# Materialisation of fixed media music

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# Chapter 1

## 1.1. Actualising fixed media music

In this part, I consider the concepts of the *virtual* and the *actual* (developed by Henri-Louis Bergson, Gilles Deleuze, Pierre Lévy and others), in order to chart in more detail the ontological status of fixed media electroacoustic music and its concert situation. These concepts, I assert, provide a valuable framework to define fixed media music and explain the relationship between its various stages and elements, such as the composition process (in the studio), the sound files (the resultant product) and the concert situation (the final destination).

Actualisation, in the context of fixed media music, may be described as the process of turning the sound files (the virtual) into music (the actual), which often takes place in the form of a public event. As Pierre Lévy explains: 'actualization is an event, in the strongest sense of the term. […] The actual, as the manifestation of an event, arrives, its fundamental operation is occurrence' (*sic*) (1998 ,171-2). The concert situation is, therefore, a moment of becoming, of arriving at a destination, namely the 'here and now' of the public presentation. This process of actualisation is exactly the responsibility of the performer of fixed media music. Actualisation is, however, different from realisation; Levy distinguishes 'realisation (the occurrence of a predetermined possible)' from 'actualization (the invention of a solution required by a problematic complex)' (Levy 1998, 26). More or less similarly, the philosopher Gilles Deleuze explains the difference between realisation and actualisation, and highlights the role of creativity in the latter.

> The possible is that which is ''realized'' . . . for the real is supposed to be in the image of the possible that it realizes. . . . The virtual, on the other hand, does not have to be realized, but rather actualized; and the rules of actualization are not those of resemblance and limitation, but those of difference or divergence and of creation. (1988, 96–97)

That also clarifies why various actualisations of the sound files lead to different sonic results, and are strongly conditioned by the circumstances of the concert situation. According to Lévy, 'the virtual is a kind of problematic complex, the knot of tendencies or forces that accompanies a situation, event, object, or entity, and which invokes a process of resolution: actualization' (1998, 24). The many parameters involved in the presentation of a piece of fixed media music, described in more detail below, determine the process of its actualisation. As in Levy's example of seed and tree (virtual and actual), 'the seed will have to invent the tree, coproduce it together with the circumstances it encounters' (1998, 24). Circumstances are indeed a crucial factor in the actualisation of a piece of fixed media music, and include a wide range of elements and variables, such as the sound reproduction system (including the playback device, processing units, mixing desk, EQ, amplifiers and loudspeakers), the arrangement of the loudspeaker system in the space, the physical characteristics of the space and its acoustical properties, the arrangement of the audience in the venue, the lighting, the atmosphere of the space more generally, and so on. As pianist and artistic researcher Paulo de Assis explains, each actualisation 'is only one ephemeral solution to the problematic field defined by a musical multiplicity' (2018, 41).

On the other hand, according to the philosopher and critic Christoph Cox, '[v]irtualization is a process that involves detachment from the present (the here and now) and movement toward a

general problematic field from which new actual entities are generated as solutions' (2018, 50). The composition process of multichannel fixed media music, then, involves exactly such a virtualisation: the production of the sound files, which are deterritorialised from the here and now (of the studio), and which can be actualised in a concert situation in multiple ways. The virtualisation process (from concrete sounds to sound files), involves an 'interim actualisation' in the form of studio listening to a succession of prototypes, and also takes place in the imagination, whose activity is in turn based on the composer's previous experiences, knowledge and skills of working with spatial sounds, and a conception of a specific atmosphere (see Chapter 2). As Deleuze writes in *Difference and Repetition*:

> While it is thought which must explore the virtual down to the ground of its repetitions, it is imagination which must grasp the process of actualization from the point of view of these echoes or reprises. It is imagination which crosses domains, orders, and levels, knocking down the partitions coextensive with the world, guiding our bodies and inspiring our souls, grasping the unity of mind and nature; a larval consciousness which moves endlessly from science to dream and back again. (1968, 220)

In that light, Levy explains the reciprocal relationship between the virtual and the actual, stating that this relationship 'implies as great a sense of irreversibility in its effects, indeterminacy in its processes, and creativity in its striving, as actualization' (1998, 27). And this clearly explains the reason why *reproducing* the studio experience (interim actualisation) in the concert situation is simply not possible.

The spoken contributions of Veniero Rizzardi (talking about the music of Luigi Nono) and Daniel Teruggi (talking about his own work as a composer) to the audiovisual part of this dissertation take opposing views of the relationship between the studio experience and the live performance of acousmatic music. Teruggi aims to *reproduce* in the concert hall the sound of the music as heard in the studio, while Rizzardi (and Nono) argue that this is impossible. In my opinion, this impossibility gives rise to an opportunity for creativity in the presentation of this music to an audience, which valorises the public presentation of fixed media music, and motivates multiple presentations in various circumstances which can produce new qualities and new experiences. In my own concert presentations, as well as in the present thesis, I have tried to express as clearly and fully as possible these possibilities as I imagine them.

### 1.1.1. Sound file versus score

To what extent are the sound files of a piece of fixed media music comparable to the score of an instrumental composition? Obviously, they both exist in guises other than the actual sounds – the sounding music. The former exists in the form of written graphical instructions, while the latter are digital representations of the waveforms that, translated into variations in air pressure over time, create the sounds heard by listeners. Unlike the score, sound files include no (explicit) instructions, while scores, on the other hand, incorporate no sonic representation of those signs. Cox explains the ontological status of musical notation according to the conception of the virtual and the actual:

> A virtual entity, the score (a visual, static, inaudible set of marks on paper) does not resemble its actualizations or performances (invisible, dynamic, and audible events or processes), but serves only as a set of instructions for the actualization of music—a

> necessarily incomplete set of instructions ensuring that each actualization will be unique, divergent from all others. (2018, 53)

In a similar way, the sound files of a fixed media piece, which may be visually represented as waveforms on a computer screen but are actually inaudible, static, and digitally stored, are not equivalent to the piece's presentation, which will be spatial and dynamic and will consist of audible events and/or processes. 'Thought is actualized in a text and a text in the act of reading (interpretation)' (Levy 1998, 56). A text thus has a double status, being at the same time virtual and actual. By the same token, the sound files of fixed media music are actual in relation to a composer's ideas and imagination, and at the same time virtual vis-à-vis its concert presentation. Sound files are territorialised in the sense that the durations of all their constituent musical events are fixed, so that the overall structure of the music is not subject to alteration. However, at the same time, they are deterritorialised in the sense that they 'sound' dramatically different in various actualisations, because of the aforementioned contingencies.

### 1.2. Composer/performer

Chris Cutler, in his book *File Under Popular,* maintains that '[n]otation is a medium which encourages & reinforces a specialising division between Composer & Performer. This is a division which becomes more absolute as its productive potential is unfolded (leading eventually to a destructive contradiction)' (1985, 137). What about fixed media music, in the absence of a notation? Does this specialising division between composer and performer occur here as well? In my experience, in the context of electroacoustic music, an inexpert listener, unfamiliar with the practice (and even sometimes the experts), might find the music making process quite enigmatic. As Dellaira confirms, '[i]t's too hard for the listener to know, much less imagine, just what the composer did exactly; the whole process of getting music from brain to ear back to brain again is invisible to the listener, mediated by machinery and gadgetry' (1995, 202). According to the composer Paulo Chagas, '[v]ocal and instrumental sounds are transparent; they make visible the flow of gestures. […] On the other hand, electroacoustic and digital signals are opaque. They break the transparency of the musical flow' (2006,125). The 'musical flow' is conceived by Chagas as the simple 'mapping' of a visible gesture to an audible sound, which is absent in fixed media music. But when we 'break the transparency' this might create compositional possibilities rather than restrictions. Based on conversations I had with audience members after my concerts, it appears that many of them think that what they just heard was produced by me on the spot on the mixing desk. This is a logical observation, since I was the only one 'in charge' of what was heard during the performance. This is often accentuated by the lighting situation in which the 'music maker' is illuminated under a spotlight as the only agent in action (however minimal) during the performance. Nevertheless, I was of course the one who actually made this music, the only difference being that this happened beforehand and 'outside time'.

Cox discusses Glenn Gould's approach to using recording technology as a performative medium, and states that 'as Gould foresaw in the mid-1960s, the boundaries between the roles of "composer," "performer," and "recording engineer" have become increasingly blurred.' (2018, 59) Similarly, Cutler believes that 'recording places the emphasis firmly on performance, & optimally indeed is a medium of composition for performers' and recording 'strongly favours the reuniting of those two roles' (1985,143). According to Cage, 'a composer is simply someone who tells other people what to do. I find this an unattractive way of getting things done. I'd like

our activities to be more social and anarchically so' (1967, ix). However, a composer of fixed media music is not telling 'someone' (the performer) what to do, but instead doing it themselves. Composing fixed media music is emblematic of a DIY (do-it-yourself) approach to music making. From developing the ideas, executing those ideas by recording or generating the material – which sometimes involves making new instruments or computer programs – to developing, processing, structuring, editing, mixing and mastering: all is usually done by the composer alone. All of these tasks involve using technology and require a certain level of technical skills. It is often the case that the public presentation of the pieces is also undertaken by the composer. Therefore, in fixed media music, we can truly observe the mingling of the roles of composer, performer and 'technical engineer', as Gould suggested above.[6]

In fixed media electroacoustic music, the processes of performing and composing are intertwined. The composer in general 'performs' their own musical materials by generating and structuring them concretely and directly onto the medium. As Cutler confirms, composers of concrete music 'had become performers - & with a new instrument: the media of electronic transformation, recording & reproduction of sound' (1985, 141). On the other hand, the composition continues into the performance phase, by actualising the piece under the circumstances of its public presentation, which often requires taking decisions that could be described as compositional. According to the composer Jonty Harrison, sound diffusion (see below) 'is, in a way, a continuation of the compositional process' (2013, n.p.). In other words, the composition is finished or completed at the moment of its presentation. In Chapter 3, I discuss a way of working that I term *post-mix*, where indeed a composition made in a higher number of channels than those to be used in the concert presentation is adapted to different performance circumstances by extending certain compositional decisions into the presentation itself.

Cutler discusses the ideas and ambitions of electroacoustic music pioneers, stating that '[a]lready in the '20s & '30s Varèse, Eisler, Honegger & others had begun to dream & write about machines which could directly realise their compositions without involving troublesome, inexact musicians at all. *But there is another way of understanding this: at a functional level composers wanted once again to become performers*' (1985, 140, my emphasis). This statement resonates with my personal experience as a composer who simultaneously wants to be a performer. Many years ago, during my music studies (when I was performing casually) I realised that I did not want to be a performer. For me, there was nothing exciting about it, as many performers might claim – it was a rather stressful and draining task. I found being a composer a much more personally appropriate approach; I could stay behind the scenes, be creative, take my time, reflect and make music 'outside time'. Emmerson points to these two different modes of music making (inside and outside time), stating that:

> In the traditional studio a composer's choice might take hours of listening to alternatives, finely tuned variants, including pathways well trodden, yet might still result in a work which is lively, surprising, fresh and unexpected to the listener. (2007, 26)

Similarly, the composer Andrew Lewis observes that composing fixed media music in studio allows for:

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[6] Of course, this does not amount to being 'social' and 'anarchistic' in Cage's sense. However, the medium of electroacoustic composition is in fact open to collaborative approaches, for example when a number of composers contribute material to a collective work. Cage's own electroacoustic composition *Fontana Mix* consisted of a 'score' of instructions to be realised in the studio by someone else who would take a role analogous to that of a traditional performer of a notated score.

> transforming ephemeral, transient detail into permanent, significant detail. Its ability to do this has nothing to do with real-time processing, but arises precisely from the possibility of engaging with sound out of real time. It allows us to ponder our sounds, to reflect on them, to put them under a microscope, to thoughtfully consider their possibilities and to search diligently within them for the inner life they may contain. (2014, n.p.)

In what follows, I will discuss how this outside-time performativity manifests itself in the composing process.

### 1.2.1. Performativity in the composing process

According to the media artist and writer Joe Milutis, in the case of fixed media music 'the spirituality of the performer, if there was one, was hidden away in the compositional process, and not monkey-suited in the concert hall' (2008, 71). Apart from the fact that this statement once again fails to recognise the performative aspect of the recorded material in the presentation of the music, it accounts nevertheless for a performative agency embedded in the composing process. The performative component of fixed media electroacoustic music can manifest itself in various manners from the earliest phase of composing. For instance, in my own practice, I literally *play* the musical instruments in order to produce the desired sound material for constructing the composition. Of course, many other composers have done that as well. For instance, Iannis Xenakis played a mouth organ (as one of the sound materials) for *Bohor* (1961), and, for *Source Signals 2* (2021), Kees Tazelaar played electric and acoustic guitars as the main sound material for the piece. Comparable performative qualities can also appear in the interactions with analogue or digital equipment which might be utilised in producing (or transforming) sound. Emmerson (2007, 25) discusses Schaeffer's vision and desire for a new instrument in the analogue studio which could be 'played' by the composer. Schaeffer envisaged an organ which was in fact a 'disc-based sampler' controlled by a keyboard: 'an enormous instrument capable not only of replacing all existing instruments, but of every conceivable instrument' (Schaeffer, 1952, 15–16). Emmerson observes that, as such, '[t]he finished work instantiates an idealized *performance* – only one which did not happen at one particular time' (2007, 25). Harrison explains how performativity was part of working in the analogue studio, and the fact that performative gestures continue to manifest themselves in the digital workflow.

> The manipulation of sound materials was, historically, a physical, manual process - it was, in other words, "performing" in the studio. Even though this is now often done via digital surrogates, our aural understanding of the essential "physicality" of performance gestures in shaping musical utterance remains intact. Thus we can assert that elements which we would readily associate with performance were and remain embedded in the composition of musique concrète and its descendants. (1999, 4)

Harrison underlines the amalgamation of composition and performance practices in creating certain musical materials, because of technical limitations:

> Indeed, I'm not entirely sure where composition stops and performance begins. We are now so used to having limitless numbers of audio tracks that we forget that composers

> not so long ago had to do multiple sub-mixes to achieve complex textures and events — and that meant performing those sub-mixes in the studio, in real time, over and over again until they got them right. (2013, n.p.)

In an interview from 1997, Bayle highlights the relationship between his body and the studio, and talks about a period in which he was working while standing and another period while sitting, and that this change had a an effect on his musical output.

> I have now entered a period where I want to hold the hand of the listener. That is to say, I want to make a music in which the listener can feel the body. The body is the instrument now, or more specifically, the gestures of my hands. […] Like a painter, my music is also the product of my hands, ultimately. My spirit selects and saves what my hands do, but it is the hands that perform the work. These imperfect gestures shape the sound's morphology, and serve as signs to the listener. (1997, 17)

Similarly, Manning explains the workflow of using tape machines in analogue studios and the performative qualities which emerge from that process:

> The freedom to start and stop recorders at will, while at the same time dynamically regulating the amplitude levels of these reproduced materials, cultivated an art of performance in the realisation of works which is very remote from any of the practices normally encountered in the highly integrated world of the digital computer studio. (2006, 84)

This performativity might be different when utilising computer-based programs from what Manning describes for analogue equipment. Nevertheless, it is still present in the form of mouse and keyboard interaction, (midi) controllers and so on. In my own composition practice, besides playing instruments and recording them, performative actions can also appear in the form of controlling the parameters of the Max/MSP patches (with certain gestures) via knobs, buttons and faders, in a similar fashion to an analogue studio.[7] Of course, the design of computer-based environments is influenced by the same ergonomics as were previously realised in 'concrete' form in the analogue studio. Karlheinz Stockhausen believed that the composer is already acting as an interpreter in the case of fixed media music:

> The attitude toward making music is in the case of prefabricated music radically different. One writes as a composer and interprets as an interpreter, because of wanting to produce something that should remain valid once and for all and is not repeatable. So, you make a tape, like a sculptor or like a painter ... You worry to high heaven out of concern for the sonic reality. (1996, 91)

However, Stockhausen does not acknowledge how dramatically this 'sonic reality' changes in various circumstances when the music is presented in public. Manning discusses (2006, 90) the case of 'reproducing' Stockhausen's *Studie II* from the score (without the composer's collaboration) at Elektronmusikstudion (EMS) in Stockholm (1971), in order to supposedly create a 'better' version, which Stockhausen rejected as 'awful, a farce to say the least' (Tannenbaum

[7] Max/MSP is a visual programming language for music and multimedia developed and maintained by software company Cycling '74. It is a common tool for electroacoustic musicians to generate and manipulate sound for live and studio purposes. https://cycling74.com/products/max

1987, 22).[8] Manning discusses the possible reasons for this, and underlines the importance of tiny variations in cutting and splicing which determine the composer's relationship to the material. He continues that '[s]imilarly, the manual control of amplitudes introduced subtleties of interpretation unique to the composer, which cannot be deduced from the score' (2006, 90). In the early years of electronic music, the composer would often provide a 'recipe' to be realised by studio technicians. However, by the end of the 1950s this practice was already abandoned, which may indicate a greater importance of the details of the production process than was apparent at first.

Chagas describes Stockhausen's approach in working with the equipment in the WDR studio, and specifically mentions Stockhausen's insistence on controlling the mixing desk himself. Chagas concludes that:

> This gestural approach of electronic music production is an essential aspect of his aesthetics; the composer plays with the machinery of the studio in dialogue with the technicians and assistants. […] The electronic studio was for him [Stockhausen] a model of a performance situation; the listening experience has to be constantly actualized in order to adapt the compositional ideas to the production conditions in studio including technique and space. […] He envisioned the production of an electronic music work in studio as the result of a live performance with musicians and technicians playing with musical apparatuses. (2014, 190-2)

Also, in the case of *Octophony* (1991), Stockhausen discussed the process of spatialisation where '[c]omplicated motions were separately regulated by hand, stored in a computer, and recalled in rhythm for the recording' (1993, 152).

Examining in detail all these various manifestations of performative agency in fixed media music composition requires a thorough investigation, and is beyond the scope of this research. Nevertheless, through the examples outlined above, I underscore how performative agency can already be embedded in the composition process. I do not conclude that the studio is like a musical instrument to be 'played'. What I am trying to highlight here is the performative qualities which emerge during the process of composing fixed media music, in interaction with the equipment in the studio; in other words, traces of the composer's (bodily) presence in the work. Such qualities are consequently reflected and captured in the recorded material and, most likely, will be perceived by the audience as well. As such, a performative agency in the context of fixed media music, can be considered to be embedded in the composition. This suggests that we can understand performativity as a flux between the composition and the presentation stage.

### 1.2.2. The performer in fixed media music

Applying the term performer in the context of presenting fixed media music has been controversial given the prerecorded nature of the music. It is no secret that the performer of fixed media music is not producing the music on the spot, and there is also no reason to try to pretend otherwise. Questions might arise as to the appropriateness of the term 'performer' in

[8] The score of *Studie II* (1954) is in fact a precise instruction of how to (re)create the piece in the studio.

this case, or whether the term may be broadened in order to accommodate new forms of agency. Can the definition of performer be opened up to embrace new forms of musicking? It is true that performing in the context of music is traditionally associated with 'primary (or direct) causation' (Godlovitch 1998,97) which involves manual dexterity in generating sound, like what an (acoustic) instrumentalist does. In the history of new music, as discussed by Auslander (2023, 114), pieces such as *4'33''* by Cage already challenged the role of performer (and even the definition of music). Electroacoustic music, however, brings still newer challenges to the notion of the performer, by offering new ways of producing sound. Electronic instruments and computers used in live performance give rise to a secondary causation (Godlovitch 1998,97), in the sense that the sound is produced indirectly via controlling the interface of a synthesizer, or a computer program, which results in sounds coming out of loudspeakers. Emmerson maintains that a live performer can also be the one 'who does not mechanically cause the sound, yet who may cause, form or influence it through electronically mediated interfaces under their immediate control' (2007, 90). Many studies have been carried out on the agency of electroacoustic music performers and the concept of instrumentality where the input effort and gestures of the performer and the resultant sonic output are not always correlated in a one-to-one correspondence (d'Escriván 2006). The composer Julio d'Escriván argues that the generation familiar with these new technologies, is not necessarily tethered to the 'efforted-input paradigm':

> Those who have been brought up with personal computers and video games could be more open towards effortless performances […] What is certain is that our appreciation of performing skills has widened to accept all kinds of live music-making as valid […] If the music captures our imagination, it does not really matter whether the laptop musician is sweating. (1996, 188-190)

The composition process in fixed media music also involves secondary (and even primary) causation to produce the sound materials, but when it comes to its presentation, the agency of the performer is yet different from that of live electronic performers. Here, the 'labour of sound production', as John Croft puts it (2007, 60), is eliminated from the act of performing, and this situation is fundamentally different from that of the primary or secondary causation mentioned above, since there is simply no sound production taking place, either direct or indirect.

Regarding technological advances and emergent new aesthetics in music making, Auslander (2023) suggests a new paradigm of musicianship which transcends the traditional instrumentality. He concludes that:

> it is not necessary to produce sound through direct physical agency in the manner of a traditional instrumentalist or even a turntablist to be considered a musician. The category of musician can also encompass those who in some way manipulate or manage sounds they did not create or possibly did not even select. (2023, 114)

Such a definition of a performer who manipulates and manages sound without being its creator closely resembles the role of a fixed media music performer who works directly with the sound files and gives these materials what they find to be the 'proper' sonic actualisation. Oliver Bown, Renick Bell and Adam Parkinson (2014) discuss the role of performers in the context of laptop musicians, and propose a paradigm shift in our understanding of performance by the

introduction of computers in performances. As such, they foreground the importance of the bodily presence of the performer, stating that:

> Even if doing nothing or even faking, the essence of their performance lies in the fact that they stand on stage, in control, and with all eyes on them, and thus avail themselves to an analysis of performativity. (2014,14)

This view highlights the accountability of the performer – regardless of what kind of activity they do – as the one being *in control* and *responsible* for the musical experience of the audience. Following that line, what a performer of fixed media music does can perhaps be compared to a conductor, who shapes and controls the sounds of an 'orchestra of loudspeakers', and is in charge of the emergent musical result and the manner of its unfolding. A conductor and a performer of fixed media music are both 'silent musicians' in the sense that they do not produce any sound themselves at the concert. Until the mid-19th century, the fundamental task of a conductor was to keep time, like a metronome (Neuman 2021, 4), although in fixed media music, ironically, timing is one of the most rigid musical elements of the composition and is out of the performer's control. Of course, the role of conductor has evolved since the 19th century, and goes far beyond being a 'timekeeper'. Nowadays, it encompasses a wide range of diverse activities, from programming and learning the score to auditioning and management. In his book *The Silent Musician* (2018) the conductor Mark Wigglesworth discusses the role of a conductor and the intricate relationships they have to maintain in regard to the composer, the score, the orchestra as an organisation, the musicians as individuals and of course the audience. Eventually, this comes down to the conductor being responsible for the emergent musical experience, and for establishing the *right atmosphere*. This is quite similar to what a performer of fixed media music is supposed to do; *to make sure that the audience has the best possible experience of the music*. Performing fixed media music is not as established a role as conducting. Nevertheless, like a conductor, besides balancing and shaping the sound of the 'loudspeaker orchestra', a great deal of their activity takes place far in advance, prior to the concert moment, in form of planning, practicing, preparation and rehearsal. They need to study the music in order to realise what it demands musically and technically. Accordingly, they need to design a sound system in relation to the venue and the music (and perhaps the audience). For instance, even deciding about the concert venue, or deciding on how to arrange the audience area, is an artistic/musical/interpretative choice. In my experience this is sometimes a matter of compromise. The available choices – with respect to the space and the equipment – are sometimes not as broad as one might like. With creativity, the performer should try to make the best out of the available resources, in order to achieve the ultimate goal: creating a meaningful experience for the audience. When I perform my own pieces, I do feel as if I am 'conducting' – specifically, the extensive presence of instrumental material in my compositions literally evokes such a feeling. I believe that conducting offers a useful analogy to explain what a performer of fixed media music does.

While being a 'silent musician', physical skills can still be relevant. A conductor is required to learn certain skills, for instance how to hold the baton and move their hands (and body) (Wigglesworth 2018, 29-30). Similarly, a fixed media music performer needs to have the required skills in managing all the inputs and outputs on the mixing desk during the concert, which can be quite demanding (specifically regarding works with a higher numbers of channels), and they should be able to react instantly as the music unfolds. Given that manual dexterity in performing fixed media music is not at the same level as that of an instrumentalist,

what is the relevance of virtuosity? Apart from the fact that sound diffusion can become a virtuosic act (see below), the composer and researcher Gerriet K. Sharma (2017) looks at it from a different angle, and suggests a definition of virtuosity beyond the physical dexterity of a performer on an instrument. He explains that virtuosity, in fact, indicates transcending the instrumental difficulties and techniques, in other words, making seemingly impossible things possible. According to this view, moving sounds in the space, which is the result of technological and artistic capacities, can be considered a virtuosic act.

> Virtuosity has then shifted from bodily effort to the knowledge and spatial practice of a deepened interdisciplinary scientist-artist collaboration as an act of mutual translation of different languages, technical abilities and spatialisation before the actual performance, digitally stored to be later performed within the "virtuous" interplay of loudspeaker arrays projecting sound and the conditions of the listening space. (2017, 6)

Similarly, Dellaira considers the technological advances in music as a virtuosic attribute.

> One thing is certain: the driving force behind each and every technological advancement was to make a wider range of sound available – more pitches, greater dynamics, richer timbres – with easier effort. And that meant greater range [sic] could be explored and exploited by instrumentalist and composer alike in the creation of more intense illusions. Technology thus collaborated with the composer in defining the virtuoso as the one who could bring off these illusions. In a sense, then, the history of music technology parallels the history of virtuosity. (1995, 202)

Perhaps we can also consider a listening virtuosity, again like a conductor (or better, like all musicians): the ability to listening to all the nuances of the music while unfolding in the space and reacting to them if necessary requires what could be called a listening virtuosity.

### 1.2.3. The art of sound diffusion[9]

'Sound diffusion', used as an idiomatic term, denotes a particular practice in the tradition of presenting fixed media music where the 'sound diffusionist' projects a stereo signal over a larger number of loudspeakers (usually of different types and differently positioned) in the hall, as a performative act. As François Bayle explains, the Acousmonium was inspired by a symphonic orchestra 'with its standardised ordering, arranged for the best acoustic effects by groupings of instruments and levels of intensity (strings, woodwinds, brasses, percussion).' (2007, 242). This practice partially stems from the limitations of the sound technology in the past, such as the limited dynamic range of magnetic tape, which necessitated a compensational act during its performance by making the loud parts louder and the soft parts softer (Harrison, 2013, n.p.). According to the composer Denis Smalley '[s]ound diffusion is the projection and the spreading of sound in an acoustic space for a group of listeners – as opposed to listening in a personal space (living room, office, or studio). Another definition would be the "sonorizing" of the acoustic space and the enhancing of sound-shapes and structure in order to create a rewarding listening experience' (Austin & Smalley 2000,10). Harrison describes sound diffusion as an

[9] The term *projection* is also common in this context. Bayle indicates the analogy between the sound *projection* and stereo *image* in our technological age (2007, 243) On the other hand, Harrison argues that the term 'diffusion' is more appropriate in view of the physicality of sound and how it propagates (diffuses) in space (1999, 125).

'active intervention to enhance the sound image(s) on the storage medium and to render those images more "readable" in a space' (Harrison, 2013, n.p.).

Preserving and enhancing the 'stereo image' is therefore one of the main motivations for sound diffusion. As Smalley explains '[o]ne reason why an art of diffusion emerged was the need to expand the stereo image and to project it effectively in a large space' (2007, 12). The stereo image refers to the virtual sound field constructed between the two loudspeakers, based on interaural time differences (ITDs) and interaural level differences (ILDs). This image is best perceivable at the 'sweet spot', which is normally thought of as the third apex of an equilateral triangle formed by the two loudspeakers and the listener. According to Harrison '[e]ven on a good hi-fi system, with the listener in the sweet spot, the stability of the stereo image is notoriously fickle — turning or inclining the head, or moving to left or right by just a few inches, can cause all kinds of involuntary shifts in the image' (Harrison 2013, n.p.). In other words, these movements disturb the integrity of the sound field by altering the ITDs and ILDs from the values which have been incorporated into the music at the time of composition. As such, with only one pair of loudspeakers in a large concert hall, at best only a limited number of audience members in the centre of the hall perceive the 'correct image'. To address this issue, multiple loudspeaker pairs were added to cover more of the audience area. Accordingly, in the case of BEAST, mentioned earlier in this chapter, each pair is described in terms of its positioning and the resultant sound quality, such as Main, Wide, Distant, Punch, and so on (Harrison 2013, n.p.) Moreover, the application of various types of loudspeakers gives rise to different 'characters' which can be used as yet another interpretational tool.[10] This approach results in a multichannel sound system controlled via a mixing desk, so that the stereo signal may be sent dynamically to any of the loudspeaker pairs.

Such a multichannel sound system is therefore utilised to project and maintain the stereo image, firstly in order to cover the whole listening area (so that most of the audience can perceive that image correctly), and secondly in order to enhance, exaggerate and manipulate this image as a performative/interpretative act. In other words, such practice involves *corrective* and *expressive* agential acts (Stansbie 2013, 46) In this context, the *lower* channel number of the source (often stereo) gives *more* flexibility in the sound diffusion performance, and hence more latitude for interpretation. It is important to note that the approach of such a multichannel sound system is essentially quite different from a multichannel sound system which is meant for *composing* multichannel music, where the source material itself consists of multiple sound files, and the positioning and character of those loudspeakers are taken into account at the composition stage, or as a compositional strategy (see Chapter 3). As such, sound diffusion perhaps could be considered as 'performed orchestration', as opposed to 'composed orchestration' where the music has been composed in more than two channels in the studio. Such 'gesture enhancing' actions on the mixer are in fact very limited in comparison to what can be composed in a multichannel format.

I clearly recall my first experience of attending the Acousmonium concert during the Composing Spaces symposium (2013) in The Hague, where 'sound diffusers' were performing pieces from the GRM repertoire. Some of them in fact had been trained as sound-diffusion performers only.

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[10] According to Simon Emmerson, '[w]e may try to describe this in terms of technical quality – scientifically measurable parameters of frequency response, dynamic range, transient handling, directionality and so forth. Alternatively we may resort to a range of verbal attributes which are much less easy to define, such as 'punch' ,'colour' ,'clarity' ,'warmth' even 'honesty' which seem to convey something of this character' (2007, 147).

After a couple of performances (regardless of the musical content), the limitations of such diffusion practice became apparent, in terms of a limited number of movements and gestures that can be made with a stereo signal. The fact that only ten faders can be controlled simultaneously is a natural limitation – assuming that each finger can operate independently. And of course the input source consisting of only two channels is another limitation. At times, a disjunction between the musical content and the performative acts was noticeable: more or less similar gestures and strategies were applied to various pieces, which would sometimes overshadow the music and turn it into an acrobatic act. For instance, repeating the gesture of moving the stereo image from front to back and vice versa in the concert venue ('washing over the audience' so to speak) rapidly became a cliché. Nevertheless, attending the premiere of *Huellas Entreveradas* by Beatriz Ferreyra in Berlin (2019), where she performed her stereo piece over a 10-channel sound system, I could not believe that I was listening to a stereo piece. Here the sound diffusion seemed to be serving the unfolding of the music in the space, displacing various musical elements at different moments, rather than just moving sound in the space. However, as she explains in the audiovisual dissertation, she did not consider it herself as 'a performance', and she did improvise it rather than preparing it in advance, having spent a great deal of time during the soundcheck walking through the venue and listening from various positions to have an understanding of how the music sounds in the space, which of course is also informed by her extensive experience in working with different sound systems in different spaces. As the various contributions to the audiovisual part of this dissertation show, there is no consensus as to how to conceive and describe the act of sound diffusion and how it relates to the concept of performance.

The practice of sound diffusion often demands a high degree of physical skill. In fact, watching a sound diffuser while performing can be quite fascinating. The dexterity in moving fingers on the faders (almost like a piano player) brings sound diffusion practice back to the realm of traditional instrumentalism and virtuosity. Here, the physical skills of the performers have a direct and huge effect on the musical results. As such, the agency of a sound diffuser might fulfil a nostalgia for traditional skill-based performativity. As John Croft remarks, 'the demand for a connection between bodily effort and acoustic output is a form of nostalgia for a traditional form of musical performance' (2007, 63). On the other hand, the composers associated with this tradition are accustomed to taking into account, during the composition process, the kind of performative/interpretative actions that the performer might wish to execute. For instance, a sustained drone-like sound is an invitation for the performer to move it around the space. Or a sound object with a 'distant quality' (lacking high frequencies) might be placed on the 'distant pair' of loudspeakers to further exaggerate this effect. Or, similarly, energetic and active musical materials might suggest rapid movements in the space. Smalley explains that when he is composing, he is constantly considering the possibilities of the art of diffusion in terms of dramatising gestures, clarity of image and so on.

> For example, if I have a texture that's bustling around, I might try and make it bustle more by changing its perspective, possibly using sets of frontal loudspeakers so that the image might expand or contract and maybe also play with a little distancing depending on the nature of the texture. (Smalley 2007, 17)

Sound diffusion can be done in an improvised manner (like Ferreyra), or it can be fully 'composed' where the composer (or sometimes the performer) makes a so-called 'diffusion score' to indicate what has to happen in terms of diffusing the sounds in space as well as giving

instructions for controlling the dynamics. Examples of such diffusion scores are Trevor Wishart's *Red Bird* (1978) and Smalley's *Valley Flow* (1991).

Sound diffusion systems (such as Acousmonium and BEAST) nowadays also include multichannel arrays, but the approach stays more or less the same, and the influence of the stereo approach remains dominant. Harrison considers multichannel composition limiting in comparison to the flexibility of stereo diffusion, and does not regard it as an advancement. He asserts that if such a multichannel system is used for multichannel composition, then:

> The flexibility offered by stereo diffusion to deliver images that are close, intimate, diffuse, distant, high, etc., by using multiple pairs of loudspeakers is, ironically, sacrificed in the name of progress. (2013, n.p.)

He explains what he considers to be the problem with multichannel composition (specifically 8-channel) in relation to the 'image', and asserts that multichannel pieces require a particular configuration, which is according to him a restriction:

> The sonic images [in multichannel compositions] I discussed earlier are composed with that specific speaker set-up in mind, and any other configuration creates an immediate distortion of the images, or even their complete destruction. (2013, n.p.)

In the case of Jonty Harrison's music this is the case, in contrast to other composers including myself. It greatly depends on the material and the composition strategies. If, for instance, the goal is to move a virtual sound source precisely in a certain trajectory within the multichannel setup, indeed most probably the 'image' (or that trajectory) is distorted (or destroyed) when projected through a different loudspeaker arrangement. But in many other cases, the result would be a variation of that 'image', or better, a different musical quality which is not necessarily inferior. It becomes a different actualisation, and that difference can be turned into an interesting musical element to work with. This is exactly what makes the adaptation of a composition for a new arrangement interesting, and gives rise to new actualisations, which is where, as mentioned above, the roles of performer and composer blur. Moreover, in the same way that a piece for string quartet requires four string players, and a symphony requires an orchestra, a multichannel composition requires a certain sound system for its presentation. Nevertheless, a string quartet or orchestra might be differently arranged on stage in different performances: for example, some conductors prefer to seat the second violins of an orchestra behind the first violins, while others place them to the right side of the stage opposite the first violins. The same kinds of considerations apply to the placement of loudspeakers in a performing space.

BEAST's approach to addressing this issue was to add multiple arrays of eight channels each (a similar approach to adding more stereo pairs), in order to form and shape the image and foreground the gestural behaviours of the music. Emmerson explains Iannis Xenakis' approach to using loudspeakers by stating that they were 'a key building block in Xenakis's increasingly complex polytopes – an absolute point in space from which an individual soundstream would contribute to the statistical whole' (2007, 160). Such an approach is in line with his instrumental music, where individual instruments (as points in space) are frequently used to create a dense polyphonic texture – for instance, in *Terretektorh* (1966) where 88 orchestral musicians are distributed throughout the performing space. Similarly, in his electroacoustic pieces 'the loudspeaker becomes an agent in a mass of agents, its character subsumed into the essential

group activity. This engages perfectly with Xenakis's interest in granular synthesis: the loudspeaker here acts not as a virtual source of a "stereo image" but as an individual source within a mass of sources' (Emmerson 2007, 160). Obviously, the approach taken towards utilising loudspeakers depends to a crucial extent on the composer's musical intentions. In Chapter 3 I discuss my own approach to composing for multichannel setups, and I explain why the latter approach (such as that of Xenakis) offers greater possibilities in composing and performing fixed media music.

While the practice of sound diffusion attempts to foreground performativity by bringing the role of the sound diffuser closer to that of a traditional instrumentalist with their extensive interpretative skills, it is at the same time compositionally limiting in the sense that the affordances of the multichannel setup in the composition are sacrificed in the name of the flexibility of a stereo image. For instance, *spatial polyphonic* possibilities are greatly reduced when only two channels are used. It is important to note that many of the activities and approaches mentioned above are not specific to the 'art of sound diffusion'. For instance, actively controlling the dynamics as the piece unfolds, or extending the dynamic range if necessary, as well as utilising loudspeakers with various characters and positioning, are all common tools for presenting multichannel music as well. What I describe here as 'sound diffusion' is the historical approach (as seen in many sound diffusion systems) which is centred on the notion of a stereo image, and the fact that such an image requires 'spatialisation' as a performative/interpretative act rather than just being played back in its original form. Sound diffusion might even be said to have given rise to different identifiable styles, for example 'the Montreal school, which often relies on front-rear movements' (Boutard 2019, 105). There also exist events where sound diffusion artists compete for a prize, indicating the extent to which this practice has become a tradition with its own identity and rules.[11]

As discussed in the beginning of this chapter, the necessity and urgency of active control when presenting 'recorded' music for an audience was present from the very beginning of the history of electroacoustic music, and the art of sound diffusion was born naturally out of that necessity. As the composer and former director of the GRM Daniel Teruggi underlines, the Acousmonium is a long-term development of the concept that 'music should be controlled when presented to an audience, thus creating a performance situation' (2007, 218). While such concerns are still absolutely reasonable and valid when presenting fixed media music to an audience, the performance practice of fixed media music – or the agency of the performer – might be better considered in a much broader sense, especially because many of the technological limitations in sound reproduction systems of the past have been eliminated, and multichannel sound technology is much more widely available and affordable. Furthermore, the understanding of performativity by audiences has evolved in the meantime, and is no longer limited to that of traditional instrumentalism.

[11] For example 'the spatialized interpretation competition' at the L'Espace du Son festival (https://www.lespaceduson.be) which takes place annually in Belgium and is focused specifically on the practice of sound diffusion, and includes a sound diffusion (interpretation) competition where 'sound projectionists' compete in presenting the best interpretation.

### 1.2.4. Composing for the Acousmonium

In 2013 I had the opportunity to take part in a workshop on the Acousmonium, and I composed a piece (*Gereh II*) for it, which was presented using that system some months later during the Next Generation festival at ZKM (Zentrum für Kunst und Medien) in Karlsruhe.[12] When I first listened to all those various loudspeakers with different characters and positioning, I thought of actually composing a (multichannel) piece which integrates all of them (not necessarily at the same time), instead of making a 'performed orchestration' by moving (or duplicating) a stereo image during the performance. Eventually, I made a compromise and composed the piece for eight channels. Despite the fact that the Acousmonium had eight-channel rings in the system, such a multichannel approach proved not to be convenient, since the arrangement of the Acousmonium is mainly in terms of left and right pairs, which complicates the process of working with 8-channel pieces.

I aimed for an idea whereby I could explore or integrate sound diffusion within the composition itself, since this approach was suggested by the nature and history of the Acousmonium. My idea for the piece was to repeat similar musical material (a dense texture consisting of short percussive sounds) multiple times, and in each iteration to *diffuse* the material onto a different group of loudspeakers. In this way, I intended to foreground the different characters of the loudspeakers and to delineate how those characteristics affect the same sound material. I left a little bit of silence in between each iteration, in order to isolate them more clearly. These silences had another practical function, which was to create a moment to move the sound (faders) to the next group. This is a clear example of how the use of a particular sound system affects a compositional strategy. And, conversely, how the composition takes into account the performative strategies (in this case, by leaving a moment of silence for moving the faders). In practice, though, the fact that most of the Acousmonium's loudspeakers were situated on the stage had the effect of limiting the articulation of the differences between the loudspeaker groups.

In retrospect I would say that, although my diffusion strategy was working well, and although I was indeed performing an important proportion of the compositional ideas through sound diffusion during the concert, I could have achieved much more elaborate textures and intricate relationships if I had had the possibility to compose for all the loudspeakers with separate inputs. This approach, however, is discouraged by guardians of the Acousmonium aesthetic who tend to regard it as going against the intentions of its designers, as I found in the course of attending a workshop on this system. Later on, I made some changes to the piece to make it more suitable for 8-channel configurations. However, I left the silences intact since they also served aesthetic purposes. I performed this piece in many other occasions with various sound systems and arrangements, and in the end I was more content with the final 8-channel version because of its more elaborate *spatial polyphony* which is concerned with simultaneous musical events taking place in various points in space (see Chapter 3). Nevertheless, I tried to utilise various loudspeakers with diverse characters whenever these were available, in order to highlight the compositional ideas I had originally intended.

[12] https://zkm.de/en/about-zkm

### 1.3. Public presentation of fixed media music

> A concert is a communal event, and the connections that a great performance weave through all who hear it are its most valued purpose. (Wigglesworth 2018, 194)

One of the crucial aspects distinguishing fixed media music from other recorded music is its public presentation in the form of a live event, which aims to encourage a dedicated and focused listening experience. While most recorded music is tailored to the purpose of individual listening – for instance, by bringing something like a concert hall experience to private spaces such as a living room, car or headphone space (which can coexist with any other space) – in the case of fixed media music the audience comes together in a concert venue to experience this 'fixed' (recorded) music in a 'live' (concert) event.[13] This gives the public presentation of fixed media music a peculiar character compared with more traditional concert forms and with most other experiences of recorded music. Fixed media music is often composed with the intention to be experienced in a live setting – in the here and now of the concert situation. Therefore, this collective listening ritual, in turn, inspires and affects the composition process, by causing the composer to be aware and deliberate in thinking about how their music is going to be presented in a concert setting. Such questions are probably more consciously addressed by the composer of fixed media music than by the composer of traditional instrumental and vocal music, who might more often take for granted the circumstances under which their music will be heard by an audience, that is to say on a stage in a concert hall of a certain size, shape and acoustic, as if these circumstances are neutral and transparent, which of course they are not.

One of the reasons for a public presentation of fixed media music is the application of a space as a musical parameter, either as a compositional or a performative aspect of the music, or both. As a result, the physical space becomes an integral part of the presentation of the music, since the spatial characteristics incorporated in the music need to be manifested as clearly as possible in the actual space. As the musicologist Gascia Ouzounian explains, in the context of spatial music, such 'awareness [of utilising space] compelled compositional methodologies that accounted for many individual listeners instead of a single "body" of listeners' (2013, 76). Each of these individual listeners has their own perspective on the music, which is one of the most interesting aspects of listening to multichannel music, and which will almost inevitably be a strong influence on a composer's conception of the music. For example, the notion of a 'sweet spot' is no longer relevant – each sitting position in the venue offers a unique and specific 'mix' of various sound sources. This highlights the importance of the listening experience of a piece of fixed media music in the concert hall. According to Ouzounian, '[t]his was an important step towards locating the value of a musical work not only within the abstracted medium of the score [or in our case the sound files], but in the *actual*, experiential dimensions of listening' (2013, 77, my emphasis). While most vocal/instrumental music will be experienced as emanating from a stage in front of the audience, it is frequently the case that the audience for a piece of multichannel fixed media music will hear sounds from either side, from behind and even from above, and their experience will be of occupying a particular individual position *within* the music rather than a more generalised position outside it. Similarly, the composer Emma-Kate Matthews (2019) in her article 'Activating Audiences: How spatial music can help us to listen', explores the relationship between architecture and music, and compares the more conventional frontal 'stagebound' setting in concert halls to a spatial one where the audience 'inhabits' the music.

[13] This can be any type of space, traditional or nontraditional (a warehouse, an old factory, and so on) concert venues.

She observes that '[s]patial music reminds the listening audience that they are implicit in the act of listening. The audience are occupying the space and they are occupying the sound' (2019, 299). Matthews argues that listening in such a situation demands a higher degree of involvement and thus gives the audience a more active agency. Connected to his idea, the American composer Charles Ives maintained already decades before Matthews that in music which simultaneously consists of various 'rhythmic, melodic, harmonic schemes, the hearer has a rather active part to play':

> the listener may choose which of these two rhythms he wishes to hold in his mind as primal.... As the eye, in looking at a view, may focus on the sky, clouds, or distant outlines, yet sense the color and form of the foreground, and then by observing the foreground, may sense the distant outlines and color, so, in some similar way, the listener can choose to arrange in his mind the relation of the rhythmic, harmonic and other material. (Harley 1997, 75)[14]

Spatiality in music can also increase the emotional involvement of the audience. In a thorough experiment on 40 participants listening to various types of electroacoustic music, the composers Federico Schumacher Ratti and Claudio Fuentes Bravo conclude that spatiality is a property of sound that 'seems to play a central role in both cognitive and affective processes of empathy' (2017, 403).

This individual experience takes place within the context of collective listening (the bodily presence of fellow listeners), which, therefore, sits at the heart of fixed media music-making practice. As the composer Eric Lyon explains,

> Music for large numbers of speakers also commands a social presence that stereo music does not require, since spatial electroacoustic music must be performed in special venues with appropriate multichannel sound systems, whereas much stereo electroacoustic music could be fairly appreciated at home on a good stereo system. (Lyon 2014, 2)

Compositional/performative strategies such as *spatial polyphony* or *post-mix* (discussed in Chapter 3) are emblematic of such approaches. This reciprocal impact of the listening situation and the musical intentions embodied in a composition gives rise to a *performance practice* in fixed media music.

### 1.3.1. Corporeality in fixed media music

In their article 'Analyzing from the Body', musicologists George Fisher and Judy Lochhead observe that '[r]ather than conceiving of meaning as a mental construct shaped entirely by linguistic concepts, many thinkers [such as Maurice Merleau-Ponty and Michael Foucault] have focused on the body as a central focus for the constitution of meaning and understanding' (2002, 38). In the context of musical performance, this embodiment can be considered in two forms, the corporeality of expression (of the performer) and the corporeality of the perception (of the audience). According to Fisher and Lochhead, 'the performer's body moves when

[14] This remark relates to Ives' approach to spatial separation of the instrumental groups and how he created a polyphonic texture, which will be discussed in Chapter 3.

making music, and those movements provide a strong visual cue to how individuals carry out a performative enactment of musical meaning' (2002, 46). However, the bodily presence of the performer in fixed media music is of a different nature (as discussed above). Here, the performer is *not* producing the sounds as they would be in vocal and instrumental music; their bodily presence is reduced to sitting (or standing) behind the mixer, generally with a minimum of actions. As such, the bodily expressions of the performer are mostly absent (or extremely minimal). Fisher and Lochhead explain that in such acousmatic situations,

> when listeners apprehend musical sound through the non-visual medium of recordings, performative enactment of musical meaning relies on a prior backdrop of experience that allows listeners to imaginatively engage the physical activities that went into its production. (2002, 47)

If I relate their remarks to fixed media music, listening becomes an intense imaginative engagement, whether those physical activities of sound production are based on actual movements and gestures or abstract ones. On the other hand, the bodily perception of the audience is fully at work, specifically within the immersive and complex sound world which results from the way the sound of the music fills the space. In other words, the corporeality of the audience can become a more prominent factor in fixed media music concert situations, so that listeners might concentrate not so much on the corporeality of live performers but on their own.

In any kind of musical presentation, as Godlovitch observes, '[l]isteners … have a central role. In our musical culture, attentive listeners contribute meaning and purpose to much otherwise free-floating musical activity' (1998, 45). Perhaps this could be said even more strongly of fixed media musical presentations. Corporeality manifests itself also in the way the body is situated in a concert venue, which gives a specific vantage point to that body in experiencing spatial music. As the music theorist Karolina Dąbek explains, in such a situation the body becomes the point of reference and the centre:

> It is only in the various variants of spatial music that the centre of gravity has shifted onto the listeners, their own perspective, as well as onto the body in relation to which they perceive and experience the music. (2020,187)

It is clear that bodily presence determines and affects the perception of the music. While perceiving spatial audio, bodily movements can manifest themselves specifically in the form of head movements (which are indeed observable in the audiovisual part of this dissertation). These (micro) movements change the perspective and the spatial cues, and result in a richer perception and localisation of the musical events in the space, specifically in experiencing spatial polyphony (see Chapter 3). According to the composer and writer Gary S. Kendall, '[i]n directional hearing, the front–back distinction is very dependent on the dynamic movement of the head, which clarifies what is in front from what is behind' (2010, 230). Similarly, the music theorist Erik Clarke, in his contribution to the book *Music, Sound and Space*, explains how head movements aid the localisation of lower frequency sounds which are by nature difficult to discern.

> Because low frequency sounds are diffracted ("bent") around the head, reducing the shadow effect, intensity-based discrimination is poor or non-existent below about 500–800 Hz; and phase differences become ambiguous above about 1,500 Hz – although in

> both cases acuity improves with the dynamic cues that come from moving sources and listeners' own head movements. (2013, 93)

This phenomenon has implications for how the different frequency areas of spatial music might be composed and/or diffused. Jens Blauert, in his seminal book *Spatial Hearing* (1997, 178-201) discusses 'motional theories' which are '[t]heories of spatial hearing that describe relationships between the position of the auditory event and the changes to the ear input signals during head movements' (1997, 178). By analysing numerous experiments on various head movements (such as rotating, tipping, pivoting and their combinations) in relation to varying positioning of the sound sources (in the horizontal and vertical planes), he concludes that 'head movements improve the ability to determine the direction of sound incidence' (1997, 190). Rotating movements proved to be more effective than others, while the combination of various head movements gives an even more accurate localisation (1997, 183). According to Blauert, besides the shape of the head and pinna, the vestibular organs and even the receptors in the neck muscles play a role in how head movements help in sound localisation (1997, 190). Again, such considerations are essential to bear in mind when composing and/or diffusing music in which the spatial location or movement of sounds is an important factor.

Fisher and Lochhead claim that 'hearing entails a bodily enactment of musical meaning that links listeners, performers, and creators in the same musical enterprise' (2002, 46). Accordingly, they suggest that 'all hearing is performative', adapting the concept of performativity developed by Peggy Phelan (1993), who states that 'all seeing is performative' (2002, 46). During his residency at the Studio di Fonologia Musicale, Milan in 1957, the composer Marc Wilkinson realised for the first time the importance of body positioning and movement in perception (or, as he puts it, interpretation) of spatial music, which was a novel experience at that time.

> The listener can [perform] the act of hearing. In good conditions, surrounded by a stereophony of sound projectors, his mind will automatically concentrate on different sets of projectors in turn. Each "performance" of the work will bring new visions, for the mind will almost certainly rearrange the sequence of its concentration in space; for that matter, the listener can "interpret" the music by moving about within the confines of the stereophony during performance, thereby consciously creating states of imbalance between the component constructions in sounds simultaneously projected from the different spatial origins. (1958, 48 in Manning 2006, 85)

Wilkinson's discovery of the interpretative potential of moving around within the sound field created by multiple loudspeakers puts the bodily presence of the listener at the heart of the experience of spatial music. Taking Wilkinson's thoughts a bit further, Caleb Stuart suggests a concept of 'aural performativity' which takes place in a mediated, intense and immersive sonic environment where 'causal relationship between what we hear coming out of the loudspeakers and the body of the performer is broken'. As such 'the performer is also a listener. This is especially clear in psychoacoustic experimental music as the bodies of all individuals in the space are receiving different aural information based on their position'. As a result, '[t]he performativity of the music is to be found in the act of listening and the performance of the audience in relationship to the sound they hear' (2010, 64). Although these considerations do not directly apply to music presented to a seated audience, as opposed to a sound installation

where listeners are able to move around, even to static listeners the spatial experience of the music is strongly (if usually unconsciously) influenced by their head movements.[15]

In the course of making a series of compositions based on carpet designs, I drew a comparison between observing (experiencing) a carpet with all its intricate patterns and listening to a complex spatial music where the audience could 'wander' through this complexity and discover its various polyphonic relationships.[16] The idea was based on the fact that Persian carpet designs are in fact representing gardens. As such, a piece of music can also be thought of as a garden — a place in which the listener can be immersed and whose diverse spatial locations and pathways they are encouraged to explore.

> This large cosmos of diverse sounds creates a situation where each listener can explore its various corners and discover the similarities and differences of this sonic symmetric space [see chapter 3], as one would do in observing a carpet, exploring different parts and their relationships. In this way, [in the words of Salvatore Sciarrino,] "what you see becomes less important than how you see". (Anvari 2020, 55)

Here I am not talking about physically moving through the space, but rather – as in Ives's remark – about listeners directing their attention and focus to one or another aspect of what they hear.

### 1.3.2. Liveness in fixed media music

Being physically present in the concert situation of fixed media music brings about a quality of *liveness* – despite the fact that it is often considered as the opposite of 'live music'. Liveness has often been associated with the presence of human bodies. According to Auslander, the term *live* first appeared in the context of radio production (in the separation of the auditory and the visual) in order to 'distinguish live performances from the playback of recordings heard over the air' (2023, 81). Paul Sanden explains that '[l]iveness is not a fixed ontological state that exists in the absence of electronic mediation, but rather a dynamically performed assertion of human presence within a technological network of communication'. He considers liveness as a quality of perception, and explains that 'liveness is intrinsically linked with perception and therefore highly dependent on the one perceiving the musical performance' (2013 ,115). That is to say, liveness is a quality brought to the music by the listener rather than by any performer. Similarly, the improvising musician and philosopher Gary Peters discusses various ideas of liveness, and concludes that the essence of liveness is *presence:* '[W]hether what is experienced in the live moment is produced or re-produced, embodied or disembodied it is nevertheless valorised as a presence, "now"' (2016, 164). As I argued above, in the context of fixed media music, the corporeality of the audience is highly conspicuous. For me, the presence of the audience always brings excitement to the concert moment, an excitement of experiencing something together, a ritual. This shared experience shapes the atmosphere (see Chapter 2) of the performance, especially when the audience is seated in a circular formation rather than in a more traditional setting where everyone is looking in the same direction; listeners become more aware of the collective nature of the event, rather than only observing the performer's actions. The concept of aural performativity is paralleled in the composer Dugal McKinnon's comment that

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[15] Similarly, in relation to the developments of new aesthetics in experimental music, Auslander suggests a displacement of 'the ideas of performance and liveness from the relationship between the performer and the sound they produce to the relationship between the listeners and the sound they hear' (2023, 114).

[16] 'Composing Music Based on Carpet' (Master Thesis), Institute of Sonology, Royal Conservatoire The Hague, 2014

'[l]oudspeaker music shifts the centre of gravity away from the performer and towards the listener, reconstituting liveness as listener-determined' (2016, 269). McKinnon also underlines the link between spatiality in music and the active involvement of the audience:

> The liveness of loudspeaker music, particularly in immersive sonic environments, emerges in the interaction of sound, space and the somatic, affective, and interpretative activity of the listener […] This can happen only in the absence of performer and performance, and in the presence of the loudspeaker. Such liveness is both singular and radical, particularly within a contemporary cultural context dominated by multimedia, whether spectacular or mundane. (2016, 267)

However, unlike McKinnon, I don't think that in presenting fixed media music we are dealing with an absolute 'absence of a performer'. What is at stake in fixed media music, as discussed above, is the presence of a *different kind of performer*, who is co-responsible for the musical experience of the audience during the concert.

As I have argued above, experiencing (spatial) fixed media music in a concert venue is an activity which transcends mere 'listening to a recording'. Bodily involvement and the collective presence of audience and performer in the here and now of the concert gives rise to a quality that could be considered as liveness. This is in line with Auslander, who nominates 'the audience's experience rather than the properties of the thing experienced as the locus of liveness' (2012, 6). This quality, as well as many of the other issues considered in the present chapter, will be more precisely defined and discussed using Gernot Böhme's concept of *atmosphere*, which is the subject of the following chapter.