

Mimetic Instrumental Resynthesis*

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This article provides a brief survey of composition in which field recordings or other referential sounds are transcribed for acoustic instruments. Through a discussion of how electroacoustic music and scholarship have conceptualised the notion of *mimesis*, and how various forms of contemporary acoustic music have adopted electroacoustic techniques, it identifies a recent musical practice in which these concerns are brought together. The article proposes the term *mimetic instrumental resynthesis* as a way of describing the common threads behind works that employ electronic-assisted or computer-assisted techniques towards instrumental imitations of environmental and extra-musical sounds. The article also highlights some of the conceptual and aesthetic questions emerging from such a practice, including the idea of transformation, issues of referentiality, listening, the influence of different technologies and their aesthetic implications, and the tension between abstract and concrete conceptions of the works discussed. Finally, the article raises concerns surrounding the language of discussing what is necessarily an interdisciplinary venture.

1. INTRODUCTION

A musical practice is developing around the reproduction of referential sound sources through instrumental means in acoustic, and especially mixed (acoustic and electronic), composition. These works often feature the instrumental imitation of field recordings and other 'extra-musical' sounds, realised through computer-assisted analysis and transcription. They present a strong example of an application of electroacoustic¹ sound and thinking in an acoustic context, and thus offer an opportunity to understand instrumental music from the perspective of sound art. The panoply of means in adapting electroacoustic ideas and methods to instrumental compositional practice has a number of rich traditions already, but this more recent engagement with potentially recognisable recorded sounds calls for

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¹Already at the crossroads of a heated terminological discussion, I will be using the terms 'sound art' and 'electroacoustic music' interchangeably. My inclination is to consider 'electroacoustic music' as a practice *within* 'sound art', though for the purposes of this discussion I will apply these terms towards works using electroacoustic sound as their sole or primary medium, diffused in a concert format.

further documentation and discussion. Proposing the term *mimetic instrumental resynthesis*, this article attempts to identify and outline an emerging practice and highlight some aesthetic concerns stemming from it.

2. DEFINITIONS AND CAVEATS

The works I will discuss lie at the intersection of the tradition of written acoustic music, whose scholarship has a rich vocabulary, and the more recent practice of sound art, whose equally rich lexicon often shares more with visual art and philosophy. Therefore, investigating the idea of mimetic instrumental resynthesis is necessarily an interdisciplinary venture and can be understood from many perspectives. My discussion is framed largely in the language established in the discipline of sound art, and hopes to present a case study for the application of these terms in acoustic music.

2.1. Mimesis

Mimesis, from the Ancient Greek 'to imitate', is a familiar term in critical theory applied most often in visual art and literature to describe representation, resemblance and the act of imitation. Though the term has been discussed broadly in these fields, I will be using it strictly to address representation in art. From as early as Plato's writings, *mimesis* has more readily been associated with representation in *images* than in other media (Melberg 1995: 23). While the history of Western visual art is deeply tied to representation, the idea is perhaps not as immediate in music's history. Of course, *imitation* is an important part of musical performance and how musicians entrain to one another; however, the idea of *representation* in the resultant sound is the focus of my engagement with the term.

I will borrow a relevant narrower definition of *mimesis* from Simon Emmerson, who describes it as 'the imitation not only of nature but also aspects of human culture not usually associated with musical material' (Emmerson 1986: 17). This integrates well with the concept of 'extramusical' sounds, though potentially poses a contradiction, particularly if we are discussing musical material defined by its

non-musicality. Where we perceive mimesis, however, is in the recognition of something *outside of the music* being *imitated* in the material. This distinguishes this notion from the 'infra-musical' imitation of musicians entraining as part of a performance. In short, mimetic musical material potentially refers to extra-musical ideas indirectly through a process of imitation.

The notion of 'reference' opens the vast discussion of *meaning* in music. While I cannot broach the whole of this subject in the scope of this article, I will briefly clarify the assumptions on which my inquiry rests. We may say that a sound is *referential* if a listener can identify its source, given relevant background (i.e. identifying the source of a birdsong as 'a bird' requires the listener to understand what a bird is and have sounds associated with it). Another way of stating this is to say that the sound is strongly *source bonded*. Denis Smalley defines this as 'the *natural* tendency to relate sounds to supposed sources and causes' (Smalley 1997: 110).

Smalley emphasises source bonding as 'natural', but this understanding is necessarily predicated on the engagement of the listener in a particular way. Therefore, it may be an oversimplification to refer to 'referential sound', or 'referential material', but we may use such terms as a kind of shorthand for sounds with strong *potential* to encourage source bonding or to engage *referential listening*. Katharine Norman describes this potential in the following way:

References, memories, associations, symbols – all contribute to our understanding of sonic meaning. Rather than deprive us of this activity, the real-world composer can treat it as a creative force, one which may ... give us an enriched understanding of real-world sounds: listening is as much a 'material' for the composer as the sounds themselves. (Norman 1996: 5)

We may connect this specifically to the two 'objective' *listening modes* (so-named because we turn our attention towards the object, rather than ourselves as subjects) advanced by Pierre Schaeffer: *écouter* (attention towards the cause of the sound) and *comprendre* (attention towards symbols and connotation) (Schaeffer 1966: 116).

3. BACKGROUND

3.1. Compositional approaches to mimesis

Mimesis, while perhaps most salient in music using recorded sound, is of course found throughout the history of Western music. At least as early as the Renaissance, we have examples of vocal works imitating natural sounds, such as Clément Janequin's *Le chant des oiseaux* (1528) in which singers imitate bird calls. However, applying this idea to instrumental writing became increasingly present in the nineteenth century through the popularisation of programme

music. There are many examples, but Beethoven's Symphony No. 6 (1808) and Berlioz's *Symphonie Fantastique* (1830) may be seen as paradigmatic. In these pieces, environmental sounds such as thunder, footsteps and bird calls are imitated by instruments, and specified in the score or through programme notes. However, it is worth noting that many of these works establish their connection with the real world not through an acoustically similar imitation of other sounds, but through shared cultural symbols and metaphor. The musical style of these works also often severely limits the extent to which an imitation may bear similarity to its antecedent sound, imposing its own infra-musical structure (i.e. the tonal and rhythmic conventions of its time). A more recent well-known precedent can be found in many works by Olivier Messiaen, who has extensively detailed the application of birdsong transcription in his work (Messiaen 1994–2002). In my view, however, these transcriptions are not applied towards a substantive *mimetic* musical discourse, as the imitative materials are consistently abstracted from the acoustic properties of their source (often Messiaen's birdsong melodies are transposed down several octaves and given to timbrally and morphologically distant instruments).

The advent of recorded sound as a compositional medium in the twentieth century significantly expanded the possibilities of mimetic discourse in music. With its borders no longer drawn by the limitations of instrumental timbres, the province of environmental sound in music has become vast, as has its implications for ways of thinking about music. Schaeffer's revolutionary inversion of the traditional musical practice of producing concrete sound from abstract notation towards a new derivation of musical values and structure from working directly with concrete sound essentially spawned a new art form – aptly named *musique concrète* (Schaeffer 1952). Equally significant is his subsequent distancing from the term in an effort to reconsider the breadth of means available to practitioners of this art, proposing instead the more generic term *musique expérimentale* (Schaeffer 1966: 24). A large part of Schaeffer's re-evaluation happened in reaction to an interpretation of *musique concrète* as a manifesto for a compositional focus on mimetic sound – he was suspicious of the limitations of a 'too-naïve' faith in the outside world, but also of a simplistic hermetic division of abstract and concrete (Schaeffer 1966: 23–24). As Schaeffer was quick to establish, there are many ways of thinking about recorded sound; and so, many composers drew their attention towards an increased study in the formal properties of electroacoustic sound and a fundamentally abstract aesthetic.

Electroacoustic music has since fostered numerous approaches to composing with and conceptualising mimetic material, variously through *soundscape composition* (Truax 1996), *musique anecdotique* (Ferrari 1964),

phonography, *cinema for the ear* (Normandeau 1993) and other narrative or ‘found sound’ approaches. While these approaches share in common the frequent use of field recordings, they may be better characterised by a concern for the potential referentiality – or the ‘grain’ – of sounds (the sense in which sounds are specific to an individual source, as in Barthes’s ‘grain of the voice’: Barthes 1977). Walter Branchi has proposed a distinction between composing ‘with sound’ and composing ‘through sound’; where the former views sound as neutral material to be manipulated, and the latter implies a preservation or extension of the sound’s original characteristics (Branchi 1983). Barry Truax has since connected this distinction with the application of signal processing in soundscape music, suggesting that composers working with environmental sounds are less likely to use processing to abstract a sound from its source, but rather to highlight or extend aspects internal to it (Truax 1992). However, just as Schaeffer does not see this approach as incompatible with more abstract tendencies, many composers from outside these traditions also often apply the same sensitivity to environmental sound sources. As an example, I have previously written on Denis Smalley’s application of processing as an extension of the natural properties of his source materials in *Empty Vessels* (O’Callaghan 2011). It is perhaps through these various approaches that we have the clearest examples of mimetic electroacoustic music. Because this medium employs recorded sound as its material, it offers great potential for such a discourse. Therefore, if we are interested in accessing that discourse in acoustic music, borrowing the techniques and theory of electroacoustic music may yield successful results.

3.2. The instrumental studio and *musique concrète instrumentale*

Recorded sound and the studio techniques of analysis and signal processing developed as part of electroacoustic practice have had significant impacts on composers working with instrumental means. There are many such composers, but Edgard Varèse, Iannis Xenakis and György Ligeti may be some of the most familiar. Composers have been more or less explicit in the manner in which electroacoustic techniques have influenced their instrumental writing, but one extensive overview can be found in Martial Robert’s book *Ivo Malec et son studio instrumentale*, in which he details some of the direct ways that Malec imitates studio processes in his acoustic composition (Robert 2005). It is from this text that I borrow the term ‘instrumental studio’ to refer to the general attitude of thinking about instrumental composition from the framework of an electroacoustic sound studio.

A direct descendent of *musique concrète*, and one with substantial theoretical discussion surrounding it, is Helmut Lachenmann’s *musique concrète instrumentale*.

While this music could be superficially compared to the aesthetic conventions of electroacoustic music in its emphasis on noise-based sounds and a kind of kinetic gestural relationship between them, it is more from a position of *listening* that Lachenmann conceives this work (Lachenmann 1996: 124–5) – and it is herein that the connection to Schaeffer’s ideas is richest. While Lachenmann’s works are known for their breadth of extended playing techniques, even ordinary playing with distinct equal-tempered pitches is included in his vocabulary. According to Lachenmann, what is important to his work is a context in which these sounds are not heard for their relationship to the structures of interval-based music,² but for their formal properties taken in their totality (Lachenmann 1996: 124–5). Of course, one can listen to the music for intervallic relationships, but the multiplicity of timbres and the performance context of the music invites a direct engagement with the act of listening. And so, while it is possible to compare the sounds we hear in Lachenmann’s music to those we hear in *musique concrète*, a more significant relationship may be in the kind of *listening intention* the music affords.

Since these are Schaefferian ideas, it is relevant to briefly consider how Lachenmann’s music interfaces with Schaeffer’s *listening modes* (Schaeffer 1966). Lachenmann’s translation of what he perceives as the ethos of *musique concrète* into the instrumental domain provides an interesting tension between these modes. First, it addresses the reflexivity of listening itself – Schaeffer’s *ouïr*.³ Acknowledging one’s own perception becomes important to the music, as it affords exchange between different listening strategies. The richness of timbre and formal complexity of his music may also inspire Schaeffer’s *entendre*; a focus on the formal properties of sound. However, the novelty of playing technique, the physicality and the *materiality* of sound encourages listening to the causes of the sounds (Schaeffer’s *écouter*). Indeed, Lachenmann’s writing is often concerned most with the physical and material aspects of his techniques (Lachenmann 1996: 124). The quotidian aspects of sound production seem to be of central importance to much of his music. Particularly telling is an indication at the beginning of his work *Pression* (1969) for solo cello that the score should not block the audience’s view of the cello and the bow (Lachenmann 1969). This is a far cry from the *acousmatic* listening situation, where the listener does not have a corresponding image for the sound (Schaeffer 1966: 91).

²I borrow the distinction between ‘interval-based’ and ‘sound-based’ music from Lasse Thoreson (Thoreson and Hedman 2010).

³Schaeffer insinuates a kind of hierarchy among his four proposed listening modes, where *ouïr* is the passive (*banale*) activity of perception, and *entendre* constitutes a trained (*spécialisée*) listening intention. *Écouter* and *Comprendre* are similarly polarised as ‘natural’ and ‘cultural’ (Schaeffer 1966: 121). I mean to make no claims about which modes are most immediate or specialised in listening to Lachenmann’s music, viewing them all as potentially intentional stances.

With such a focus on sound production and source, it may be a question whether or not Lachenmann's work might be considered *mimetic*, though we might say that the only sound source referenced in these works is the instruments themselves. Drawing from Emmerson's definition, we may not consider this a reference to something 'not usually associated with musical material' (Emmerson 1986). Perhaps, then, except in a limited way, the one Schaefferian mode from which Lachenmann's music does not benefit is *comprendre* – connotative listening. If anything, 'music' becomes the subject matter in a rather self-referential manner: the objecthood of the musical instruments is reified and exposed.

However, Lachenmann's work (and others like it) continually re-asserts the physical gesture of sound production. We may invoke Smalley's distinction here of *first-order* and *second-order gestural surrogacy*, where both are concerned with the physical production of a recognisable sound, but the latter is distinguished by a recognisable performative training and intention, as in the case of musical instruments (Smalley 1997: 112). We may see the 'instrumentalisation' of sound as an abstraction, whereby the sound is removed from an environmental context into a formal one. As Lachenmann's music is concerned with transplanting the *concrète* into the *instrumentale*, we may adopt a predominantly abstract perception of the music precisely because its instrumentality dominates. And so, I do not find a straightforward relationship with either the idea of mimesis or the acousmatic listening context, but these ideas of source and objecthood will become important as they extend to the instrumental works I will discuss later that draw a stronger connection to environmental sound.

3.3. Instrumental (re)synthesis

Perhaps the most significant body of work in instrumental music that directly draws from recorded sound as part of its aesthetic and compositional process is the broadly conceived 'genre' of *spectral music*. According to Gérard Grisey, one of its chief architects, this music derives its formal organisation from the observation of recorded media and 'the physics of sound, as discovered through science and microphonic access' (Grisey 2000: 1). A central pillar of spectral music is the technique Grisey calls 'instrumental synthesis', where a recorded sound is orchestrated based on an analysis of its frequency content over time (either by the visual aid of a spectrogram or, as is often the case in contemporary efforts, increasingly sophisticated and diverse software analysis tools). The technique is so-named in order to draw a parallel to the electro-acoustic additive synthesis of complex sounds; only in this case, the 'building materials' are not individual oscillators but acoustic instruments. The essential and

defining example remains the analysis of a low trombone E note leading to the opening materials of Grisey's *Partiels* (1975), wherein the individual instrumental voices are mapped onto the harmonic series and transient partials of the source sound.

Since Grisey's initial experiments, composers have extended the idea through diverse means, and extracted musical ideas from more complex sources. Joshua Fineberg's *Paradigms* (1994) derives its models not from a single note, but from an ensemble recording. Rather than Grisey's 'zoom-lens' magnification of a single source sound through an ensemble stretching it over space and time, Fineberg attempts a closer mapping of a temporally and spatially complex source onto one of a similar configuration. In his discussion of the work, Fineberg describes the spectral technique as 're-synthesis' (Fineberg 1994, emphasis mine). He later connects this term to its electroacoustic antecedent: the additive synthesis technique based on analysis of an existing sound and subsequent resynthesis in an effort to model the sound (Fineberg 2000), whereas ordinary synthesis would involve building a sound from scratch. The analysis/resynthesis technique is a closer analogue to the spectral technique; and so, in my mind, 'resynthesis' is a more precise term.⁴ The 're' in resynthesis also draws attention to the analysis process and to the source sound. This becomes especially relevant when the source sound is something extra-musical, but we may ask to what extent the source sound is relevant in the cases of Grisey and Fineberg (and indeed of much of the spectral music 'orthodoxy').

In fact, Fineberg introduces the term 'resynthesis' in his discussion of *Paradigms* antithetically to define his goals. He claims that 'analysis techniques generally aim to ... permit an exact re-synthesis of the original' (Fineberg 1994). He contrasts this with his own efforts to extract values from his analysis towards a novel musical structure. We may also question to what degree Grisey's work models its source sounds. Evidently, besides the example from the beginning of *Partiels*, the instrumental (re)synthesis technique is scarcely present in his work (Donin 2014). François-Xavier Féron has conducted considerable work challenging the extent to which spectrogram analysis was involved in Grisey's *Les espaces acoustiques* as a whole (Féron 2011).

I do not mean to question the significant artistic and theoretical accomplishments that Grisey and others have achieved through spectral music, but rather to re-examine the rhetoric behind it. Grisey's claims of spectral music's achievements include a 'more

⁴We might make an exception in works such as Tristan Murail's *Désintégrations* (1983), where some of the material is based on FM Synthesis (Murail 1989) – in this case, there is no recorded sound to 'reconstruct', so the metaphor is indeed closer to instrumental *synthesis*.

“ecological” approach to timbres, noises and intervals’, a ‘more “organic” approach to form’, and an enforcement of ‘biological rhythms’ (Grisey 2000: 2–3). The use of language here is exemplary of a perspective I have often observed anecdotally, where spectral music is perceived as somehow more naturalistic than other forms of instrumental music. If composers employing this technique typically abstract their resultant materials considerably from the source sound, and indeed when their sources are so often recordings of musical instruments (which may show up again in the ensemble, imitating themselves), we may wonder how this engenders a greater ‘naturalism’ than any other abstract, infra-musical technique. As in Lachenmann’s *musique concrète instrumentale*, the instrumental character of the music reasserts itself. To recall Branchi’s distinction, we may even say that such efforts exemplify composition ‘with sound’ rather than ‘through’ sound (Branchi 1983). I have no doubt that in these cases, a thorough engagement with a sound source bears a strong relationship with the resultant formal musical values, but I wonder if we hear the ‘ecological approach’.

Nicolas Donin has recently written extensively on the topic of instrumental resynthesis and asserts that ‘spectralist “instrumental synthesis” of natively instrumental sound stays within the world of musical sound and does not afford the imitation or representation of the pre-existing sonic object to be grasped by the listener’ (Donin 2014: 9). However, he does distinguish approaches that attempt to connect to referentiality by using other sounds as models, drawing on examples from Peter Ablinger and from my own work (Donin 2014). The present text is an attempt to identify an artistic approach emerging from this concern, and elaborate on its methods and conceptual implications.

4. MIMETIC INSTRUMENTAL RESYNTHESIS

Stemming from the technique of instrumental resynthesis, a growing body of works attempts to connect to the outside world through the use of field recordings and other referential materials. In short, these works adopt the means of spectral music combined with the ethos of soundscape music (and similar electroacoustic genres). Not only do these works use ‘extra-musical’ source materials as the starting point of their analyses, but they also attempt to preserve aspects of the source sound through the transcriptive process to engage in a mimetic discourse. The term *mimetic instrumental resynthesis*, then, refers to both a technical practice and an aesthetic motivation.

The application of the term *mimesis* to these works also connects to the more general idea of musicians *imitating* as part of a performance. While the

performance gestures of an instrumentalist imitating an environmental sound may be quite different from the physical production of the original sound, the performance is necessarily imitative: both in the sense that it attempts to copy the aural result and in that group performance involves its own kind of internal imitation.

The earliest potential example actually predates the idea of spectral music. François-Bernard Mâche’s *Le son d’une voix* (1964) involves the spectral analysis of his reading of a poem by Paul Éluard. This analysis was applied to an instrumental transcription of the sound realised by a large chamber ensemble: consonants recaptured by various percussion instruments, and vowels by held pitches corresponding to vocal formants. We may question to what degree the spoken voice extends beyond the borders of ‘musical sound’ (considering our difficult conception of mimesis), but it is clear that Mâche is interested in a kind of ‘musical naturalism’ (Mâche 1992). A contemporary review of the work describes the technique as ‘a kind of sound-photography’ (Rostand 1967, translation mine). The comparison to photography here recalls the idea of ‘phonography’ in sound art, so we have some assurance that the mimetic approach is possible in an instrumental context (Mâche himself later actually used the term ‘phonography’ to describe this approach (Mâche 1992: 193–4)).

Mâche has since elaborated considerably on these ideas in his music and writing. To a certain extent, he sees the development of mimetic music as a move towards the sound-based (rather than interval-based) music that is jointly championed by the aforementioned instrumental composers who are also influenced by electroacoustic techniques (our ‘instrumental studio’). In contrast to those who emphasise the instrumental studio as a means towards abstraction, he writes: ‘by abandoning the cult of notation in order to enjoy a reunion with sound, one must be careful not to substitute a new acoustic formalism for the old formalism of signs’ (Mâche 1992: 33). Subsequent works involve transcription of sounds more readily associated with nature. *Rituel d’oubli* for chamber ensemble and tape (1969) employs various environmental sounds and their instrumental transcriptions, including those of birds, bees, a windstorm, bubbling and recordings from a marine cave (Mâche 1992: 193). The sounds are ‘meticulously transcribed and included in the score’ in what has been called a ‘deliberate erasing of traditional boundaries between nature and culture’ (Ina/GRM-Hyptique 2000, translation mine).

Mâche has continually developed this idea in further works, but for the most part, at the time they were written, Mâche’s approach was somewhat idiosyncratic. The other works I will discuss are all much more recent. Whether directly inspired by him, or completely

unaware of his work, a number of contemporary composers are now working with similar ideas. To an extent, newer instances of mimetic instrumental resynthesis are distinguished by their tools. Just as the initial wave of composers engaging with the idea of an 'instrumental studio' had their aesthetics shaped by technology, as the technology has changed, we may expect to see a change in the music. To my knowledge, Mâche's technical procedure in his transcriptions is not extremely well documented. We know that as early as 1964 he consulted a spectrogram, so it may be a reasonable assumption that much of his work was done through careful listening and manual transcription, aided by spectrographic frequency information. Similarly, examples of composers who are normally situated in the context of electroacoustic soundscape music writing works including instruments may be seen as employing a more intuitive process (examples include Westerkamp's *Fantasia for Horns II* for french horn and tape (1979) and Truax's *Dominion* for ensemble and tape (1991)).

The recent explosion of software-assisted transcription and orchestration tools may have encouraged composers to adopt the technical and aesthetic concerns of mimetic instrumental resynthesis. As Donin writes, 'The increasing use of this kind of technique by composers in the two last decades reveals the gradual transition of musical material from analogic to digital reproducibility: the more powerful and user-friendly computer-assisted composition tools become, the more variable in length and nature samples become' (Donin 2014: 8). Arguably, the efficiency of the software-assisted approach affords a greater degree of detail, a greater 'accuracy' in the transcriptions, and engenders an aesthetic not possible in the pre-digital era. A concern remains that 'some sounds are more or less well-suited to analysis, transcription and instrumentation' (Donin 2014: 9). It may not be a surprise, then, that often candidates for transcription are the pitched sounds of human and other animal vocalisations, or various horns and signals used in urban settings. A significant number of other considerations emerge when transcribing field recordings that do not necessarily come about when the source sound is an isolated studio recording (O'Callaghan 2013).

Jonathan Harvey is a composer closely connected with spectral music, and in his later works he increasingly applied spectral techniques using environmental sounds, including *Bird Concerto with Pianosong* for piano/sampler/synthesiser, ensemble, orchestra and electronics (2001) and *Speakings* for large orchestra and electronics (2008). The latter work is closely associated with the development of the *Orchidée* software at IRCAM (Nuono et al. 2009). The *uncanny*⁵ quality

⁵I mean the term in the sense of the 'uncomfortable strangeness' of something familiar, yet alien (Jentsch 1997).

of the interpolation between vocal and instrumental timbres in *Speakings* may have something to do with the means of transcription. While traditional instrumental resynthesis techniques focus on pitch and duration (analysing spectra for frequency data and 'quantising' to pitch and rhythm values), corpus-based analysis tools such as *Orchidée* compare a target sound with a library of instrumental recordings, offering matches based on several types of spectral analysis. In this sense, timbre remains an element of focus, and the tool acts as a kind of 'automatic orchestration' (Carpentier et al. 2012). The method of transcription may be telling of a shift in attitude and musical aesthetic: an interest in environmental sound is not well attended by an exclusive focus on the interval-based concerns of pitch and duration. By comparing analyses of complex environmental sounds with noise-based instrumental techniques, one may have a greater pool of resources to put towards a sound-based music.

Another good example of the influence of contemporary software on mimetic instrumental resynthesis is the *Quadraturen* of works by Peter Ablinger (1997–2004). *Quadraturen III* manifests in several installations for computer-controlled player pianos, each based on speech analysis mapped onto the available pitches of the piano, whose keys are activated by a computer-controlled set of mechanical 'fingers', effectively operating like a player piano or Disklavier (Ablinger 2006). The resultant sound is surprisingly speechlike, considering the limitations of the piano's timbre. Beyond the production of the sound being characteristically digital (the mechanical keyboard achieves a density and precision exceeding player pianos, never mind human performability), Ablinger outlines the development of software (purpose-built in C by Thomas Musil) as predicating the realisation of the work (Ablinger 2006). Ablinger has applied the same software and concepts towards his *Drei Minuten für Orchester* (2003) where a field recording of an urban environment is coupled with an orchestral transcription (albeit a very 'low resolution' one).

In these works, Ablinger appeals to what he calls 'phonorealism' (Ablinger 2006) as an analogue to the contemporary genre of *photorealism* in painting (Meisel 1980). *Photorealism* may be seen as an imitation of (or reaction to) a modern tool using traditional means – a painting imitating the quality of photography, whose status as an 'accurate' documentation of the real world might be seen as having culturally replaced a dominant function of painting. Photorealism perhaps reappropriates that function, but the artworks reassert their 'paintedness' through an uncanny interaction between something perceptually 'real' and the knowledge of its artifice. Ablinger's phonorealism attracts much the same ideas to music (traditional instruments imitating the quality of sound recording). However, the cultural circumstances are different – arguably, instrumental

music historically never held the same cultural function of *portrayal* and *depiction* that painting did. So, the sense in which instrumental phonorealism is reinterpreted as a kind of documentation, in reference to the documentarian quality of sound recording, is novel and encourages a kind of listening engagement that is perhaps not as culturally entrained.

From Mâche to Ablinger we have a consistent comparison between recorded sound and photography. This comparison is not trivial, as practitioners of mimetic instrumental resynthesis seem to have in common their desire to frame the field recording as *documentation*. Alec Hall writes:

although the sensory mechanism employed to decode it is different, there is only a small, essential difference between the recording of a street-scene by photograph versus an audio recording. If we can treat both recordings as a captured image of reality, then we can begin to interpret noise through more complex lenses. (Hall 2013: 7)

Hall's compositional output reflects this concern. *Imitation Blue* for ensemble, electronics and video projection (2014) draws the comparison to photography directly as the recordings and transcriptions are juxtaposed with still photographs (by Stephan Sagmiller) depicting their subjects. The subjects are diverse, including many natural environments and 'found sounds' with particular cultural connotations, including a Coca-Cola can opening and the Windows 95 'startup sound' (Hall's output has a decidedly political character). The mapping is not always directly linear (between the images, recordings and instrumental sounds), so the interaction between image, reference and sound is constantly renegotiated. Nonetheless, the work operates through a context-rich web of association between nature, culture and music.

Aaron Einbond is another contemporary composer working with these ideas, and his use of the corpus-based concatenative synthesis tool *CataRT* towards transcribing environmental sounds has been well-documented (Einbond, Schwarz and Bresson 2009). This technique has been applied with field recordings of rain in *What the Blind See* for ensemble and electronics (2009); of frogs and speech in *Without Words* for soprano, ensemble and electronics (2012); and variously through his *Sonic Postcards* series of works, where instrumentalists perform transcriptions of field recordings from various locales (2012–14). For Einbond, the sense of *place* in these works is significant – a field recording is not just a generic reference, but one of a particular time and place (Einbond, personal communication, 27 August 2014). The interaction between the source sounds in these works and their instrumental realisation is one between identities. This is reflective of Einbond's process, where the instrumental recordings used as corpus for his analysis and

resynthesis are made by the performers premiering the work (Einbond, pers. comm.). This sometimes affects the performative aspects of the piece – for instance, *Sonic Postcards* has been performed in contexts outside of the concert hall, where the field recording is in a sense 'returned to the field'. Of *Without Words* he writes: 'Each of the sources activates a different time and place in the work's genesis ... the "performance" of the frogs captured by the field recording, the soprano's improvised performance during the sampling session, and the live performance in which the soprano reinterprets the transcribed score' (Einbond 2013: 70).

The sense in which different temporalities are accessed through the process of transcription-as-composition is an important concern in my own work. The triptych of pieces *Isomorphic* (acousmatic), *Isomorph* (orchestral) and *Isomorphia* (orchestra and electronics) (2013–14) illustrates this idea. Each work is closely linked to a collection of field recordings from natural and urban environments. The first half of *Isomorphic* was composed first, where the field recordings are rapidly juxtaposed according to semantic and morphological comparisons. The first section of the orchestral work, *Isomorph*, is more or less a direct transcription of that part of the acousmatic piece (not only the raw field recordings, but also their organisation and manipulations). The latter part of the orchestral work is novel material, still derived from field recordings, but in isolation from an electro-acoustic assembly. Finally, the last section of the acousmatic piece is composed 'in response to' the orchestral work, where the same field recordings are applied towards new manipulations. The mixed work, *Isomorphia*, juxtaposes the two: the electroacoustic material transforms into the acoustic transcription and vice versa.⁶

4.1. Transformation: endogenous and exogenous

The idea of *transformation* is central in all three works of the *Isomorph(icia)* triptych. Trevor Wishart proposed the term to refer to the gradual movement from one sound source to another (Wishart 1996: 155) and this has been a major feature of many of his works, including *Red Bird* (1976) and *Vox 5* (1986). Smalley has since classified this category of transformation as 'source bonded transformation' (Smalley 1993: 282). In *Isomorphic*, the source sounds are constantly shifting and interpolating between one another. *Isomorphia* mediates these transformations between environmental and instrumental sound identities. In certain instances, it intercuts the transformations from *Isomorphic*; water drops directly transform into clock

⁶*Isomorphia* in particular is extensively documented (O'Callaghan 2014).

ticks in the electroacoustic work, but the source and target environmental sounds are mediated with a transformation through a repeated cello pizzicato note in the mixed work.

In a certain sense, transformation is at the heart of mimetic instrumental resynthesis in general; it necessarily involves the movement from one sound identity to another (typically from an environmental sound to an instrumental one). A distinction may be made in whether or not this transformation is *heard* during the course of the work. Both Wishart's and Smalley's conception of the term refers to the unfolding of sound *within* the music as heard. However, the same process may happen 'outside of real-time' during the compositional process. So, there may be some use in expanding the term to categorise transformations as *endogenous* (within the work in real-time) or *exogenous* (as part of the compositional process).

The interaction between these two ideas is especially interesting in mixed works. Whether the source recording is present or absent in the final work dramatically influences our perception. In these cases, the environmental sounds typically appear both as transcriptions for instruments and in their 'raw' form. Undoubtedly, the presence of recorded environmental sounds dramatically increases the likelihood that a listener will draw a relationship between these sounds and their instrumental imitations. When they appear proximally, our percept may shift between environmental and instrumental source bonding. Because they have a strong relationship, we may even have ambiguous percepts where an instrumental sound is 'falsely' bonded to an environmental one (and potentially the converse). As such, the endogenous transformations in these works are a rich compositional resource.

It also possibly highlights the process behind the work; whereby the juxtaposition of the model and copy may act as a window to the transcription process. Our perception of the composition-as-transformation thereby creates a complex interaction between the percept of endogenous transformation and exogenous transformation. This could be seen as an instrumental analogue of *technological listening* (Smalley 1997: 109) where a listener's attention is drawn to the means of technical production rather than other aspects of the sound. I have previously compared the idea of transcription to electroacoustic processing (O'Callaghan 2012) – we may say that one 'hears the processing *as* processing' if we follow the metaphor.

4.2. Abstract and concrete tensions

Finally, we are drawn to the quality of the instrumental sounds in comparison to the environmental sounds: they are distinguished, and their instrumental identity and objecthood are reinforced. We are pulled into a tension not only between source bonding to the 'real'

sound source of the instruments and their mimetic antecedents, but also between listening to the source and the inherently abstracted quality of the transcription. The instruments, then, recontextualise the environmental sounds as abstract to a certain extent. We might compare this to Schaeffer's experience of the *sillon fermé*, or 'closed groove' of a vinyl record (Schaeffer 1966: 391); the idea of a loop reinforces listening to the sound in different ways (typically away from its source and towards its formal qualities – just as we repeat words our attention may shift towards their sound, rather than their meaning).

Conversely, the recordings imprint onto the instruments. As Einbond makes explicit in the discussion of his works, but as is implicit in all of these works, the 'grain' of the environmental sounds is as much a point of access for these works as the grain of the instrumental sounds. The context of these works encourages a focus on the particular histories from which their materials are drawn. In a sense, we have an inversion from Lachenmann's *musique concrète instrumentale* to what Einbond has called *musique instrumentale concrète* (Einbond, personal communication, 27 August 2014). The abstract history of instrumental music is recontextualised as concrete: specific to a time and space.

Composers employing mimetic instrumental resynthesis often welcome these tensions and multiple modes of access to their work. Despite Mâche's caution against adopting a 'new formalism' through such an approach, he is interested in the interaction between concrete and abstract ideas. Of *Rituel d'oubli* he writes: 'This is therefore neither a formalist use of "new" anonymous materials, nor a dramatic reportage across a soundscape, nor the mystical contact with a world from which all relationship of thought would be absent, but the search for a synthesis between the exploration of moments' (Mâche 1992: 194). Similarly, Ablinger has indicated that his 'main concern is not the literal reproduction itself but precisely this border-zone between abstract musical structure and the sudden shift into recognition – the relationship between musical qualities and "phonorealism": the observation of "reality" via "music"' (Ablinger 2006).

Still, it remains a question to what degree and in what manner the idea of referentiality is preserved, revoked or reshaped by the transcription process. Various contexts in and around the works reinforce or occlude this question. Part of my motivation in creating the *Isomorph(iclia)* triptych was to provide different contexts for this idea; counterfactuals for the presence and absence of the raw sounds. It would be interesting to develop a perceptual experiment to understand the ways listeners interpret the transcriptions given these different contexts – 'aural priming' though the raw field recordings in and out of musical context, 'visual priming' (as with the projected

photographs in Hall's *Imitation Blue*), or to see whether listeners connect with the instrumental imitations mimetically without any antecedent.

5. CONCLUSION: INSTRUMENTAL SOUND ART?

Discussion of these works necessarily challenges a clear conception of 'music' as an entity distinct from 'nature'. The notion of *mimesis* (as 'extra-musical' imitation) and the surrounding language employed by composers and theorists suggests an intuitive, received distinction between 'musical sound' and concepts *outside* of music. For simplicity, I have preserved some of these distinctions in this article, but to me a central point of their interest is the way in which these works deconstruct such barriers.

The sense in which they are mimetic is multifarious, as are the different points of access to them. While imitating environmental sounds, they also imitate electronic processes. The idea of 'instrumental resynthesis' is precisely an imitation of an electroacoustic tool. While the project of translating electroacoustic sound into a notated medium fundamentally alters our engagement with it, I believe these works present a window into an aural discourse beyond the score. Thus, I have largely applied vocabulary associated with electroacoustic scholarship, believing that the freedom of this prose-based tradition is best situated to discuss sound-based music. In this sense, these works can be understood through the lens of *sound art*.

Still, they remain *instrumental* in character; the physical performative context reinforces the *concrète* condition of the sound production. The potential inversion of Lachenmann's *musique concrète instrumentale* to Einbond's *musique instrumentale concrète* gives us a 360° cycle through Schaeffer's conception: from concrete sound, to abstract notation, to a return through a (different) concrete realisation. So, insofar as they extend the borders of musical listening, they also engage readily with musical history and the conditions of musical performance. If this cycle is discerned by the listener, they do not simply return where they began, but perhaps discover something new as they engage with the transformations between media. Mimetic instrumental resynthesis, then, provides a potential window into aural representation, while creating tensions between abstraction, depiction and physicality.

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