The network as niche

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Abstract

As telematic music emerges as a medium distinct from that of live performance, broadcast or recorded music, we are in a privileged position to experience it in its naïve form. This article investigates where these distinctions reside and starts by considering the ways in which telematic music systems mediate the music made with them. It then turns to Anthony Chemero's rendering of William Gibson's theory of affordances, imagining Online Orchestra as an 'environment', or musical habitat. Rather than focusing on spurious notions of the fixed properties of the media that comprise this environment, attention is given to the relations between the various mediating forms within the system, whether they be performers, audiences or technical media.

Keywords

Online Orchestra; telematic performance; mediation; affordance; network; niche

Introduction

During a rehearsal for the pilot performance of Online Orchestra at Five Islands' School on the Isles of Scilly, one of the flautists played a note high in her register in a section of a piece where her part was relatively exposed. In the second or so that followed, a clear echo returned with the unmistakable acoustic imprint of a cathedral. From the small school hall on St. Mary's island, the sound of her flute had travelled to Truro Cathedral on the mainland and filled the cavernous space there before returning transformed, indelibly marked by its encounter with a space only just imaginable from across the sea. Minimizing echo had been one of the primary objectives in optimizing the system for performance (see Prior et al. 2017b, in this special issue), and yet this experience stood out as an epiphany. In this moment, our understanding of *how* Online Orchestra worked gave way to a very tangible experience of what is at stake when remote performers and the spaces they are connected to are connected in near real time. The assemblage of devices used to create Online Orchestra – microphones, cameras, computers, loudspeakers and screens – was all familiar, but in this moment, we moved from an experience of the various media that comprise Online Orchestra to an experience of Online Orchestra as a medium in and of itself, with its own set of behaviours that could not be predicted or explained simply by making reference to experience and understanding of the component devices that it combines.[i]

However, the experience of the flute in the rehearsal provides a point of departure for this article not because it represented the apogee of what the project team was trying to achieve, but because first of all it demonstrated that new formulations of familiar

technologies can exhibit new and unexpected experiences, and secondly that in revealing a characteristic of the system that we might seek to suppress (echo), it might also have revealed something of the system's essential constitution. There are examples of music and sound art that make these moments of revelation a core objective. Alvin Lucier's work comes to mind, and in particular *Music on a Long Thin Wire*, or *I am Sitting in a Room*, where that which is usually hidden from our perception becomes manifest and this becomes the primary focus for the work. Within the relatively short history telematic music itself, there are numerous examples of works that seek to highlight or manipulate the acoustic characteristics of the locations involved (Oliveros et al. 2007), focus on open-ended, distributed dialogue over conventional notions of performance (Neuhaus 2017) or sonification of the network itself (Tanaka and Bongers 2001; Chafe 2009). While Online Orchestra's focus is different, alongside the objective of creating a sense of connection and immersion between musicians and audiences distributed across a network is the acknowledgement that the technological infrastructure put in place creates a new context for composers, performers and audiences alike, and learning to work idiomatically with this context has been of key concern to the project. Indeed, while future phases of the project will refine and improve the technology, the new matrix of relationships between performers, composers and audiences – and between time and space – that telematic performance brings about represents a new ontology for performance that warrants our attention. This article considers what it means to think idiomatically about telematic performance systems like Online Orchestra. It begins by introducing telematic music as an emerging medium, considering the different ways in which it *mediates* the music made with it. Attention then turns to William Gibson's

theory of affordances as a lens through which to think about telematic music in general, and Online Orchestra in particular, where the network is understood as a new environment or musical habitat. Following a rendering of Gibson's ideas by Anthony Chemero, attention is drawn away from the notion of this environment 'offering' characteristics to its users, towards a focus on the relations between the various mediating forms within the system, whether they be performers, audiences or technical media. The article concludes by proposing that as with the physical world, the network provides for a number of 'niches' that can be inhabited in different ways by its users and that while working with it idiomatically does not constitute a single mode of operation, understanding the ways in which it mediates the music made with it is crucial.

On music, media and mediation

In thinking about what it means to compose for, perform with and listen to, Online Orchestra idiomatically, we might start our enquiry by considering the ways in which the system mediates the music made with it. Georgina Born reminds us that music is inherently 'mediational'. She writes that 'music is always (but variably) experienced through a constellation of aural, notational, visual, performative, corporeal, social, discursive and technological forms – forms that mediate the music (or sound)' (Born 1991: 158, quoted in Born 2015: 9). With the history of ensemble playing at the heart of Online Orchestra (see Rofe et al. 2017) and established live sound engineering techniques and technologies providing the input and the output to the system (Prior et al. 2017a, 2017b), the cultural and technological forms that mediate within it are almost without

exception not new in themselves. Even without experience of other telematic performances then, most players and audience members will be familiar with the behaviour of the mediating forms that comprise the system and the cultural practices they suggest. However, while these forms might be familiar individually, their arrangement in this new context changes the nature of how they mediate both one another and the music performed.

At this point, it might be helpful to think about the relationship between the words 'mediation' and the word 'medium', with its plural, 'media'. Of the 'constellation of forms' (Born 1991) implicated by Online Orchestra, instruments, performance conventions and social relationships can be identified that clearly mediate the music being made, but that would not conventionally be described as 'media' in themselves. Technologies such as microphones and cameras can be identified as media but common usage of the word 'medium' tends not to be applied to a single device but researved for higher level formations, such as the 'medium of recorded music'. Perhaps the most common use of the word 'media' is as a collective pronoun to describe the press, radio or television, etc., where individual technological and cultural forms are subsumed within the higher level structure of the organization described. In his book *No Media*, Craig Dworkin argues that media can never be apprehended in isolation. He writes,

> Media – if there are such things – are only recognizable as collectives. […] To know if a
> compact disc has been used 'for recording or reproducing' music, for example, it needs to
> be played; to actually hear the music, moreover, requires not just a player but speakers.
> The 'medium' of the music, in the sense of its material format, cannot just be the disc
> alone, but must comprise the networked apparatus of inscriptive relays that also includes
> a laser and processor, as well as a range of other materials likely including wires and
> cones, drivers and foam and casings (not to mention an electrical source).

It is even easier to observe the collective nature of the media involved in Online Orchestra than it is in the case of the compact disc, and perhaps behind Dworkin's ambivalence towards the word 'media', there is an ambiguity in the way in which it has come to be used. Marshall McLuhan's definition of a medium as 'any extension of ourselves' (McLuhan 1964: 7) offers a useful expansion of the word's scope and represents a crucial shift in the discourse around media when he first introduced it in the first half of the 1960s. Within his definition, a medium might include anything that might 'amplify or accelerate existing processes' (McLuhan 1994: 8). McLuhan offers the electric light as a quintessential example of this, as this device carries no content – 'a medium without a message' as he puts it – yet mediates experience nonetheless by changing 'the scale or pace or pattern that it introduces into human affairs' (McLuhan 1994: 8). Understood this way, a microphone, a camera or musical notation could certainly be awarded the status of media. However, in McLuhan's near-synonymous use of the words media, medium and technology, he does not provide an adequate nomenclature through which to express all of the different ways in which Online Orchestra's 'mediating forms' interact. Indeed, if McLuhan's definition of media usefully drew attention to the mediating characteristics of communication technologies,[2] his privileging of a notion of 'extension' – in the prosthetic sense of adding or extending some ability or capacity[3] – fails to account adequately for all of the 'constellation of forms' that can be observed as mediating the content of a message, and this is particularly true of the cultural and social forms that might not be an 'extension' of anything.[4]

Considering other uses of the term 'mediation' might be instructive here. In his seminal essay 'Genesis of the media concept' (Guillory 2010), John Guillory directs attention to the Oxford English Dictionary definition of mediation, which states that in law or in a situation of conflict, it is to adopt 'the state or fact of serving as an intermediate agent […]' (OED 2010, quoted in Guillory 2010: 342). It can be assumed here that the intermediary will have some agency upon the outcome of a given situation but, crucially, rather than being understood as an 'extension' of one of these parties in the pursuit of mediating the other, the intermediary is located between the two, acting on behalf of both.[5] This brings us much closer to an understanding of how a complex system such as Online Orchestra is operating, where a constellation of both technological and cultural forms act as intermediaries between each other as well as between the music performed and its audience. In this way, with Bruno Latour, both human and non-human actors can be identified, transforming one another within a network of agencies (Latour 2005).

The brief discussion above illustrates the ambiguity at the heart of a contemporary use of the concepts of media and mediation. Guillory's essay makes an invaluable contribution to the debate by tracing the philological and philosophical history of the concept of media back to its roots in an English version of Aristotle's *Poetics* from the mid-fifteenth century. Guillory observes that, although a contemporary understanding of the term only extends back to the late-nineteenth century, for centuries before this, there was a growing need for a term that could express the processes by which ideas could be communicated. The emergence of the media concept in the nineteenth century was, he argues, 'a response to the proliferation of new technical media – such as the telegraph and

phonograph – that could not be assimilated to the older system of the arts' (Guillory 2010: 321). Significantly, this development of new technical media, and the emergence of a concept to describe it, 'perplexed thereafter the relation between the traditional arts and media of any kind' (Guillory 2010: 322).

If this broader history of the concept of media's evolution is beyond the scope of this article, Guillory's focus on the conditions in which the media concept emerged, and its subsequent impact on our understanding of forms that preceded its development is nevertheless highly relevant here. With a number of contemporary media theorists,[6] Guillory suggests that it is only when new media become available, and the content of existing media is transposed into the new one, that the mediating characteristics of existing media can properly be observed for what they are. This process, aptly described by Bolter and Grusin as 'remediation' (Bolter and Grusin 2000), builds upon McLuhan's assertion that 'the "content" of any medium is always another medium' (McLuhan 1994: 8). As McLuhan writes,

> The content of writing is speech, just as the written word is the content of print, and print
> is the content of the telegraph. If it is asked, 'What is the content of speech?' it is
> necessary to say, 'It is an actual process of thought, which is in itself nonverbal'.
>
> (McLuhan 1994: 1)

For Bolter and Grusin, remediation is always transformative, and the process McLuhan describes is far from neutral. The printing press, then, did not just *absorb* the content of writing but changed our understanding of it, and indeed language per se. In turn, the word processor and the computer visual display have changed our relationship to, and our understanding of, print, revealing the texture and grain of previous media that might not have been clear without the benefit of the hindsight the new technology provides. As

Guillory suggests, our understanding of any given media – and indeed, of the media concept itself – is only made possible by this process of remediation.

Telematic music-making presents just such a scenario: both the technical limitations and the new possibilities offered by this new media context bring new insight to the characteristics of existing technical media and to some of the assumptions that might hitherto have been made about music itself. Just as the printing press revealed aspects of language and of writing that had previously been taken for granted, so too can telematic music-making reveal aspects of music and of music technology that have previously been obscured by the normative contexts in which they appear. A good example of this is latency, an issue that immediately demands attention in telematic music-making. As Jonas Braasch writes, the relatively slow speed of sound means that when musicians are distributed across a stage, and audience members occupy various different parts of an auditorium, our experience of the temporal aspect of live music is never completely shared with anybody else in the room (Braasch 2009). Although in a concert situation the difference in the arrival time of a sound event between the various listeners in the room would usually be very small, it is nevertheless present. Indeed, the fact that certain venues are considered more or less appropriate for certain styles of music, and the fact that performers adapt their playing technique in response to room acoustics, confirms that latency has an aesthetic bearing even on acoustic performance practice. Conventional audio amplification further changes the temporal relationship between performers and audiences, and great efforts have been made by sound system designers to obviate the issues caused by the disparity between the arrival times of sound events in different parts of a venue. However, once sound events are transferred across a

network, latency increases by an order of magnitude causing a profound change in the perception of musical time and as a consequence forces composers, performers and audiences alike to reconsider the relationship between music and time and adapt their performance practice and expectations accordingly (Rofe and Reuben 2017). In this way, the emerging medium of telematic music can be seen as significant not only for the new opportunities it affords but also for the way in which it changes our understanding of the existing media that it is simultaneously constituted by and that it, in turn, reconstitutes.

All media seek to disappear

To identify something as a medium is to describe not just the technology itself but also the assumptions behind its development and the human behaviour that evolves around its use. From newspapers to Skype calls, however, our engagement with media is always an engagement with an assemblage of devices, people, codes and practices, and for a medium to be identified as such, it must appear to transcend the sum of its parts and be perceived not as a collective but as something unified and transparent. It must also seek to disguise the ways in which it is always in the act of filtering – mediating – the content that it carries (McLuhan 1994).

One of the ways in which new and emerging media forms can illuminate the mediating behaviour of previous forms is by revealing the means by which the older ones attempted to become transparent. When we come to use a given technology in a way that appears to us as unproblematic, it is in fact partly the result of the development of cultural practices that obviate the shortcomings of the technology. An often-cited example of this

is the development of the 'Hello/Hallo' greeting, as a response to the new-found need for etiquette specific to the use of the telephone. In this way, the telephone – in its ideal form a *neutral* conduit for speech communication – instigated the development of both new language and new behavioural norms specific to its use. For any medium to be considered successful by its users, then, it must either feature a design that is already familiar or intuitive for users migrating from related media or promise opportunities so great that users are prepared to invest the effort necessary to make its use seem instinctive or transparent. An example of the former might be the introduction of touch screens on portable 'smart' devices, which, despite representing a paradigm shift in the way in which users interacted with technology, was readily assimilated into mainstream culture due to its integration of a range of either familiar or intuitive interface conventions. By contrast, an example of the latter might be that of spoken language, which, despite requiring considerable effort on the part of those learning it, enables benefits that are deemed valuable enough to warrant the expenditure involved.

Positioned in a new assemblage, familiar technologies – and the behaviours that have evolved around them – are put into relief, revealing latent characteristics disguised by their ubiquity and the confidence with which they are used. Returning to the anecdote from the Isles of Scilly, then, such a process of remediation can be observed. The component media in the system behaved as they always would: the microphones listened (but not quite like our ears do); the microphone pre-amplifiers boosted the signal (but not without imparting a subtle character of their own); the audio interface converted an analogue index of the original waveform into a digital one (at a resolution almost, but not quite, transparent enough to have no effect); the latency within the network created an

inevitable delay and the loudspeakers at the other end filled the room with sound (but not in quite the same way that the original instrument would have radiated). And yet, while the mediating behaviour of the components was familiar and predictable, our behaviour towards them was necessarily altered by their new context, forcing us to invent tentative new codes of professional and cultural practice to accommodate the new situation.[8]

To assert, as above, that a microphone does not hear the way our ears do, or that a loudspeaker does not radiate like an acoustic instrument, is not to ascribe either the ear or the instrument an originary status: they too are mediators of vibration in the medium of air. It is, however, to assert that, in every case, a medium is selective and, as Daniel Chandler observes,

> The selectivity of any medium leads to its use having influences of which the user may
> not always be conscious, and which may not have been part of the purpose in using it.
> We can be so familiar with the medium that we are 'anaesthetized' to the mediation it
> involves: we 'don't know what we're missing'.
>
> (Chandler 2002: 3–4)

An example of such anaesthetization can be found in our experience of room acoustics rendered through loudspeakers. To hear the acoustics of a space such as Truro Cathedral by means of a recording or a telematic performance is clearly different from experiencing the acoustics in the space of the cathedral itself, yet so accustomed are we to the mediating effects of recording technology that we are unlikely to pay attention to the shortcomings of the way in which a microphone and loudspeaker render space unless the experience in question is startlingly different (for better or worse) than our expectations.[9] Chandler also returns us to the fact that mediation is reciprocal. He continues,

> […] when we engage with media we both act and are acted upon, use and are used.
>
> Where a medium has a variety of functions it may be impossible to choose to use it only
>
> for one of these functions in isolation. The making of meanings with such media must
>
> involve some degree of compromise.

<div align="right">(Chandler 2002: 4)</div>

Chandler's observation might most obviously be applied to high-level media formations, such as newspapers or television channels, where the ideology of the media organization can have a bearing on the curation of programming content or the way in which a news item is conveyed. With the rise of ostensibly free services provided by Internet companies such as Google and Facebook, who track and sell users' data, his comments seem even more apposite. However, even at the level of 'individual' media devices such as those that concern us, Chandler's argument for the reciprocity of mediation still stands. It is not simply the case then that a microphone can only perform within its technical limitations and filters incoming sound in the process: we must also recognize that in response to the microphone's behaviour, its users gradually adapt their approach to performance to make best use of its behaviour,[10] and eventually, this begins to alter their conception of music itself.

Gibson's theory of affordances

Our discussion of Online Orchestra as an example of the emerging medium of a telematic music system has invoked the idea of an environment in which a network of media acts upon one another, disrupting previously rigid mediating forms and creating new ones in the process. Brief reference has already been made to Bruno Latour, and with the above

in mind, Online Orchestra would make an ideal candidate for analysis made through the lens of his actor network theory (Latour 2005). However, this is for another day. For now, it is useful to turn to another critical framework through which to consider Online Orchestra: James Gibson's theory of affordances. Since Gibson's seminal study, *An Ecological Approach to Visual Perception* (Gibson 1986), numerous authors have refined, augmented and adapted his notion of affordances, which he describes as the features an environment offers to an animal: 'what it *provides* or *furnishes*, either good or ill' (Gibson 1986: 127). It is useful in the present context to focus on one particular rendering of Gibson's ideas put forward by Anthony Chemero (Chemero 2003), in which Chemero posits that affordances are not properties of an environment but *relations* between an environment and an animal that resides in it. In keeping with Gibson's original ideas and much of the scholarship that has followed them, Chemero retains a focus on the relationship between animals (human and non-human) and their environments.[11] However, the aim here is to translate this framework by positioning Online Orchestra as an 'environment' and thinking of its affordances in terms of what it 'provides or furnishes' to the musicians and audiences who interact with it.[12] Furthermore, Chemero's rendering of affordance theory gives a powerful lens through which to understand not only the relationship between Online Orchestra and its users but also the myriad relationships that exist between the whole 'constellation of forms' at play in a complex system of mediating forms.

Chemero begins by locating his own study within the broader context of theorists who – following Gibson – have sought to expound an ontology of affordances, all of whom start from the premise that affordances are animal-relative properties of the

environment.[13] He then identifies the differences of opinion that emerge from the discourse between these authors, which centre around their disagreement as to whether affordances are exploitable resources in the environment itself, which guide processes of natural selection in animals (Reed 1996), or whether affordances are *dispositional* properties of the environment that must be complemented by properties of animals themselves (Turvey 1992). Chemero offers the example of 'being fragile' as a dispositional property. He writes,

> […] something is fragile just in case it would break in certain circumstances, particularly circumstances in which it is struck sharply. Thus, dispositional properties are conceivable only when paired with actualizing circumstances, circumstances in which the disposition becomes manifest. So, for example, the affordance 'being edible' is a property of objects in the environment only if there are animals that are capable of eating and digesting the object.
>
> (Chemero 2003: 183)

Chemero attempts to cut through these two interpretations by offering a third in which he suggests that affordances are not 'properties' at all but 'relations between particular aspects of animals and particular aspects of situations' (Chemero 2003: 184). In his interpretation of affordances as relations rather than properties, Chemero offers a useful way to think about the ways in which the 'constellation of forms' (Born 1991) that mediate within Online Orchestra are constituted by and reconstitute one another.

Recapitulation

In the introduction, I began by recounting an incident that occurred during one of the Online Orchestra rehearsals where novel and unexpected characteristics of the system began my own enquiry into what it might mean – for composers, performers, technologists and audiences alike – to work with Online Orchestra idiomatically. Starting with Georgina Born's assertion that all music is meditational, attention turned to the idea of Online Orchestra as an emerging medium, drawing on media theory as a way to try to understand the nature of the system itself and the way in which it relates to the music, technology and performance practices that precede it.

It was noted that John Guillory identified that our current understanding of the concept of media only extends back to the nineteenth century. The concept of media was a necessary intellectual development to help make sense of emerging technologies – particularly network and recording technologies that reconstituted our relationship with time and space – as these represented a paradigm shift in the ways in which they influenced human behaviour. Marshall McLuhan's broadening of the media concept justifiably shifted the emphasis from a study of the content of media to one in which the characteristics of the medium itself came under scrutiny. However, McLuhan's near-synonymous use of the terms 'media' and 'technology' fails to account for the constellation of mediating forms in a system such as Online Orchestra, as these comprise not just technologies but also social and performative codes and practices. Following McLuhan, Daniel Chandler drew attention to the fact that media are always selective; that it is possible to be anaesthetized to this selectivity and that media act upon us just as we

make use of them. Dworkin's description of media as 'collectives', indivisible from the assemblages of technologies, codes and practices by which we know them, reasserts the multilateral character of mediation. Reminiscent of Bruno Latour's actor network theory, Dworkin brings us conveniently to the need for a framework through which to explore the space in which the mediating forms in a complex system like Online Orchestra act upon each other. Having introduced Anthony Chemero's rendering of James Gibson's theory of affordances, which focuses precisely upon the liminal space between an animal and its environment, attention can now be turned to a translation of this framework, where musician and audience stand in for the generic 'animal' and Online Orchestra stands in for 'environment'. In the process of doing this, we will also, inevitably, return to McLuhan's assertion that, the '"content" of any medium is always another medium' (McLuhan 1994) and, following Bolter and Grusin, it will be seen that through this process of remediation – by which Online Orchestra's constituent mediating forms are brought into a new assemblage – our understanding of these forms is renewed along with our exploration of Online Orchestra itself.

Online Orchestra's affordances

In his article in this special issue of the *Journal of Music, Technology and Education*, Online Orchestra's conductor Jonathan Hargreaves discusses some of the ways in which the context of conducting via a video feed made details that would be trivial in a live environment (such as shirt colour and certain kinds of arm movement) highly significant in video communication of this kind (Hargreaves 2017). Similarly, working groups with

musicians during the design phase of the project demonstrated that the size and arrangement of screens used to represent the conductor, and his relationship to the distributed ensembles, became a matter for lively debate that would be unlikely to have arisen in physical space (Prior et al. 2017b). As the medium of conducting is *remediated* by video over a network, a whole matrix of behaviours and expectations is brought into question, from choice of shirt and type of hand gesture to something more significant: that in this remediated form of conducting, Hargreaves' hand gestures do not result in an immediate or even simultaneous response from the musicians in the various locations. The effect of latency in not only delaying the audiovisual signal from one location to another but also creating a situation in which the synchronization between parts is not the same in any two locations makes for a fundamentally new musical ontology.

Chris Chafe discusses this change in our experience and perception of time in networked environments in an article in which he proposes that the Internet should be understood as a medium of sound propagation in its own right. He writes, 'Sound propagation in the network differs from sound in air, along stretched strings or through other familiar media. Among its unique aspects are jittery arrival times of sound packet data and speed asymmetries in opposite directions over a given path' (Chafe 2009: 414). By embracing these 'slight discrepancies in "now"' (Chafe 2009: 414)[14] that result in audio distributed across a network, Chafe points towards one approach to an idiomatic use of the network as a performance environment.

Julian Rohrhuber interprets the distributed, polymorphic structure of the network as reflecting a shift away from the notion of art as a unidirectional transmission of meaning already signalled in other art movements of the twentieth century, citing the

Fluxus Mail Art movement as an example (Rohrhuber 2007: 145). He summarizes this change in his observation that 'the relational structure of a social and musical network cannot be based on an absolute reference system, but results in multiple points of observation: in a way, there is no single outside any more' (Rohrhuber 2007: 149).

Although Chafe and Rohrhuber are not specifically using the language of affordances, their points can easily be read through the lens that Chemero (following Gibson) lays out. To extrapolate, Western music has evolved within a system of codes, expectations and power relations that have influenced the course by which it has developed (although of course, in keeping with everything already said about the reciprocal nature of mediation, this process is much more complex than one of simple determinism).[15] To pick just one example from its matrix of influences, Western music – or, more accurately, music of the North[16] – has, by and large, evolved within the acoustics of inside spaces.[17] In his treatise on the relationship between Western music and its performance venues, Michael Forsyth reminds us that

> From early times the acoustics of the stone buildings have surely influenced the development of Western music, as in Romanesque churches, where successive notes of plainchant melody reverberate and linger in the lofty enclosure, becoming superimposed to produce the idea of harmony. Western musical tradition was thus not only *melodic* but also *harmonic,* even before the notion grew, around A.D. 1000, of enriching the sound by singing more than one melody at once and producing the harmony at source.
>
> (Forsyth 1985: 3)

In this way, Western music's relationship to the acoustic context of large stone buildings might be understood in a similar way to Bernie Krause's notion of 'biophony' in the natural world. Krause describes biophony as the 'aural interdependence of vocal

organisms in a given biome' (Krause 2002: 22), and by his analysis, organisms have

evolved to inhabit 'niches' in the frequency spectrum such that numerous organisms can

coexist. Krause's use of the term 'niche' here is very similar to that of Gibson, which the

latter describes as referring 'more to *how* an animal lives than where it lives' (Gibson

1986: 128). This theme will be returned to later. For now, it is worth highlighting the

difference as well as the similarity between the relationship between humans and their

tools and environments, and animals and their habitats. For the network that Rohrhuber

describes is not an environment into which we were born, but a product of human

devising. Indeed, a project such as Online Orchestra is not simply adapting technical and

creative practice to thrive in a network environment but adapting the network itself – at

least to a limited extent – to meet its individual needs. As with all the other incidences of

mediation discussed then, this process is bilateral and has the capacity both to reconstitute

and be reconstituted by the other mediating forms with which it interacts.

Chemero's rendering of affordances is useful here. Borrowing his analysis of

Turvey (1992), it might be asserted that, in a network environment, the characteristics of

a medium previously thought to be stable are in fact dispositional properties. His

examples of an object 'being edible' are just such a dispositional property, in that it relies

on the 'actualizing circumstance' of there being animals that are capable of eating and

digesting the object (Chemero 2003: 183). In the same way, the property of a loudspeaker

to produce all of the frequencies within its specified range is dependent on the actualizing

circumstance of it being fed with a signal that contains this range of frequencies. To

apply this idea more directly to the context of Online Orchestra as an imagined

environment, any of the constellation of mediating forms could be inserted in the place of

Chemero's edible object. The 'property' of a conductor to determine the unfolding of time in a piece of music can clearly be seen to be dispositional, then, dependent as it is on the actualizing circumstance of the ensemble being able to see the conductor's arm movements clearly enough to interpret what they mean. By the same token, the vertical axis of a musical score can only dictate a synchronous moment in time when those reading and interpreting it have the means at their disposal to construct a shared experience of the unfolding of time. It is only when the criteria for these dispositional properties are met, then, that they become what Chemero describes as 'functional' properties.

Chemero's rendering goes further than differentiating between the stable and dispositional properties of an object in an environment though. Extending Gibson's assertion that an affordance is an animal-relative property of the environment, Chemero then tackles the conundrum of where this property resides. According to Reed (e.g. Reed 1996), affordances are resources in the environment that exert evolutionary pressure on animals, who adapt to exploit them. By contrast, Turvey's notion of affordances as dispositional properties assumes no such selectionist imperative, locating affordances wherever there is opportunity to actualize the potential of a latent property of an object. By asserting that affordances are not properties at all, but *relations* between animals and their environment, Chemero offers a different way of thinking about affordances. He presents a very simple example by way of explanation in the form of the equation: 'Shaquille is taller than Tony'. He writes, 'notice first that the only objects in this relation are Shaquille and Tony. The taller-than is not inherent in either of them but depends on both of them for its existence' (Chemero 2003: 187). In much the same way, feedback is

not a property of a microphone or a loudspeaker but the relation between them. When this relation is changed, such as when other mediating forms that incur delay are introduced into the system, what was feedback will now manifest as echo (see Prior et al. 2017b).

Returning once more to the anecdote on the Isles of Scilly, it is precisely in these relations *between* mediating forms that the uncanny experience of Truro Cathedral can be explained. While the individual mediating forms within the system behaved as they always do, the affordances they collectively offered were all reconstituted by one another in the new matrix of relations between them.

Conclusion

As telematic music emerges as a medium distinct from that of acoustic (or amplified) live performance, broadcast or recorded music, we are in a privileged position to observe it in its naïve form. To experience – or witness others experiencing – the novelty of high-resolution, multi-channel audio in very near real time for the first time, has a peculiar echo of the wonder with which earlier recording and broadcast technologies must have been met. But in this nascent stage in the development of telematic music, its selectivity is also more obvious than it ever will be again, in a future when its users consciously and subconsciously adapt to its idiosyncrasies, just as technologists seek to mitigate them.

The emerging literature on telematic music-making contains a recurrent theme in the notion of approaching the network not as a proxy for established physical performance contexts, but as a new environment with its own set of behaviours, codes and practices: Chafe encourages us to think of the network as a propagation medium

(Chafe 2009); Rohrhuber suggests that the distributed network subverts traditional notions of a 'sender' and 'receiver' of a performance, situating the audience as active participants in performance (Rohrhuber 2007); and Braasch invites us to think of the network as an environment with affordances better suited to figuring it as an instrument than simply as a means of connecting performance venues together (Braasch 2009). Chafe, Oliveros, Schroeder and Rebelo and others – including Braasch himself – have made significant inroads into responding to this challenge.

Online Orchestra started from a rather different premise, however: it was always unapologetically orientated towards the goal of broadening access to ensemble music-making, particularly to communities of musicians who might not otherwise have the opportunity to play in large ensembles. And whilst one of the objectives in fulfilling this goal was to explore new ways of making music (see Rofe and Geelhoed 2017), another was to facilitate the rehearsal and performance of a diversity of repertoire. This does mean finding ways of assimilating codes and practices of conventional conducted ensemble performance, even at the expense of foregoing some of the opportunities that the new medium makes possible. However, if previous revolutions in media technology teach us anything – the advent of film and photography; various iterations of audio recording technology and broadcast media such as radio and television – it is that there is room for a variety of approaches to burgeoning opportunities.

By thinking of Online Orchestra as an emerging media comprised of a constellation of mediating forms, the intention was to draw attention to the complexity with which each element of the system interacts with every other. Chemero's rendering of Gibson's theory of affordance gave us a useful framework within which to think about

the relations between them, eschewing the notion of fixed, or even dispositional, properties in favour of a reading of affordances as the relations themselves: between users and objects, or in the case of Online Orchestra between users and media, or indeed between media and other media.

It is in Gibson's original theory of affordances that a fitting conclusion to this article might also be found, by way of his aforementioned notion of a niche (Gibson 1986: 128). Gibson acknowledges his appropriation of the term from ecologists for whom a niche describes 'a setting of environmental features that are suitable for an animal, into which it fits metaphorically' (Gibson 1986: 128). For Gibson, though, 'niche' refers to a set of affordances, and it can be inferred from his use of this term that it provides for the possibility of numerous, overlapping and even symbiotic niches. He concludes, 'for all we know, there may be many offerings of the environment that have *not* been taken advantage of, that is, niches not yet occupied' (Gibson 1986: 128). Despite electrical network communication having been with us for over one hundred years,[18] and telepresent acoustic music having now been with us since the late-nineteenth century, our idiomatic use of the network for making music is still in its infancy. Whether we have found our niche with Online Orchestra or whether we are searching an unoccupied niche to inhabit, I am looking forward to the journey ahead.

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Notes

1.   To put in the terms Roland Barthes lays out in *Camera Lucida*, we moved from an understanding of the 'studium' of the technical infrastructure we had put in place to an experience of the 'punctum': the personal, emotional impact of the system upon us (Barthes 1977).

2.   McLuhan, with his famous dictum 'the medium is the message', corrected a tendency in the media theory that preceded him towards thinking of media as neutral conduits for the content they carried.

3.   It is worth noting that McLuhan acknowledged that alongside the 'extension' that media offer us, there is also an 'autoamputation' whereby to cope with the additional information electrical technology offers us, the nervous system must 'numb' itself to some of the sensory information it receives.

4.   Derrida's notion of the prosthesis as 'the supplement' is also relevant here (Derrida 1967).

5.   Guillory also notes the theological overtones implicit in this notion of intercessory mediation, noting that the pre-eminent example is that of Christ the Redeemer (Guillory 2010: 341).

6.   Guillory references both Bolter and Grusin (2000) and Gitelman 2006 as two pre-eminent examples of studies that explore the process of remediation and the relation between new media and old.

7.   This latter example is not diminished by the fact that the majority of language learners are babies who have not consciously chosen to learn to speak. Rather, spoken language, while a pre-eminent medium, is yet one that is still selective in the ways in which it mediates.

8.   These 'new codes' ranged from new approaches to writing music, to new methods of rehearsal and conducting, and, in the technical domain, revising approaches to microphone positioning, gain structure and so on.

9.   Arved Ashby goes so far as to describe recorded music as a 'chapter' in music's history, an epoch during which recordings represented the dominant form of music (Ashby 2010). Other literature on this subject includes Chanan (1995); Doyle (2005); Taylor (2011), amongst many others.

10.   One detailed enquiry into the effects of early microphones on singing technique can be found in Lockheart (2003).

11.   A notable example of the application of Gibson's ideas into other contexts can be found in Don Norman's appropriation of the term 'affordance' into his work on human–machine interaction (Norman 1988).

12.   Jonas Braasch also puts forward the idea of the network as an environment (Braasch 2009). Also drawing on Gibson's theory of affordances, Braasch suggests that telematic systems should be treated as a new class of instruments.

13.   Chemero lists Heft (1989, 2001); Michaels (2001); Reed (1996); Stoffregen (2000); Turvey (1992).

14.   Chafe's response to the discrepancies of time in network sound propagation is intriguing. On the one hand, he has created installations such as *Ping* that could be read

as a celebration of the characteristics of the media, while on the other, he describes the development of automata that can play ahead of the performers they are mimicking, thus obviating any latency that would otherwise cause the automata to lag behind.

15. A sophisticated analysis of the way in which music can pre-empt, rather than reflect, its social and economic context can be found in Attali (1985).

16. I make this terminological distinction not only the grounds of geographical accuracy but to underline the fact that we are talking about music that developed in generally cooler climates, hence the need for its makers to be inside!

17. Jonas Braasch also discusses the role of space in various music traditions and argues that we are still 'indebted to the idea that we can bring our traditional music culture to the table when performing in a telematic environment with acoustic musical instruments' (Braasch 2009: 430).

18. G. J. Mulgan reminds us that communication networks date back to the Chan Dynasty's messaging service, with numerous other examples of sophisticated communication networks in the years preceding the advent of electricity (Mulgan 1994). Golo Föllmer, with many other authors, identifies the *1881 International Electro-technical Exhibition* in Paris as one of the first instances of telematic music (Föllmer 2005). Here, music from the Paris opera was broadcast in stereo over telephone lines.