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Mediated Mimesis: Transcription as Processing

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Abstract

The electronic medium has opened the doors for a host of new possibilities in musical discourse: significantly, the ability to use recordings of the environment and 'found sounds' as materials may afford a referential, narrative or mimetic discourse familiar to other artistic disciplines, but rare in the history of music. While it is perhaps uncontroversial that unprocessed field recordings can be recognised as *referential*, those manipulated through processing or transcription may be able to retain their referential quality and afford new semantic and musical possibilities. This paper will focus specifically on the computer-assisted transcription of field recordings into material reproducible by acoustic instruments, interrogating this process as a potential means of conveying mimetic information.

The goals of this paper are to provide background on the use of mimetic material in instrumental and mixed music, an overview of some of the techniques that have been developed as a means of computer-assisted transcription of field recordings, a basic framework for assessing the verisimilitude of transcriptions and assignment into different perceptual categories according to degree of recognisability and semiotic distinctions, and finally, a discussion of the compositional applications of this material. I will be referencing several pieces of music in order to illustrate the proposed framework, as well as some of my own compositional work in order to describe compositional strategies and challenges related to the transcription of field recordings. Motivating this research are the questions: 'Can recognition of sound-source and other basic referential properties be preserved through the transcription process?' and 'What kinds of contexts and strategies make this more likely?'. While I am interested in the preservation of semantic information through the transcription process, what *changes* as a result and *why* are equally important avenues of inquiry.

Introduction

The electronic medium has opened the doors for a host of new possibilities in musical discourse: significantly, the ability to use recordings of the environment and 'found sounds' as materials may afford a referential, narrative or mimetic discourse familiar to other artistic disciplines, but rare in the history of music. The interpretation of such semantic content from recordings is a nebulous topic, and it is neither the object of this discussion to outline the

Proceedings of the Electroacoustic Music Studies Network Conference
Meaning and Meaningfulness in Electroacoustic Music, Stockholm, June 2012

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relevant psychological processes in listeners, nor is it intended to make a case for a particular semiotic model of such interpretation. Both of these are important areas of inquiry, and while important steps have been taken, further research would benefit the field greatly.

The topic of this discussion assumes that it is possible for listeners to identify at least basic semantic information (like sound source) from unprocessed field recordings,[1] given relevant background (i.e. identifying the source of a recording of birdsong as 'a bird' requires the listener to have a schema of what a 'bird' is and have a set of sounds associated with it). Attention is instead turned to the modification of those recordings in order to develop a framework for determining what properties can be modified (and in what ways) while still preserving recognisability. Employing various kinds of signal processing to create manipulations of such recordings is a clear example of such modification, and many composers are interested in employing these techniques toward a metaphorical or narrative discourse.[2]

The focus of my research, however, is on another kind of modification: the computerassisted transcription of field recordings into material reproducible by acoustic instruments. I will attempt to frame this form of transcription as a kind of processing, analogous to the techniques of digital signal processing, suggesting the term 'mediation' as a categorising term which includes both transcription and processing.

The goals of this paper are to provide background on the use of mimetic material in instrumental and mixed music (which I will suggest necessarily constitutes a kind of mediation, if the mimetic information is different from reference to the actual instruments producing the sound), an overview of some of the techniques that have been developed as a means of computer-assisted transcription of field recordings, a basic framework for assessing the verisimilitude of transcriptions and assignment into different perceptual categories according to degree of recognisability and semiotic distinctions, and finally, a discussion of the compositional applications of this material. I will be referencing several pieces of music in order to illustrate the proposed framework, as well as some of my own compositional work in order to describe compositional strategies and challenges related to the transcription of field recordings. Motivating this research are the questions: 'Can recognition of sound-source and other basic referential properties be preserved through the transcription process?' and 'What kinds of contexts and strategies make this more likely?'. While I am interested in the preservation of semantic information through the transcription process, what *changes* as a result and *why* are equally important avenues of inquiry.

Definitions and background

It is necessary to clarify some important terms (particularly those invoked by the article's title) before further discussion. The term 'mimesis' has gained considerable traction already

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[1] Recording environments other than field recording are obviously not excluded from transmitting the same kind of information, but for simplicity, I will be mostly referring to field recordings in my discussion, as an example of recorded materials that may be interpreted mimetically.

[2] For instance, the transformation and abstraction of recognisable materials is a central discursive element in Trevor Wishart's *Red Bird* (1977), with the goal of creating a kind of metaphorical narrative. (Wishart, 1996. 168-169) More broadly, Barry Truax has identified this as a principle feature of the genre of Soundscape Music (Truax 1996, 2002).

Proceedings of the Electroacoustic Music Studies Network Conference
Meaning and Meaningfulness in Electroacoustic Music, Stockholm, June 2012

www.ems-network.org

in the analytical literature of electroacoustic music, perhaps most clearly owing to its application by Simon Emmerson in his article, "The Relation of Language to Materials", from which I will borrow the definition. *Mimesis*, as Emmerson uses it, refers to "the imitation not only of nature but also aspects of human culture not usually associated with musical material." (Emmerson 1986) This synthesises nicely with the perhaps more familiar concept of 'extramusical' sounds, though we have the immediate problem of contradiction if we are discussing *musical* material defined by its non-musicality.[3] The more crucial element to highlight is the idea of *imitation* (as in 'to mimic') of something other than itself. So, describing the *material* as 'extra-musical' is perhaps a conceptual contradiction, but describing its *referent* as 'extramusical' may not be. In short, mimetic musical material potentially refers to extra-musical ideas through a process of imitation.

Thus, a focus on *transcription* of *mimetic* material concerns itself with, for instance, the reproduction of birdsong, but not quotation of other musical material. Similarly, the kind of analysis and 'instrumental re-synthesis' of instrumental sounds we find in much spectral music doesn't really fall under this classification, but it does where same techniques are applied to environmental and other 'extra-musical' sounds. For example, we might not want to say that the instruments in Gerard Grisey's *Partiels* 'imitate' the trombone sound-source from which some of their parameters are derived, because the idea of the instrumental source-cause is already salient in the instruments (including a trombone) reproducing it, so no new referential possibility is added as they 're-synthesise themselves'. Besides this, such a referent does little to address the ideas of extra-musical meaning to which I have appealed. This is instead, perhaps, an example of "music about music about music".

Still, the spectral technique acts as important historical precedent to the notion of environmental sound transcription, and efforts in this direction often employ the same tools of computer-assisted analysis. Another clear precedent of this idea without computer-assistance is in the works of Olivier Messiaen, who famously made scrupulous transcriptions of recordings of birdsong he had collected. However, in Messiaen's case (and others like it), the composer arguably was more interested in abstracting musical values from the material, rather than trying to *represent* the original. We don't have to appeal to this (potentially trivial and contentious) question of the composer's intention, however. It is clear from the material that the elements shared in the transcriptions and the recordings are the more traditional musical concerns of pitch and duration (transcriptions were often made to timbrally and morphologically distant instruments like piano and percussion, and even transposed down octaves), though it might be that these are actually the most salient acoustic features in the birdsong, and Messiaen is certainly also interested in other features like timbre.[4]

Finally, the idea of *representing* something extra-musical with instruments is obviously not as new as all that, as this was an important feature of Romantic *programme music* and its own historical precedents. It could be argued, however, that the representational quality in these cases is based more on shared cultural symbols and metaphor than in any effort to capture the ideas through acoustic similarity. Some relationship with this latter idea is present in some romantic music, but it is typically more closely confined within the syntax and pitch

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[3] This is a nice problem to have, in a way, as many composers who work with mimetic material would be happy to find it more commonly understood as 'musical'.

[4] Perhaps not necessarily in capturing the timbre of the birdsong, but instead in the timbral possibilities of the new instrumental context.

Proceedings of the Electroacoustic Music Studies Network Conference
Meaning and Meaningfulness in Electroacoustic Music, Stockholm, June 2012

www.ems-network.org

organisation of the infra-musical structures, and not created with any kind of rigorous transcription process. The result is typically such that the referent is not possible to preserve without additional cultural symbolic context, or indeed textual context from the title and programme notes (as is implied by the genre's name).

The hypotheses motivating my inquiry into contemporary transcriptions of field recordings is that high acoustic-similarity of transcription and certain musical contexts can allow the referent of the original sound to preserved and conveyed from purely aural information. It may be possible to conceive of a complete 360° cycle from Schaeffer's original notion of *musique concrète* (Schaeffer 1952): a *concrète* sound has musical values abstracted from it, collected toward the end of re-constructing the original *concrète* idea with different musical means. Always, however, something is added and changed through the process – like a mould cast from an object and then filled with different material to manufacture a new object with the same shape. The questions beyond the immediate 'does the copy resemble the original?' are 'what is added?' and 'why?'.

This idea of the transcription process adding something or re-framing the original sound, then, is an example of *mediation*. Just as in digital signal processing, the transcription process mediates between the two *concrète* objects, like 'seeing the sound through a coloured lens'. It may be thought of as a kind of 'encoding' of a signal, as in information theory (Shannon 1948), where the kind of encoding employed adds its own features to the resultantsemantic unit. We receive not only the idea, but the 'language' in which the idea is spoken: the interaction between these two elements may create new meaning in and of itself. Thus, in the case of instrumental transcription of field recordings, we have not just the referent of the source sound (if indeed this is present at all), but also the referent of the instruments themselves, their own acoustic character, and all the history and associations behind them. If a piano imitates birdsong, we simultaneously encounter the ideas, 'piano', 'birdsong', and the new, composite idea of 'pianobirdsong' created by the collision of the first two ideas. What may result, then, is a kind of aural equivalent to the idea of *multistability* in visual perception.[5] The perception of sound-source and referent cannot be 'stabilised' into one object or another, possibly changing rapidly between the two, as in the famous 'rabbit-duck' visual illusion.
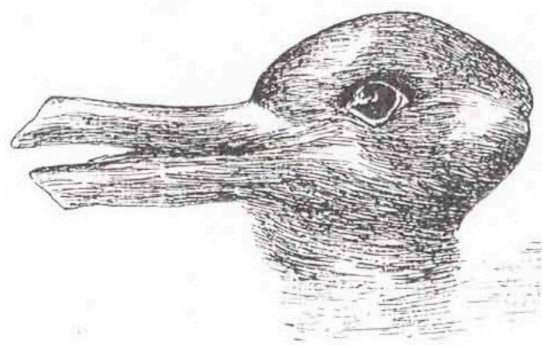

Fig. 1. Rabbit or duck? (Jastrow 1899)

Besides the ambiguity in perception of source-cause in these cases, such aural multistability

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[5] This is similar to Trevor Wishart's idea of *transformation*. (Wishart 1996) However, in the case of transformation, the change of percept from one source to another occurs gradually over time, rather than simultaneously. Purely electroacoustic examples of simultaneous source percept might result from processing such as convolution between two sounds or cross-synthesis.

Proceedings of the Electroacoustic Music Studies Network Conference
Meaning and Meaningfulness in Electroacoustic Music, Stockholm, June 2012
www.ems-network.org

may result in increased exchange between listening modes. The causal listening mode (Schaeffer's *écouter*) is encouraged in trying to determine the source of the sound when it is ambiguous[6], while the exchange between the two sounds highlights their infra-musical features, encouraging abstract listening (*entendre*) (Schaeffer 1966). We might, then, experience a kind of multistability of listening modes in addition to the multistability of source-cause percepts.

Composing with mimetic sounds: approaches and methodologies

It is certainly possible and indeed common to use environmental or mimetic sounds as compositional material, but without concern for preserving their referential or indicative capacity. However, if one is interested in attempting to use these sounds for their referential character, many new considerations are brought to the fore.

Previously, Barry Truax has contrasted these approaches as 'composing *with* sound' and 'composing *through* sound', respectively. (Truax 1992) Truax applies these terms in reference to attitudes toward the use of digital signal processing, suggesting that the dominant approach is to use processing to 'enhance' sounds or 'imposing' a kind of extrinsic musical agenda onto them. The contrasting approach of composing *through* sounds, however, intends to reveal or extend the inner levels of meaning within the sounds. Much of Truax's compositional output (and that of other composers whose works may be called soundscape compositions) adopts this approach. Another interesting example, perhaps outside of this tradition, is in Denis Smalley's *Empty Vessels* (1996), where many of the (environmental) sounds in the piece are recorded from inside some resonant garden pots. (Smalley 2000) This kind of 'natural' processing of the sound is extended in the piece by applying resonant filters to the sounds in later sections, highlighting and expanding their natural character.[7]

It may be possible to conceive of a parallel approach to transcription. Transcriptions based on spectral analysis employed solely as a means of generating musical material may be thought of as composing *with* the sound, whereas employing transcription as a means of 'translating' the sound, attempting to reproduce its essential characteristics, and ultimately say something new about the sound through the transcription process, may be thought of as composing *through* the sound. It is not a trivial matter, therefore, to consider what methods and concerns are relevant to preserving the character of the original material.

One initial consideration is in the choice of material for transcription. It should come as no surprise that some sounds are more easily imitated by orchestral instruments than others. Because their resonant, harmonic character is so indigenous to their physical makeup, often the best candidates for transcription are sounds, which share these properties. Sounds such as train whistles, car horns, and sirens are examples of *signals* (Schafer 1977), which are typically listened to in an environmental context for their 'information content', but they are also similar in character (and, unsurprisingly, construction) to musical instruments. Therefore, they make excellent sources for transcription, as they are easily mimicked by instruments, but

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[6] There is obviously no question in a live instrumental performance of a transcription that the instruments are what is causing the sound, but this might not be clear in a recording, or in a mixed piece where the original sound is integrated with the instrumental material.

[7] I have written previously on ways in which Smalley's work may be interpreted from a Soundscape perspective (for more detail, see : O'Callaghan 2011).

Proceedings of the Electroacoustic Music Studies Network Conference
Meaning and Meaningfulness in Electroacoustic Music, Stockholm, June 2012
www.ems-network.org

also harbour much of their own environmental reference. While perhaps not a strict example of 'transcription' as such, Truax's *Dominion* (1991), for chamber orchestra and tape, is a good representative of how these kinds of sounds are integrated with instrumental imitations or extensions of them in a mixed context.

We are still faced with the question of how likely it is that any of the original referent can be preserved through a strongly-colouring mediation process like transcription onto instruments. A future goal of this inquiry, then, is to create listener studies to help elucidate what contexts afford this. One reasonable assumption, however, is that the degree of acoustic similarity between the original sound and the transcription likely has a high degree of correlation with the ability to preserve the referent. Thus, the more 'accurate' the transcription, the more likely it will be recognised as referring to its source sound. In recent years, a wealth of new tools involving computer-assisted analysis of sounds has been made available and can be useful to this end. It is worth briefly mentioning some of them to highlight the approaches available.

The combination of the software *AudioSculpt* and *OpenMusic*, both developed by the IRCAM forum, are perhaps the most commonly used tools for spectral analysis and generation of musical material based on these analyses. *AudioSculpt* can be used to generate markers at which to sample information (based on transient detection or spectral differencing) and create a 'chord sequence' analysis, essentially quantising the spectral information into a specified number of pitch values. This information can then be imported into *OpenMusic*, where other forms of data manipulation can be applied and then the resultant values can be exported into notation. Another useful software is Michael Klingbeil's *SPEAR*, which performs partial-tracking analysis, allowing the user to have a visual indication of the precise strength and duration of each partial from the input sound, while there is no way to automate this information into notation, it can be a useful reference to compare with the output of an *AudioSculpt*/*OpenMusic* analysis, as one might be interested in preserving the various dynamics of different partials, and preserving the trajectory of particular partials – perhaps as assigned to different instruments. These approaches, and those provided by other similar programmes, however, are primarily useful only for extracting information about pitch and duration. Considerations about timbre and choices of orchestration are left to the ears of the composer. Some newer software, again from IRCAM, attempts to tackle this problem of orchestration: *Orchidée* and its in-development successor, *Ato-ms*. In these applications, a target sound is compared with a large sample bank of orchestral instruments playing with different pitches, dynamics and techniques. The software performs several types of FFT-based spectral analyses on the input sound, and attempts to create the best 'match' with the analyses it has of its sample database. The result is a series of 'solutions' (many parameters of which can be controlled with various filters) orchestrating the input sound, including immediate aural feedback (from the same orchestral sample database) and notation. The composer is then able to audition each possibility, and make adjustments. The limitations to this approach include dependency on the corpus of orchestral samples (it will only be able to suggest instruments and playing techniques it has in its database) and that orchestration results don't take into consideration performability or balance, among other things.[8] *Orchidée* is also not exactly time-dynamic – it more or less analyses an average of frequencies across the entire sample, while *Ato-ms* has shown some promising steps to tackling this complex

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[8] One major problem could be to do with the individual nature of the recordings – a mix of many close-miked instruments is not the same perceptual effect as those same instruments sounding together in a room!

Proceedings of the Electroacoustic Music Studies Network Conference
Meaning and Meaningfulness in Electroacoustic Music, Stockholm, June 2012
www.ems-network.org

problem. The diversity of these tools and the acoustic and musical parameters on which they focus are by no means mutually exclusive, and may benefit from interaction and cross-reference. In the end, it is always the composer's ears and decisions which govern the process and result – it is precisely a *perceptual* phenomenon we are dealing with, and so perception must command the final result.

Finally, it is important to reiterate that regardless of the 'accuracy' of the tools at ones' disposal, one is always adding or changing something through the transcription process. Even if it were possible to create an absolutely indistinguishable aural replica of the source sound, the collision of sources (transcribed sound-source and instrumental sound-source) creates a third, new meaning which is distinct from its parents. It is perhaps this aspect which is the most interesting result of the transcription process.

Categorising transcriptions

In an effort to understand mimetic transcriptions and their perceptual affects, it may be pertinent to categorise them according to a continuum of verisimilitude, and if my assumption is correct, corresponding referential capacity. I will outline three such categories and suggest semiotic interpretations, conditions under which their referentiality might be preserved, and some examples from several pieces, which might meet these categories.

A first consideration, which delineates categories is whether the transcription resembles the source sound. The discussion in the previous section suggests that acoustic similarity between transcription and source is correlated with recognition, so the first category is one which maximally achieves both of these properties. Therefore, we may consider category 1 transcriptions as necessarily recognisable as representational of the source sound, and achieving a high level of verisimilitude. In this case, this matter of verisimilitude – how like the transcription is to the source – is the means by which the source may be recognised. It therefore may be classified as an instance of an iconic sign, following C. S. Peirce's semiotic categories (Peirce 1982). These transcriptions may be subject to the *multistability* effect mentioned earlier, where source-cause information is blurred.

Many of the best examples of this category feature both computer-assisted analysis and electronics-assisted *reproduction*. Jonathan Harvey's *Speakings* (2008), for orchestra and electronics, presents many such scenarios. It was the hallmark piece demonstrating the *Orchidée* software and features some sophisticated and uncanny blurring between vocal recordings and instrumental imitations. The inclusion of the original recordings, many times at very subtle levels, provides an aural context through which the instrumental material can be better heard as vocal sounds. The opening section features a similarly-orchestrated baby's cry, which repeats several times, but with different amounts of the original recording juxtaposed – unsurprisingly, the moment where the recording is most present has the most potent effect of multistability: it is difficult to discern at certain points whether the sound is caused by the instruments or the source recording. Other points in the piece where the recordings are not so exposed benefit from the context of these moments, increasing the facility with which they may be interpreted as speech sounds. However, it is perhaps only these moments where the electronics are present that an individual transcription meets this extremely highverisimilitude category. So, the electronics-assisted reproduction of the original sound affords this blurring.

Another very different example may be found in Peter Ablinger's *Quadraturen III* series of

Proceedings of the Electroacoustic Music Studies Network Conference
Meaning and Meaningfulness in Electroacoustic Music, Stockholm, June 2012
www.ems-network.org

installations for computer-controlled player pianos. All of these pieces are based on speech analysis, mapping this analysis onto the available pitches of the piano, and activating them with a computer-controlled set of mechanical 'fingers', effectively operating like a player piano or disklavier, but with an adaptable mechanism which can be fitted onto any keyboard (and is quite visually striking). The result is surprisingly realistic, considering the limited pitch and duration values available from the piano, and its characteristic attack-decay morphology. While Ablinger is interested in the realistic recapturing of the vocal sounds, what he calls *phonorealism* (a parallel to painting's 'photorealism'), he is as interested in the 'accidents' that emerge from the noise of the recording, and the different musical results available by changing the quantisation. (Ablinger 2006) The changing levels of quantisation in some of these pieces means that different sections will fall into different categories, but at their most 'accurate' they are very good candidates for this first category of transcription, betraying an uncanny resemblance to the human voice and this multi-stability effect. It must be noted that at these extremes, the material is impossible for a human to perform, and so it necessarily meets the requirement of electronic-assisted production.

Other kinds of nominally *iconic* transcriptions of source sounds, however, may not be similar enough to the source to afford recognition on their own. And so, the second category of transcriptions I will propose is characterised by some acoustic similarity to the source sound, but is distant enough that it requires other extra-musical contexts to identify. This may be achieved from the programme note or title, or perhaps other forms of visual or aural priming. As discussed above, in Harvey's *Speakings*, there are many such transcriptions, which are acoustically similar to their source but may not be identifiable without other context. Given the presence of higher-verisimilitude category 1 transcriptions in the piece, the aural context of these instances (particularly as aided through electronics) may be enough to orient the listener toward interpreting these other transcriptions as referential to their source sounds (especially if those sounds derive from the same source, as they do in *Speakings*, where the human voice is always the source sound). Failing this, the title and programme note may accomplish the same goal. Instances of category 2 transcriptions should be fairly easily recognisable given appropriate context, but are also clearly 'not' the source sound: there is no possibility for the kind of ambiguous multistability common to examples from category 1.

Finally, and perhaps the most common, are sounds which are derived from transcription process but bear very little in the way of acoustic similarity to their source sound. Any iconicity they may have[9] is not a factor in the recognition of the sound, and if listeners are able to interpret the sound as representational of its source at all, it is only through *symbolic* association created by extra-musical contexts. There are points in both *Speakings* and some of Ablinger's *Quadraturen III* installations that we know from documentation are derived from speech material, but deviate so strongly from the source sound that without this context, it would be impossible to make the association. For instance, Ablinger's *Quadraturen IIIg: Audioanalyse / Die Auflösung / Freud in England / Le grain de la voix* moves from a low-threshold, low-quanitisation output where the signal-to-noise ratio is so low that the perception of speech is minimally possible, to a very clear transcription, and finally into successively extreme quantisations, such that by the end, all speech-affect is lost and the choices of quantisation become the perceptual focus (limited pitch sets, rhythmic 'sampling

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[9] Technically, if any sound can be said to represent any other sound, they necessarily has some acoustic features in common, even if they are the most banal, such as 'there is sound rather than silence'. However, these kinds of trivial similarities are not sufficient for the sound to be called 'iconic' in any meaningful way.

Proceedings of the Electroacoustic Music Studies Network Conference
Meaning and Meaningfulness in Electroacoustic Music, Stockholm, June 2012

www.ems-network.org

rate', etc.). Another piece from Ablinger's larger *Quadraturen* series, *Drei Minuten für Orchester* (2003), derives orchestral material from a field recording, but is so abstracted that it is difficult to form the connection from the transcribed material alone. The piece even features an electronic part featuring the original recording, but listeners are likely not to make the connection between it and the orchestral material without further information, despite the transcription relationship. Harvey's *Speakings*, too becomes increasingly abstract as it progresses, and it is perhaps only through a kind of 'guilt by association' process that the later material can become interpreted as speech-derived. This is, however, an interesting process: as the opening material establishes the link so clearly, every subsequent sound becomes subject of scrutiny, being viewed through the 'lens' of speech, where it most probably would not be if divorced from the larger context of the piece.

This third category of transcriptions, then, relies on the others, or else additional outside information, to be interpreted as mimetic. It *symbolises* the source sound only if the association has been made through other means. This is typically the means by which more traditional programme music achieves its representational qualities: as the genre's name suggests, the programme makes the association, not the sound itself. If the sound is indeed a transcription, it is not a transcription made with consideration toward acoustic similarity. In these cases, significant liberties are taken with the transcription process, possibly even through a selective mapping of features to unrelated musical parameters. This can be an interesting result, adding depth and meaning to the transcription, especially when context is provided from the original sound or more accurate transcriptions – if an association is made between the two, the extrapolation of musical features beyond the scope of the original sound can be a compelling way of revealing hidden aspects of the sound and extending its inner complexity.

Compositional choices: a case study

In order to elucidate some of the different kind of compositional applications and choices that can be made in the transcription of environmental sounds, I will present some examples from my own compositional output, highlighting the different methodological considerations, limitations, and challenges encountered.

The first piece I composed using field recordings as source material for instrumental transcription was Fashion at 30th, *New York City, 1 June 2010 11:41 AM* (2011) for eight acoustic instruments.[10] The source material used was a 20-second excerpt of an urban field recording I made at the place and time indicated in the piece's title. The analysis was made with *SPEAR*, manually transcribing pitch and duration information based on the partialtracking display, and decisions about orchestration and which partials to map were made by ear without the benefit of computer-assisted analysis. For practical and aesthetic reasons, the transcription was 'quantised' to a chromatic scale and information was 'sampled' 4 times a second, though many liberties were taken to facilitate performability, to highlight salient features, and for aesthetic reasons. The piece is introduced with a more-or-less 'literal' transcription in real-time, but then repeats the process by reading the source material at increasingly slower rates, introducing more transcription 'errors' and musical extrapolations extending the transcribed material, sending the piece farther and farther away from the

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[10] Flute, Oboe, Clarinet, Bassoon, Horn, Trumpet, Trombone, and Percussion.

Proceedings of the Electroacoustic Music Studies Network Conference
Meaning and Meaningfulness in Electroacoustic Music, Stockholm, June 2012

www.ems-network.org

original material. Despite some very strong limitations (both from the practical considerations of the ensemble and self-imposed artistic decisions), the result bears some very strong surface features to the original recording, as can be seen in the spectrograph comparison below.
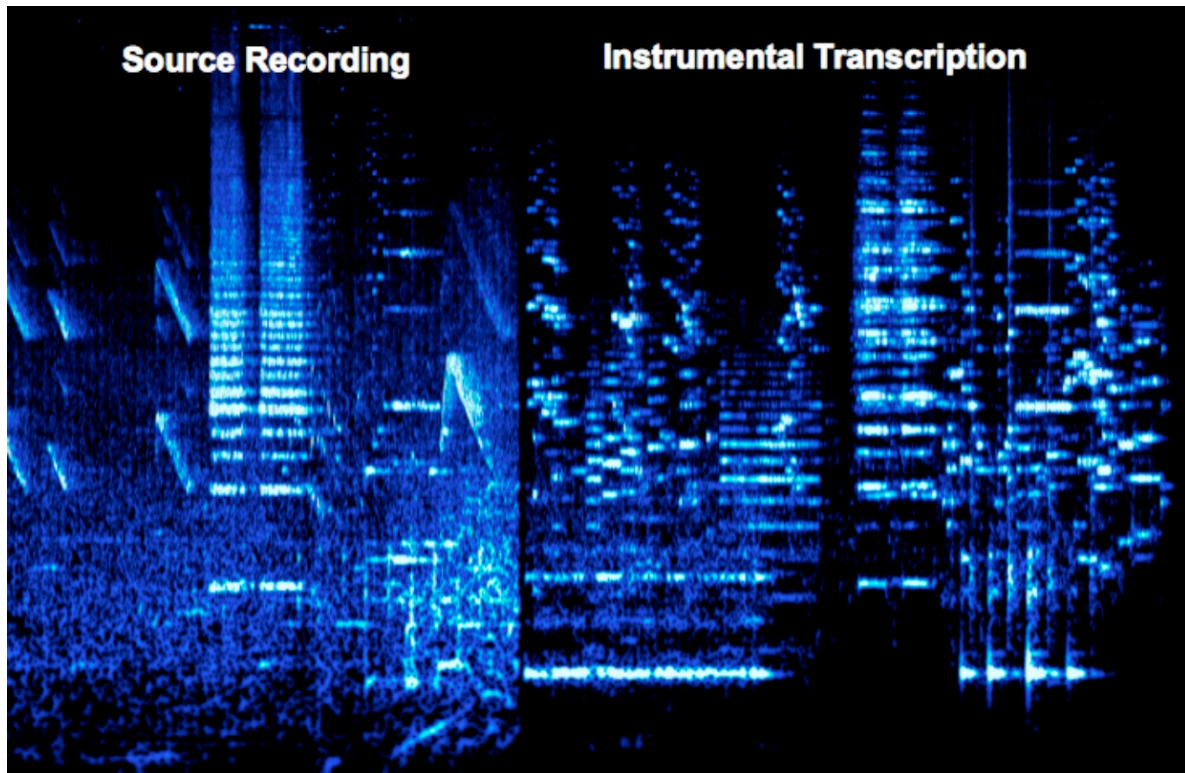

Fig. 2. Spectrograph comparison between source and transcription in *Fashion at 30th, New York City, 1 June 2010, 11:41 AM*

So, with even very limited computer-assisted analysis (particularly in this case, without any automation of the transcription itself) and fairly significant limitations, a transcription can bear some significant iconicity with its source sound. It is probable that lower quantisation (including more precise pitch and rhythm values) would produce even more convincing results.

A more recent work, *Iron Horses* (*Étude aux chevaux de fer*)[11] (2012) for string orchestra, approached the idea of transcribing field recordings from a different methodology. The source material was a series of brief recordings of various train sounds, and was subject to analysis by comparing their spectral content with that of a sample bank of string instruments, using *Orchidée*. Pitch information was quantised to quarter-tone values, and no duration information was extracted, as *Orchidée's* analysis is not time-dynamic. In some instances, durations were transcribed by ear, and in others, the duration was completely ignored as a means of extending the sound and extrapolating further musical material. An important difference between this methodology and the one employed in the previous piece was that decisions concerning timbre (as represented by instrumentation and playing techniques) were part of the computer-assisted transcription process. As *Orchidée* creates several different orchestration 'solutions', a starting point for the composition of the piece was to select several

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[11] The parenthetical subtitle is a tongue-in-cheek homage to Schaeffer's landmark musique concrète piece, *Étude aux chemins de fer*.

Proceedings of the Electroacoustic Music Studies Network Conference
Meaning and Meaningfulness in Electroacoustic Music, Stockholm, June 2012

www.ems-network.org

different solutions, edit them, and move iteratively between them, as if viewing the same sound from different angles. Some environmental sound features were applied to the transcription 'post hoc', and in some cases those features were not even present in the original recording. For instance, some transcriptions attempted to capture the 'doppler effect' of a train horn moving quickly through space, by featuring downward glissandi. In subsequent iterations, this feature was extended beyond its 'naturalistic' capacity and ventured further into musical abstraction, so the blurring between environmental spatial manipulations and abstract extrapolations was an important aesthetic consideration in the work. While transcriptions of environmental sounds typically limit the partials captured due to the relative complexity of the source sounds, in this case in certain instances, the resultant transcription was considerably denser, as different analyses were overlaid and doubled.
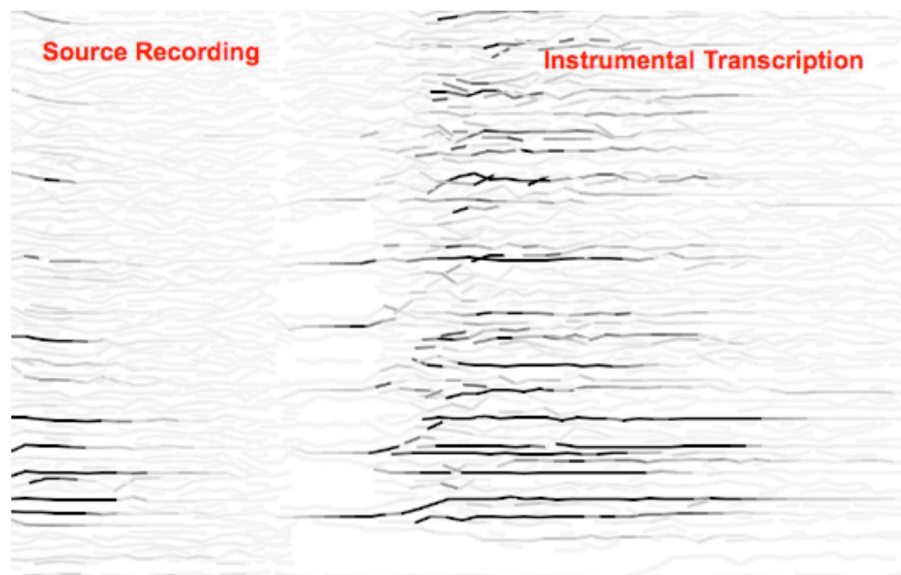

Fig. 3. Partial-tracking analysis comparison between source and transcription in *Iron Horses*

Decisions about when to attempt to map the original sound's features more closely, and when to limit parameters or extend values are important ones in the compositional context. Moving between this continuum of approaches may be a useful means of generating musical form, as in both of these pieces, where the initial transcription is made with greater fidelity, and then is repeated with increasing abstraction, and then extended and compared with other 'imposed' musical extrapolations.

A strong limitation in both of these works is that the final artistic product resides purely in the domain of acoustic music, while, as discussed previously, integrating the source sound with electronics can dramatically improve recognition of the source sound. My current work involves precisely this integration, but many more compositional choices concerning this integration come to the fore. *How* and *when* the original field recording is presented becomes of chief concern. Is it revealed immediately, or only after the transcription, so that the referent is applied *post hoc* in the memory of the listener. The can indeed be overlaid so that they occur simultaneously, affording a multistability of percepts as seen in Harvey's *Speakings*. Thus, sequence and context are very important. In almost all of the examples I have presented, including my own work, the sequence of materials tends to be organised from higher verisimilitude transcriptions to increasingly abstracted variants. This is a very natural approach, as it is likely that the initial exposure is what affords latter, more abstract or

Proceedings of the Electroacoustic Music Studies Network Conference
Meaning and Meaningfulness in Electroacoustic Music, Stockholm, June 2012

www.ems-network.org

symbolic approaches to be interpreted as related to the source. However, the opposite approach could be very rich in its discourse: presenting highly abstracted material, which is only later 'revealed' to be related to a source sound. This idea is occasionally applied to processing in acousmatic music as a way of conveying form, as in Denis Smalley's *Pentes*, where much of the material is derived from recordings of Northumbrian pipes, but it is presented in such an abstracted form that it is not possible to consider the source, until the pipes are 'exposed' in the climactic section of the piece. Listeners may then *retroactively* assess the previous material in relation to this exposition.[12]

Another very intriguing approach, which seems to have been explored less but forms the current focus of my work is the idea of *transforming* between sounds. This can be something as simple as a kind of 'crossfade' between the two media, or something more sophisticated. This approach provides an equivalent in mixed music, to Trevor Wishart's notion of transformation, where a sound gradually shifts from a percept of one source-cause to another (Wishart 1996). In this case, it is not between two environmental sounds, but between an environmental sound and an instrumental sound.

Challenges and conclusions

All of these considerations have been made with the preliminary assumption that a significant number of listeners will be able to discern a transcription's mimetic qualities under certain conditions. The idea that any music can 'communicate' such things, perhaps even aspects as basic as the source-cause of the sound, is not uncontroversial. While my own experience suggests that listeners *can* succeed in identifying these and other features, even in heavily mediated circumstances such as transcriptions, such percepts are scarcely ever unanimous and can vary widely across listeners. Previous research has suggested that even fairly unambiguous manipulations of field recordings can lead to completely unintended, and often bizarre, interpretations by listeners.[13] It is probable that more conspicuous mediation processes, like transcription, only exacerbate this problem – though it may be said that the complexities and ambiguities they afford is precisely what makes them interesting.

Part of this problem may be cultural. Most listeners are simply not accustomed to interpreting music for its mimetic qualities, as it has been historically a predominantly abstract medium. This can be contrasted with visual art, which has a long history of representation, and may even encounter the opposite problem among some viewers when it ventures toward abstraction. Even 'experienced listeners' are often essentially trained not to focus on semantic or referential qualities of the sound: within instrumental music, programmatic work is often derided as inferior or banal, and within electroacoustic music, we are faced with the strong tradition of interpreting Schaeffer's call for 'primacy to the ear' and *reduced listening* as a desirable kind of wilful ignorance of information provided from the other three listening modes he describes (Schaeffer 1966). While it is certainly beyond the scope of this paper to enter the dangerous waters of Schaefferian hermeneutics, suffice it to say that, intended or

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[12] Though some anecdotal experience with students and other listeners suggests that many are amazed to discover that many of the sounds in the piece are derived from the pipes recording after they have been told the piece's 'secret'.

[13] For an excellent example of this, see Andra McCartney's informal study of Hildegard Westerkamp's *Cricket Voice*. (McCartney 2002)

Proceedings of the Electroacoustic Music Studies Network Conference
Meaning and Meaningfulness in Electroacoustic Music, Stockholm, June 2012

www.ems-network.org

not, the significant stature of these ideas in electroacoustic music has strengthened the value of the abstract in music.[14] While these cultural biases surely play a role, there may be deeper, perhaps biological, reasons that music may never achieve the kind of representational richness (or at least, consistency!) found in other media.

In order to really tackle this question of *what* listeners interpret from mimetic transcriptions, and what kinds of contexts affect this interpretation, a future goal of my research in this area is to engage in formal listener studies. Some preliminary informal work has been accomplished to this end and shows promising results, but more rigorous study is required to really tackle the issue. For my own compositional work, I am beginning to devise strategies for the integration of mimetic instrumental transcriptions with their electroacoustic source sounds, particularly concerning the possibility of transformation. Beyond this, it seems pertinent as well to attempt to create even more 'accurate' transcriptions using a variety of software-assisted approaches.

This first inquiry into a very dense issue has meant to serve as an introduction to the idea of transcribing mimetic material, to propose a related conceptual framework, and finally outline some compositional possibilities and considerations. There are significant challenges to face, but promising work has already been accomplished toward providing music with the means to access the kind of meaning possible in representational art.

References

Ablinger, P. 2006. Quadraturen documentation [http://ablinger.mur.at/docu11.html]. Retrieved 22 September 2012.

Carpentier, G., et al. 2010. "Predicting Timbre Features of Instrument Sound Combinations: Application to Automatic Orchestration". *Journal of New Music Research*. 39(1): 47-61.

Carpentier, G., et al. 2012. "Automatic Orchestration in Practice". *Computer Music Journal*. 36(3): 24-42.

Emmerson, S. 1986. "The Relation of Language to Materials". In S. Emmerson (ed.), *The Language of Electroacoustic Music*. New York: Harwood Academic Publishers.

Jastrow, J. 1899. "The mind's eye". *Popular Science Monthly, 54*, 299-312.

Klingbeil, Michael. 2005. "Software for Spectral Analysis, Editing, and Synthesis". *Proceedings of the International Computer Music Conference*. Barcelona.

McCartney, A. 2002. "Alien intimacies: hearing science fiction narratives in Hildegard Westerkamp's *Cricket Voice* (or 'I don't like the country, the crickets make me nervous')". *Organised Sound*, 7: 45-49

Messiaen, O. 1994-2002. *Traité de rythme, de couleur, et d'ornithologie : (1949-1992)*. Completed by Yvonne Loroid. Paris: Leduc.

Nattiez, J. 1990. *Music and Discourse: toward a semiology of music*. Princeton, NJ: Princeton University Press.

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[14] This said, it is certain that awareness and advocacy for the mimetic in music is much stronger and present in the electroacoustic community than anywhere else.

Proceedings of the Electroacoustic Music Studies Network Conference
Meaning and Meaningfulness in Electroacoustic Music, Stockholm, June 2012

www.ems-network.org

Nouno, G., et al. 2009. "Making an Orchestra Speak" [http://articles.ircam.fr/textes/Nouno09a/index.pdf]. Retrieved 22 September 2012.

O'Callaghan, J. 2011. "Soundscape Elements in the Music of Denis Smalley: Negotiating the Abstract and the Mimetic". *Organised Sound*. 16(1): 54-62.

Peirce, C.S. 1982- *The Writings of Charles S. Peirce: A Chronological Edition*. Volumes 1–6. And 8. Eds. Peirce Edition Project. Bloomington I.N: Indiana University Press.

Schaeffer, P. 1952. *A la recherche d'une musique concrète*. Paris: Éditions de Seuil

Schaeffer, P. 1966. *Traité des Objets Musicaux*. Paris: Éditions du Seuil.

Schafer, R. M. 1977. *The Tuning of the World*. Philadelphia, PA: University of Philadelphia Press.

Shannon, C. E. 1948. "A mathematical theory of communication". *Bell System Technical Journal*. 27. 379-423 and 623-656.

Smalley, D. 2000. *Sources/Scènes*. CD Liner Notes. Empreintes Digitales: IMED 0054.

Truax, B. 1992. "Composing with time-shifted environmental sound". *Leonardo Music Journal*. 2(1):37-40.

Truax, B. 1994. "The Inner and Outer Complexity of Music". *Perspectives of New Music*. 32(1): 176-91.

Wishart, T. 1996. *On Sonic Art*. Amsterdam: Harwood Academic Publishers.