominous sense of distance which grants them a more imposing sense of distant size, although slightly diminishing their immediacy. Consider for example the several pitched phrases beginning at 1:10(1:30:50), for which the side pair, the Genelec array, and the main front pair are left down. The two front Nexo pairs are both used to help achieve a more three-dimensional sense of space and movement. As these phrases progress, there is a gradual increase in high frequency content and reduction in reverberation, giving a sense of greater intimacy; the diffusion follows this movement by slowly raising the side pair and reducing the rear pair slightly, and moving to a frontal balance which includes the main pair. The emphasis on the main and side pairs is slowly increased, and the Genelec array is gently brought in.

For the massive blocks of sound later in the piece, all pairs are used, with slight shifting to keep the sound 'alive', to keep the mass from settling and becoming overly static. For example, at 3:20(1:33:00) (although the sound mass has hardly built up to its later imposing dimensions), I use the same crossed-hand technique to pan back and forth across the full Genelec array. The other pairs are all up to some degree at this point, with the exception of the main pair; as a result, this panning will be heard, thanks to the absence of the main pair, but only as a subtle shifting in the foreground of the broader image, due to the presence of all of the surrounding pairs.

Later I switch back to manipulating the two pairs separately, for the expansion-contraction movement this achieves.

For the long, slow dissipation after the climax of the piece, the closer pairs are slowly brought down – first the near-front Nexo pair and the inner pair of the Genelec array are reduced, then the side pair and the outer pair of the array, and finally the main front pair, thus slowly pushing the sound out towards the edges of the room. The main pair, side pair and Genelec array are raised significantly over the course of the final set of beatings, to pull these increasingly closer and give them more impact; and finally, for the final, faint, distant gestures, first the main front pair and Genelec array are brought down – quite quickly, more or less between gestures; the distant fronts are then raised while the near fronts are dropped; and finally the rear speakers and the main inputs are dropped to nothing. This is the only use of the input faders for diffusion control in the entire concert. It will be remembered that, due to the lack of a splitter box, four stereo outputs from ProTools are being used (the maximum available from the audio interface), with the first of these input to mixer channels one and two, which are then fed to the main outputs (to the front main pair) and the four group outputs (to the two front Nexo pairs), and patched out to the inputs of channels 3 and 4 (to the side speakers). Thus a lowering of channels 1 and 2 will effect a fade on all three front pairs and the side speakers simultaneously, and thus it is used here to fade the final gesture of the piece, together with the rear speakers.

VII – SIBELIUS ACADEMY CHAMBER HALL CONCERT, NOVEMBER 4th

Two days after the *Space Within Space* concert, I had the opportunity to present a second diffusion of *Outgribing,* this time at a concert which was, coincidentally, in the hall in which rehearsals for the *Space Within Space* concert had taken place. Thus I was already familiar with the hall, and used the same loudspeaker arrangement and set-up as that with which I had rehearsed. These similarities and my familiarity with the hall and set-up were extremely convenient, while the opportunity to present the piece a second time provided a valuable comparison. While some individual sounds from *Outgribing* had been tested in this hall, this was the first time running through the piece as a whole, as it had not been completed at the time of the rehearsals. It should also be noted that running through a piece in rehearsal is no substitute for concert performance, firstly because rehearsals tend to be at rather reduced volumes and intensity, due to the need to remain attuned to the details of the sound and the space for the potentially lengthy duration of the rehearsal time, and also because one cannot achieve the same level of focus and concentration without the presence of the live audience.

The experience was somewhat surprising, in that the piece behaved significantly differently in this space than it had at the Kallio-Kuninkala concert, and rather differently than I expected based on my rehearsal experiences. In general, the space of the Chamber Hall activated to a much lesser degree than had Leonora Hall;

the sound was very present, and was not tied to the speakers as might be the risk in an insufficiently resonant hall, however there was a certain immediacy to the sound, a lack of a sense of living sound in a living space. A distinct possibility as to the cause of this difference is the lack of the two EAW loudspeaker pairs used in Leonora Hall but absent for this concert; these provided a fuller frequency response, with better support across the full frequency range and greater power in the low-mid frequencies, which would account for some of the differences between the two performances. Other possibilities include a lesser degree of reverberant sound, or perhaps simply a shorter reverberation time, but it would be somewhat surprising for these to cause so noticeable a difference, as prior to this experience I would have described these two halls as having roughly similar reverberation times.

The difference is also surprising considering the changes in the placement of the side speakers. In Leonora Hall these were much closer to the audience, and aimed directly towards the arched section between wall and ceiling at close range, whereas in the Chamber Hall the side speakers were placed significantly further out and aimed straight up, with a good distance between the speakers and the ceiling. These were found generally to activate the hall and the space very well, in a much more satisfactory manner than the side pair in Leonora Hall, and had been very successful in this regard in rehearsal; thus one would expect rather the same result in the concert

diffusions – that this hall would activate more easily than had Leonora Hall. Instead, with *Outgribing*, the opposite was found to be the case

These differences between the diffusion experiences in the two halls teach an important lesson regarding the importance of the diffusion of a piece and its impact on a work; the ways in which whole sections of the piece are experienced were significantly changed, impacting not just the aesthetic experience, but even the form and perceived mood and themes of the piece. There are two sound sources of the piece which were particularly different in this hall, and it is the importance of these sounds in the piece that causes this difference to have such an impact on the reception of the piece; these are the traffic gestures, and the spectral mass of the piece's second half. The traffic gestures failed to gather the strength and force from the hall that they had achieved in Leonora Hall, thus depriving them of some of their impact; as the strength of these gestures is critical to this section of the piece, both in terms of appreciation of the gestures themselves and the communication of the local form, this negatively impacts the success of the work. The absence of the more powerful EAW loudspeakers is perhaps the likeliest cause of the difference with these traffic gestures.

More important to the piece, however, is the change in the behaviour of the spectral material which dominates the second half. This is a dense, shifting mass, presented at substantial dynamic levels; as its dominant features are those of spectral space and an impression of physical space, naturally in diffusion this section depends

significantly on these same characteristics of the hall itself. Unfortunately, where in Leonora Hall this section had a large, warm, round, resonant feel, in the Chamber Hall the effect was somewhat harsh and aggressive, less resonant and more immediate. This significant colour change isn't experienced as simply a change in the space, but rather a change in the tone or mood of the piece itself. Thus, this change of concert space – not between two radically different spaces, but between two halls of roughly similar size and resonance – made for a serious reinterpretation of the piece, despite being diffused by the same person, using largely the same equipment and set-up, only two days apart.

Where some might see this as an argument against diffusion, on the grounds that the piece is too easily altered from the composer's intentions, I see it as quite the opposite: as a strong statement for the absolute necessity of diffusion. This change was not due to my own actions, but rather to the change of halls; this clearly demonstrates that a capable diffusion artist is an essential element in shaping the playback of a tape piece such that the piece the composer intended can be heard, regardless of changes in locale.

VIII – CLOSING REMARKS

Prior to this experience, I, like many others, both misunderstood and seriously underestimated the role of diffusion in the electroacoustic concert experience. I imagined diffusion to be an optional addition to the music, primarily concerned with the potentially frivolous movement of sound across an array of loudspeakers arranged according to the whim of the performer; instead, we have found it to be a critical means of expressing a work in the concert space, at the very least helping to adapt the work and the space such that the experience of the work in the concert space is a respectable expression of the composer's intentions, and at best allowing for an enhancement and extension of the work to provide a richer, expanded and more fulfilling experience of a work.

The *Space Within Space* concert has been the catalyst for a long and fascinating process of discovery and exploration, not just of the concept and practice of diffusion, but also of a number of facets of acousmatic music and of concert production. My survey of the literature surrounding diffusion culture, theory and practice has helped me to come to understand some of the occasionally conflicting goals of diffusion, and some of the different approaches and methods; but it is the practical experience gained that has perhaps proven the most vital. The knowledge and experience acquired range from the practical - for example the demands of concert preparation and production - to the technical, such as the tools, models,

concepts, and methods of the design of a loudspeaker arrangement for concert diffusion, to the theoretical, such as the range of possible figures, motions, and placements which form the gestural palette of the art of diffusion performance. I now feel I have a firm grasp of the essentials of the practice; this, however, is clearly only a beginning – a basic foundation in the subject on which I can begin to build a better understanding and ability. There is no question that this first in-depth experience with diffusion has been a very positive one, and one through which I have learned a great deal, not only about the art of diffusion, but about acousmatic music, about space, and about my own perceptions, senses, and instincts.

Thanks to the range of diffusion needs and requirements already found within the program choices for the *Space Within Space* concert, I can now approach the programming of concerts of acousmatic diffusion with a more informed and targeted precision, with which I can select program material which alternately provides specific diffusion challenges, opportunities to extend my range and repertoire, or simply pleasurable and fulfilling diffusion possibilities. The experience of diffusing the range of pieces included in this concert has immeasurably deepened my understanding of the inner mechanics of acousmatic music; the process of extending compositional gestures through diffusion has given me a much better grasp of the importance and interaction of gesture and of space, and of the mechanisms by which the music impacts, affects and influences the listener. This is of immense value to me,

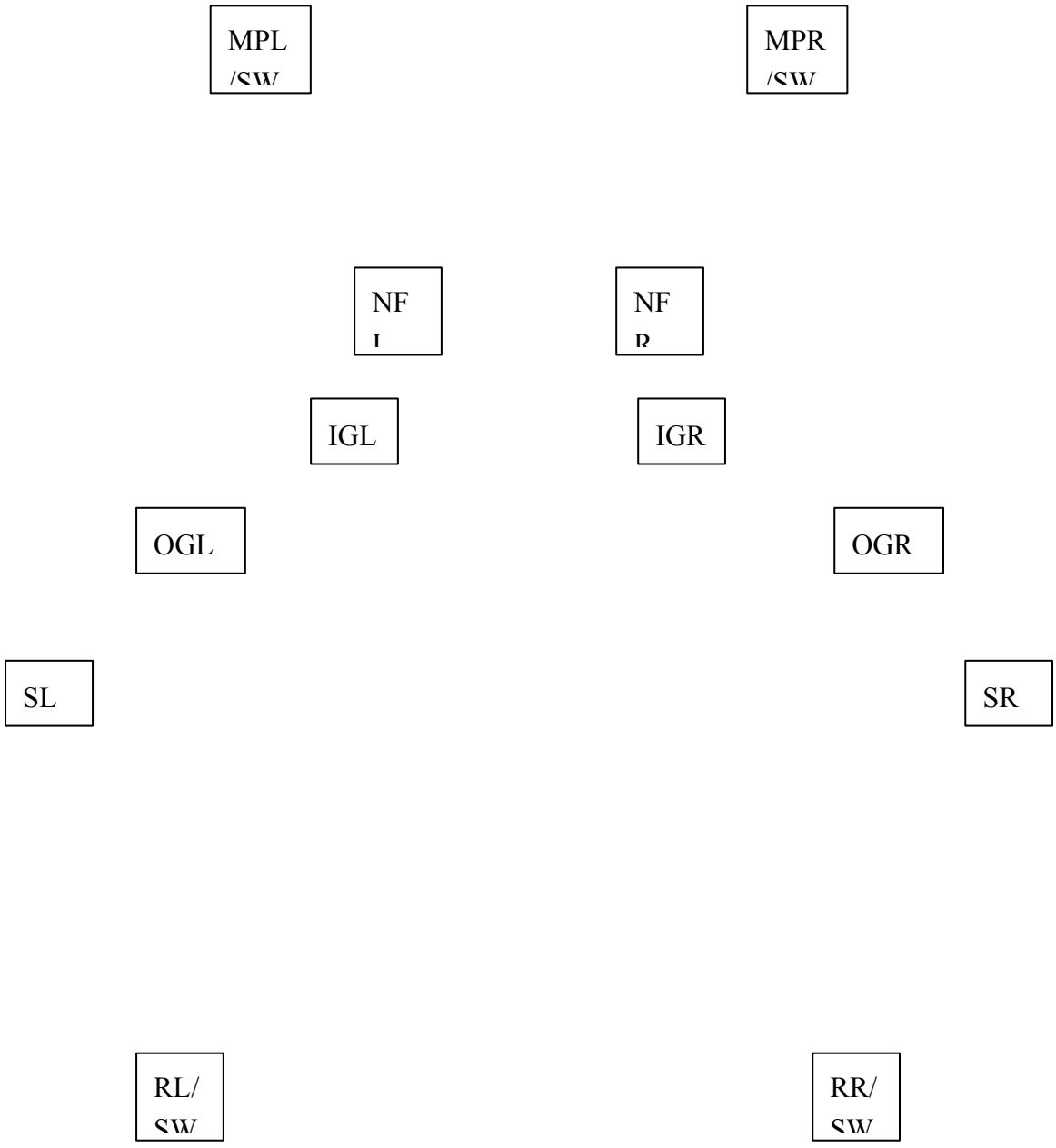
not only with an eye to future diffusion performance, but also as a composer, and even as a listener.

The fact that I now have a firm grounding in the basic techniques and concepts of diffusion means that, in future concert experiences, I can devote my time to improving my performance abilities, technique, and range, and to crafting and mastering more elaborate diffusion plans, performances and possibilities. Indeed, this is the logical next step in my study of diffusion; the experience gained through the production and performance of the *Space Within Space* concert has given me the knowledge and understanding of the concepts of diffusion, the basics of technical requirements and design, and the basic performance vocabulary, which will allow me to pursue a more structured study of performance technique in a more organised and disciplined manner in the future.

While it is possible to list some of the specific questions which I look forward to exploring in greater detail – differences between diffusion paradigms and strategies; the effects of varying loudspeaker placements, heights, and arrangements; alternative performance interfaces; the creation, contradiction or negation of the sense of space, and of alternating, changing, or successive spaces; the interaction of the simultaneous sensations of gesture, motion, and space – such a list is somewhat misleading, as it is the interconnectedness of all of these issues that is the real key.

Diffusion is in many ways an ideal laboratory for the exploration of a number of intricately intertwined issues and subjects: space; gesture; action and reaction; motion and movement; sign and symbol – all of these, and many more, are combined in and inform the art of diffusion. It is an opportunity to be composer, performer, and auditor simultaneously, and it is this multifaceted role that it offers us which makes it the ideal forum for the simultaneous exploration of this range of issues. This is why this experience has been as productive and fulfilling for me as it has proven to be, and is the reason for which I look forward to furthering my diffusion performance abilities in future concert experiences.

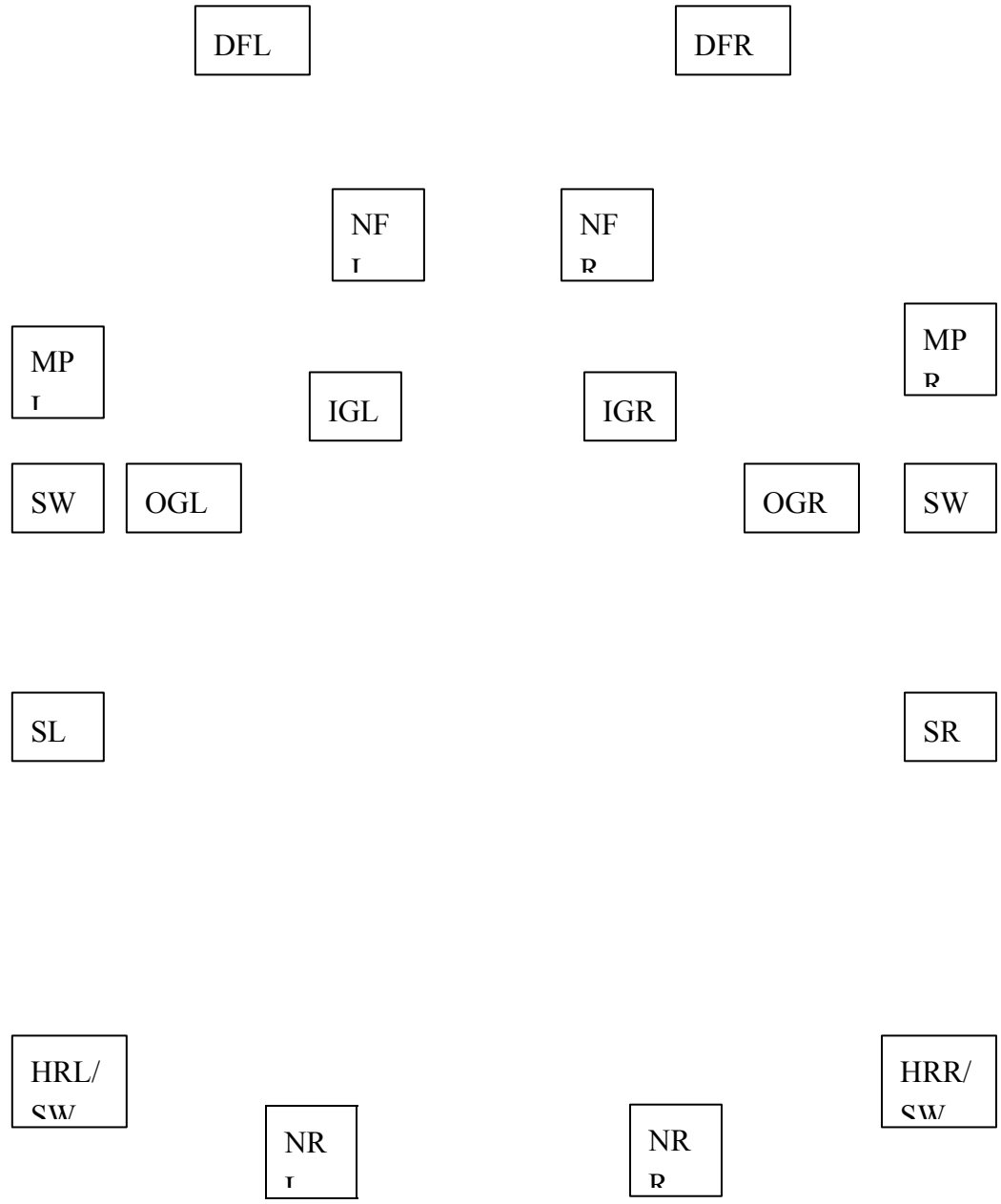
DIAGRAM 1: Loudspeaker Arrangement - Rehearsal



MPL = Main Pair Left
NFL = Near Front Left
SL = Side Left
RL = Rear Left
OGL = Outer Genelec Left
IGL = Inner Genelec Left
SW = Subwoofer

MPR = Main Pair Right
NFR = Near Front Right
SR = Side Right
RR = Rear Right
OGR = Outer Genelec Right
IGR = Inner Genelec Right

DIAGRAM 2: Loudspeaker Arrangement - Concert



MPL = Main Pair Left
DFL = Distant Front Left
NFL = Near Front Left
SL = Side Left
HRL = Hall Rear Left
NRL = Naxo Rear Left
OGL = Outer Genelec Left
IGL = Inner Genelec Left
SW = Subwoofer

MPR = Main Pair Right
DFR = Distant Front Right
NFR = Near Front Right
SR = Side Right
HRR = Hall Rear Right
NRR = Naxo Rear Right
OGR = Outer Genelec Right
IGR = Inner Genelec Right

DIAGRAM 3: Fader Arrangement – Rehearsal

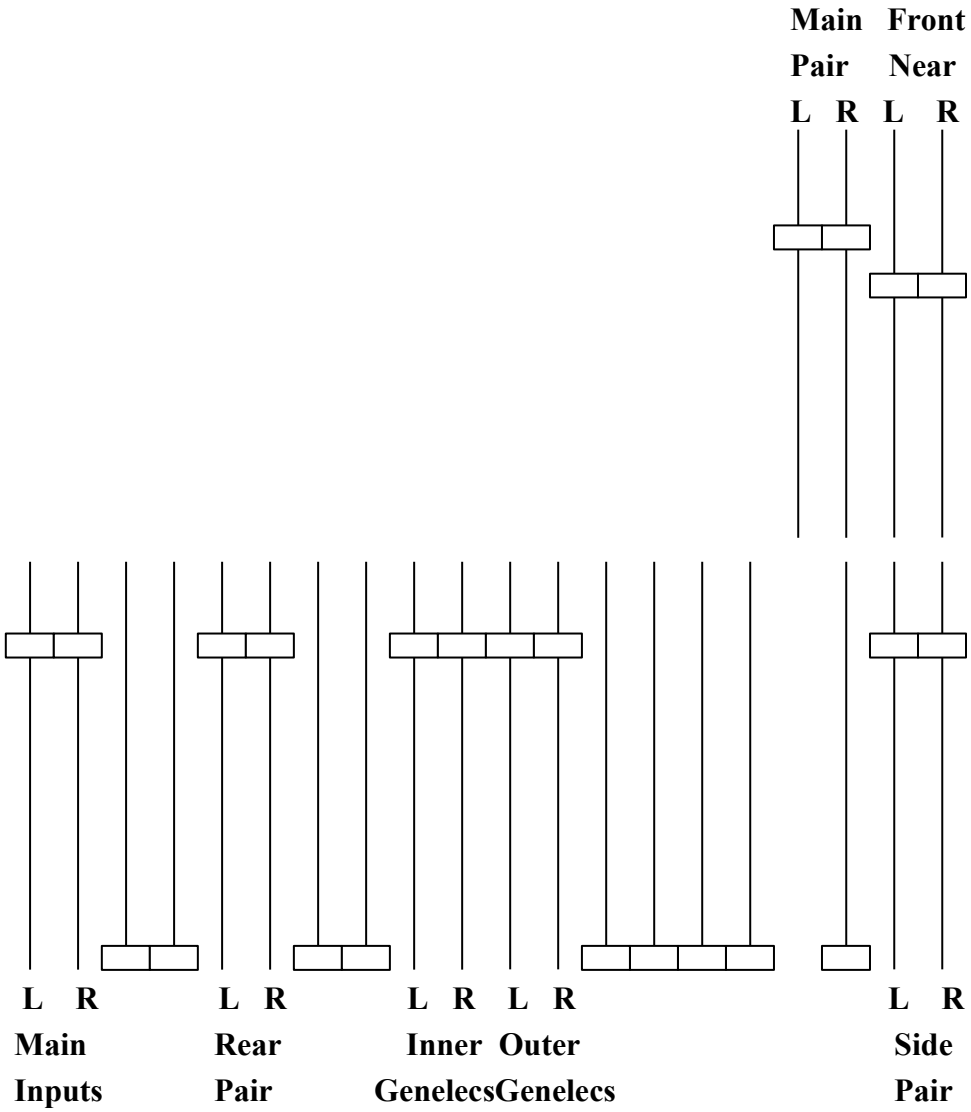
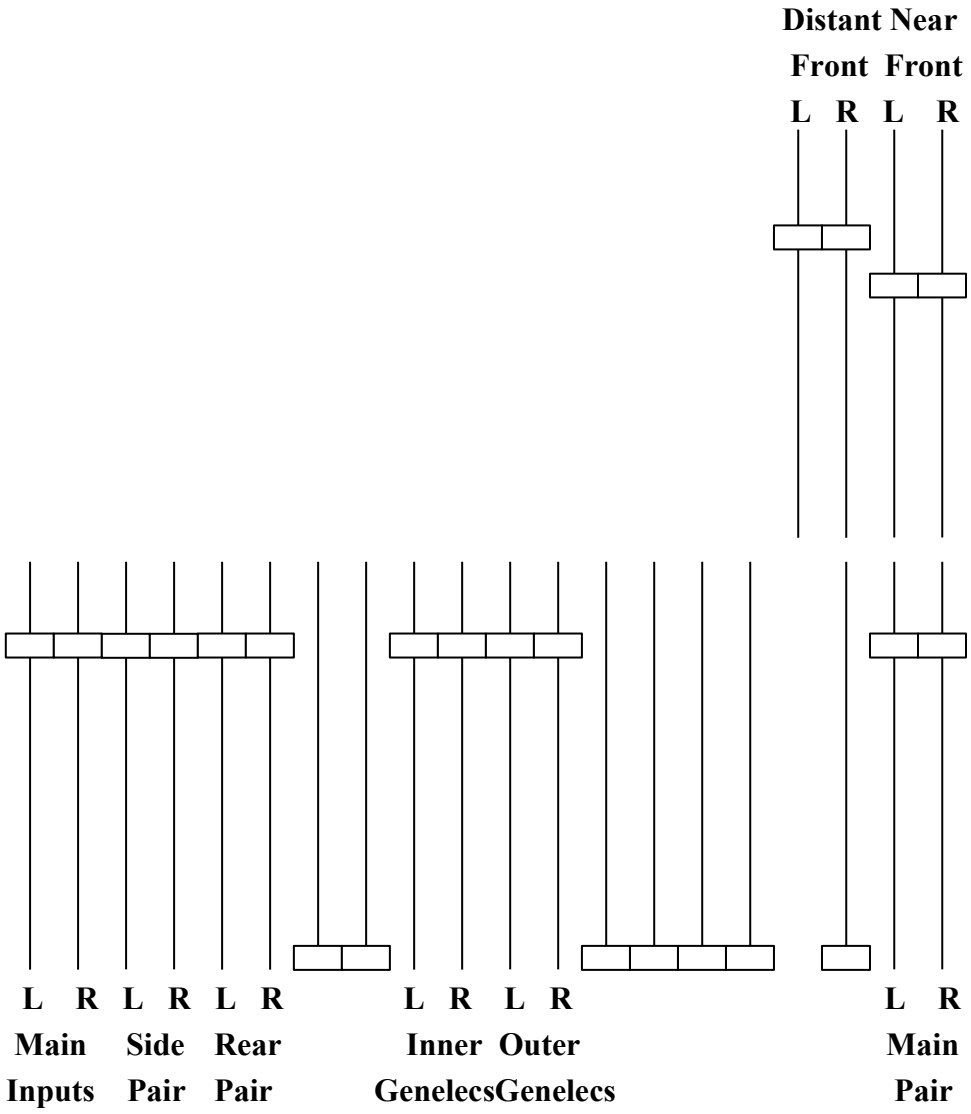


DIAGRAM 4: Fader Arrangement – Concert



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