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Haworth, Christopher

DOI:

[10.1080/07494467.2018.1577639](https://doi.org/10.1080/07494467.2018.1577639)

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Document Version

Peer reviewed version

Citation for published version (Harvard):

Haworth, C 2019, 'Protections and retentions of Xenakis and Cage: nonhuman actors, genre and time in microsound', *Contemporary Music Review*, vol. 37, no. 5-6, pp. 606-625.
<https://doi.org/10.1080/07494467.2018.1577639>

[Link to publication on Research at Birmingham portal](#)

Publisher Rights Statement:

Checked for eligibility: 17/12/2018

This is an Accepted Manuscript of an article published by Taylor & Francis in *Contemporary Music Review* on 01/03/2019, available online:
<https://doi.org/10.1080/07494467.2018.1577639>

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Protentions and Retentions of Xenakis and Cage: Nonhuman Actors, Genre and Time in Microsound.

Christopher Haworth

Length: 8,464 words including footnotes, minus abstract, acknowledgement, references. Submitted 20.12.14, last revised 08.08.18.

Abstract

This article takes an actor-network theory approach to the elusive genre of microsound. The aim is twofold: to demonstrate what ANT's sociology of associations can offer to the study of music, and to consider what aspects would need to be rethought in order for ANT to represent a credible approach to art histories and genres. The ANT analysis traces two lines of inheritance in microsound: a 'weak' line associated with 'quiet' or 'small' sounds, and with strong links to John Cage; and a 'strong' line associated with microtime, sonic materialism, and the 'granular paradigm', for which Iannis Xenakis is the primary antecedent. Through an analysis of the processes involved in reinforcing and attenuating these strong and weak lines of inheritance, some absences in ANT's analytics of mediation are identified concerning temporal mediation. The last section of the article turns to the theorisation of time and genre found in Georgina Born's extension of the work of Alfred Gell and to Michel Foucault's account of authorship to analyse the bidirectional mediation of art and music corpuses, genres and genealogies as they extend through time.

Introduction: musicology and mediation theory

Many have noted the special problem music poses to critical inquiry in comparison with other cultural forms (cf Born 2005; Hennion 2007; Straw 2012). Whereas visual art, film, and literary theorists are presented with a relatively stable, uncontroversial text for interpretation, music, as Piekut (2014, p.192) puts it, is a 'weak entity that requires entanglements'. As such, no single agent can bear the weight of analysis all by itself. The idea of a universal and enduring text is of course implied by the concept of the 'musical work', which arrives in the nineteenth-century with attendant associations of autonomy, objecthood and perdurance, but it is only by bracketing out a host of 'entanglements', ranging from the creative contributions that performers bring to works (cf Clarke and Doffman 2017), to the ways institutions work to reinforce or suppress particular aesthetic genealogies (cf Born 1995), that the concept holds together at all.

The work of the music educator and social theorist Christopher Small remains one of the most influential attempts to recover some of the mediators that the work concept suppresses. Small believed that the term 'music' was misleading, conferring objecthood upon what ought to be considered a ritual in which we participate. 'Music is not a thing at all but an activity, something that people do. The apparent thing "music" is a figment, an abstraction of the action, whose reality vanishes as soon as we examine it at all closely' (Small 1998, p. 2). His linguistic shift, from 'music' to 'musicking', was intended to dislodge the reified concept of the work and reconnect music with communality and the social occasion within which it takes place—a position that has been rightly criticised as naturalism (Hesmondhalgh 2013, p. 89). Yet at a formal level, Small's argument actually shares much with themes that are at the heart of this article and special issue. In Bruno Latour's *Pasteurization of France* we find that any number of commonsense abstractions - 'knowledge', 'science', 'languages', 'society', 'the social', 'capitalism' - come in for the charge of 'not existing' (Latour 1993). But where Small wishes to replace the locution with one he deems more appropriate - a term that captures music as a human activity - the Actor-Network Theorist (ANT) would instead seek to recover the chain of associations that the concept necessarily obscures. For instance, on 'knowledge', John Law writes:

"Knowledge", then, is embodied in a variety of material forms. But where does it come from? The actor-network answer is that it is the end product of a lot of hard work in which heterogeneous bits and pieces -- test tubes, reagents, organisms, skilled hands, scanning electron microscopes, radiation monitors, other scientists, articles, computer terminals, and all the rest -- that would like to make off on their own are juxtaposed into a patterned network which overcomes their resistance. In short, it is a material matter but also a matter of organising and ordering those materials (Law 1992, p. 2).

Replace 'knowledge' with 'music' here, and the 'bits and pieces' with instruments, scores, computer programs, mixing boards, storage media, circulation channels, magazines and periodicals, other musicians, critics and scholars, patrons and benefactors, government subsidies, concert halls, record stores, conservatories 'and all the rest', and we arrive at a notion of music as a hybridised form, a complex 'assemblage of mediations', to quote Georgina Born (2005, p. 8). This is undoubtedly closer to the reality of music than the work concept allows for, but the danger of piling up complexity in this way is that the resulting network becomes too dense to make sense of. Where does the process of identifying and accounting for all the 'heterogeneous bits and pieces' end?

One of the central maxims of actor-network theory is to 'multiply the type of actors at work' (Latour 2005, p. 64). If something leaves a trace - if it makes a difference in some way - then it is an 'actor', and it is this directive that leads to the inclusion of 'non-human' actors amongst those entities that carry agency and are able to produce effects. The seeming equivalence of humans and nonhumans in ANT has led some to argue that it is amoral, or even a 'handmaiden' to a market-like, neoliberal ontology where 'all meet on equal footing in order to exchange, translate, arbitrate, and indeed flesh out their very existence' (Galloway 2018). Yet if we stay with the example of musicking then we will see why this approach is productive for our purposes. As already noted, Small wants to destabilise the hegemony of the 'work concept' in Western music. He is dissatisfied with the idea that 'whatever meaning art may have is thought to reside in the object, persisting independently of what the perceiver

may bring to it. It is simply there, floating through history untouched by time and change, waiting for the ideal perceiver to draw it out' (Small 1998, p. 5). Instead, Small argues for the recognition of 'performers, listeners, composers, dancers, ticket collectors, piano movers, roadies, and cleaners' in what constitutes musicking (1998, p. 10), a list that is not too far removed from the one I cited above. But whilst there can be no doubt that the actors in this wider network all play their part, what this kind of list can't explain is *how* the work concept becomes so enduring in spite of this, appearing to crystallise 'what music is'. Nor can it explain how the actors in Small's list appear relatively minor, impacting minimally on the meaning and function of music in society.¹

To give an actor-network theory account of this we could say that Small multiplies the *number* of actors at work but not the *type*. As Latour writes, the social skills that human actors are able to demonstrate 'provide only one tiny subset of the associations making up society'. 'It is always things – and I now mean this term literally – which, in practice, lend their 'steely' quality to the hapless "society"' (Latour 2005, p. 69, 68). Another way of saying this is that objects (like scores) endure, continuing to exert power in the absence of conscious intention, whilst purely social bonds are confined to the reach of human presence and the time of human lives: having no inertia, they must be ceaselessly renegotiated (Ibid, p. 66). Small's musicking essentially lives in this latter world of face-to-face communication and the micro-socialities of musical performance - a world he wants to insulate from the distortions of time, space, and subjectivity that are brought about by modernity. For ANT, however, human societies are always marked by the presence and agency of things. To refuse 'to impose a priori some spurious asymmetry' (2005, p. 76) between them - human and nonhuman actors - is simply a strategy by which to avoid reducing the latter to mere passive vehicles of human intention. (This is what Law means when he speaks of overcoming the 'resistance' of materials.) To channel André Leroi-Gourhan, whose *Gesture and Speech* (1993) was an influence on Latour, ANT recognises the centrality of *exteriorisation* to the category of the human: the human capacity to externalise knowledge in objects, texts, scores, archives and so on, passing on material memory traces for future generations to inherit. Indeed, despite its superficial affiliation with sociology, ANT is best understood as a continuation of a particular lineage of French thought—associated most prominently with Leroi-Gourhan, Bertrand Gille, Gilbert Simondon, Jacques Derrida, and recently, Bernard Stiegler—that has sought to foreground technics as a central problem for philosophy.

Comment [GB1]: Odd: should it be 68-69?

Comment [ch2]: I've checked this and the quote was a bit of a Frankenstein thing where the first part before the ellipses (p.69) came from after the second (p.68). I've tried to remedy it but if you have a better solution

Theorising electronic music through ANT

Given the pride of place non-human actors enjoy within its schema, it is easy to understand why ANT has proven attractive to musicologists (Piekut 2011, 2013, 2014; Drott 2017), and especially the musicology of electronic music (Prior 2008; Born 2012). For Georgina Born, it provides a fruitful if limited means to theorise agency within those musical assemblages 'for which an ontology of the machine as actor or creative agent is central' (Born 2012, p. 167). Taking George Lewis's *Voyager* as exemplar, she shows how the design of, and performance with, technical systems can 'deconstruct prevailing orthodoxies both of the universal, culturally neutral computer system and of human-computer interaction', positioning the system as a quasi-subject, one with aesthetic preferences and capacities 'for intersubjective negotiation' (Ibid, p. 168). Moving the focus from explicitly causal musical actors to the paratexts that frame musical experience, the sociologist Nick Prior gives a similarly ANT-informed account when, writing of the digital music genre 'glitch', he states: 'the gathering of digital objects around glitch changes not only how the music is made, but also what the music 'is'. The codes, the coding, the graphic user interface, the CDs, the various hardware interfaces and their design – these all make a difference. They do not determine the style alone, but neither are they merely a backdrop to, or weapon for, the purposeful action of the acquisitive human actor' (Prior 2008, p. 314).

Like Born and Prior, my own work has focused on electronic music cultures, where non-human actors are never far from view. Whether in real-time interactive systems that learn to play with a performer, generative art that develops independently of direct human interaction, or in the all-too-familiar

¹ Ben Piekut (2011, p.6) makes a similar point when he asks of 1960s experimental music: 'how have these composers been collected together in the first place, that they can now be the subject of a description?'

spectacle of a laptop crash halfway through an electronica concert, electronic music often seems to dramatise the ANT directive that non-humans ‘act’. But it would be misleading to grant special privilege to these nonhumans when the take-home message of ANT is that all human life is entangled with technical objects, whether they be electronically mediated or not.² As such, consideration should equally extend to more generic actors like record labels, recording formats, record sleeves, concert halls, venues—all of which produce effects, to paraphrase Prior. More problematically for an ANT-type analysis, agency is also exerted through genealogy and the webs of historical influence that actors mobilise in descriptions or analyses of their own practices, and the extent to which they engage with or resist particular musical genres. Add to that historical time and the particular concept of temporality - ‘classicism’, ‘modernism’, ‘postmodernism’, ‘tradition’, ‘avant-garde’, and so on - that, as Born writes, ‘form(s) part of the calculative agency of musicians and artists and (...) supervise(s) the creation of any cultural object’ (Born 2005, p. 24), and the problem becomes complex. How would one mount an analysis of art-historical process within an ANT framework?

This basic question guides the approach I take in this article. I focus my study on microsound, an experimental electronic music genre that spans twentieth-century art music, communication engineering, electronica and sound art, and that, through the range of authors, inventors, technical objects and concepts it recruits, weaves together complex lines of historical influence. My analysis has two aims: first, to show what ANT can offer for the recovery of these ‘historical ecologies’ (Piekut 2014, p. 212), particularly via a focus on the role of nonhuman actors; and second, to outline how ANT would need to be augmented in order to account for temporal process in art history.

Tracing uneven lines of inheritance in microsound

In experimental electronic music of the late 1990s a new genre emerged around the term ‘microsound’. Delineating a compositional approach predicated on a precisely delimited realm of audio (sounds lasting less than a tenth of a second), an aesthetic commitment to sound itself, an array of techniques, a community, and a speculative theory of sound, microsound, perhaps more than most genres, is a diffuse term, drawing together a diverse array of discourses, histories, philosophies, technologies and influences. One of its central figures is the electronic musician Kim Cascone, who portrayed it in the following way:

Yet here we are ten years later and it seems no-one can offer a stable definition of what .microsound (sic) is exactly. Journalists consistently get it wrong, outsiders get it wrong, and sometimes even some of our list members get it wrong by conflating it with ‘glitch’ or some other mutant strain of electronica. As of today there are no useful descriptions of tendencies in the contemporary practice of .microsound, which, in my opinion, gives testament to its success (Cascone 2009).

How would we set about writing a history of this ‘invisible’ genre in order, perhaps, to ‘purify’ it of misconception by outsiders, music critics, and even its own followers and participants? One approach would be to start with the person who coined the term, the composer Iannis Xenakis, and trace its development from there. Xenakis is considered the inventor of the ‘granular paradigm’ in music (Solomos 2006), an approach to composition that operates beneath the level of the note, constructing larger scale sonic forms through combinations of elementary sonic ‘grains’ lasting less than 100ms. His compositions *Concret PH* (1958) and *Analogique B* (1959) are often considered to comprise founding statements for microsound: brief, rough-hewn sketches, they anticipate a new frontier for composition (granular processing and granular synthesis, respectively), but were severely limited by the tools of their era. From this beginning we might fast-forward to Curtis Roads, a former protégé of

² A tendency to equate mediation with technological disruption is prevalent in the literature, as Patrick Valiquet notes in this issue: ‘[a]lthough few would still agree that a conversation over the telephone is somehow less of a conversation than one around a café table, there is still a lingering sense that we can learn more about mediation from the former than from the latter (...) [Yet] mediation, the drawing together of things that are otherwise separate, is in a sense what makes conversation possible at all’ (Valiquet 2017, p. 2).

Xenakis', who, along with Barry Truax, brought the granular paradigm into the world of real-time computer synthesis. Roads developed new techniques and software programs for granular synthesis, which were deployed in his influential *Point Line Cloud* DVD release (2005). Most importantly, his PhD thesis outlining its history and theory was published as a book in 2001: titled *Microsound*, it takes much of the credit for popularising the term. Tracing the associations from Roads, we come next to the earlier quoted Cascone, a composer and sound designer associated variously with glitch, ambient, 'residualism', and other speciality genres, but who took up the term 'microsound' after attending a talk given by Roads in 1999. Cascone co-founded the .microsound mailing list, a forum for 'discussion and exploration of a more general "digital aesthetic" manifesting across a wide variety of styles and disciplines—from academic computer music to post-industrial noise to experimental ambient and post-techno' (Cascone 1999). He went on to write an influential article on 'post-digital' electronic music, the 'aesthetics of failure', and non-academic auto-didacticism (Cascone 2000). Perhaps it is here, in this nexus of avant-garde composition, DSP research, and digital amateurism that the new genre was born.

Now, there is certainly some truth to this narrative, but it does not entirely satisfy. For one, being based around social ties, it does not capture the full reach of the network that the abstraction 'microsound' gathers together. It is too neat, basically. For instance, how would Bernhard Günter's work using contact mics on drumkits fit into this history? Or Sachiko M, the Japanese musician whose barely audible performances stretch microsound to the outer edges of the frequency spectrum, and the thresholds of loudness perception? Both artists are regularly associated with microsound (cf Cascone et al 1999; Demers 2010), but their practices seem less like descendents of the Xenakian notion of infinitesimal timescales than instances of Cagean silence. For Cage, after all, silence was not only the name given to those sounds that did not result from a musical intention (Cage 1961, p. 22), but also an attitude or listening frame within which the normally ignored or inaudible sounds of the environment could rise to conscious awareness. These paths are explored in Cage's own works such as *Williams Mix* (1952), *Cartridge Music* (1960), *Child of Tree* (1975), and *Branches* (1976), which are written for 'amplified small sounds' normally inaudible to the ear. In the latter two cases, performers are instructed to amplify plant sounds such as cacti, whilst in *Cartridge Music*, performers place materials inside the cartridge of a phonographic pickup, which are rendered audible by their constant contact with the transducer. Are the Cagean resonances of microsound – in his terminology, 'small sounds' - a deviation, perversion, or an instance of mistaken categorisation? And if we include them, do we encroach on the territory of other Cagean 'quiet' genres, such as lowercase? Where does one draw the line?

Cracks even start to appear in 'canonical' microsound when the links are examined closely. For instance, the more we scrutinise the path of influence leading from Xenakis to Roads, the more doubts arise concerning the inheritance. Doesn't Xenakis' microsound composition actually point more in the direction of automated real-time computer music systems, cybernetics and systems art, or noise music even? And Roads: surely his version of microsound is as much a continuation of the theory and aesthetics of the Elektronische Musik of Stockhausen and Herbert Eimert as it is of Xenakis'? As Simon Emmerson notes, Stockhausen's *Kontakte* can itself be seen as a product of the granular approach in its innovative use of filtered pulse trains that traverse the perceptual threshold between rhythm and tone (Emmerson 2007, p. 50). To make matters more complicated, close examination of the origin of microsound leads to hesitancy over its restriction to the music disciplines. In the physicist Denis Gabor's laboratory, microsound was operative under a different name, 'the acoustical quanta', as he experimented with granular time stretching and pitch changing using his self-authored 'Kinematical Frequency Convertor', before proposing his new theory of hearing in 1947 (Roads 2001, p. 61). Tracing the network in this direction may then lead us to query the absence of Pierre Schaeffer in the story, a figure who, along with Jacques Poullin, developed an instrument quite similar to Gabor's, and who had in fact theorised the notion of the 'grain' of sound independently of Xenakis (Chion 2009, p. 172). Whose microsound is the right one?

The musicologist Joanna Demers seems to encounter the same frustrating problems of definition concerning microsound in her book, *Listening Through the Noise*. Considering the genre's

antecedents, she argues against opening up the term to include Cage, because this makes ‘microsound seem like just one more Cagean exercise in stretching our tolerance for unusual sounds and noises. Comparisons to Cage obscure a fundamental and distinctive trait of microsound: its use of what practitioners and listeners consider to be nonreferential, precultural sounds’ (Demers 2010, p. 76).³ To reduce some of microsound’s complexity, Demers slices the genre up into ‘independent’ and ‘institutional’ forms; the former instance being closer to other genres such as glitch and ambient, and the latter being closer to electroacoustic and acousmatic music. But even these distinctions produce problems, as illustrated when she notes that too much of an emphasis on the independent variant can make its institutional counterpart seem like the academic variant of ‘glitch’ (2010, p. 72). It is not a criticism of Demers’s account of microsound to say that it reads rather like a dance across hot coals. In fact, the delicate negotiation necessary to speak about these genres is alluded to in the double meaning of ‘noise’ in the book’s title, designating in the first instance sonic characteristics, and in the second, the chatter, contestation and disagreement concerning taste and classification that takes place amongst experimental music audiences.

There is no conclusive way to write the history of a phenomenon, but in order to give as empirically grounded an account as possible, the changes in meaning, translations from discipline to discipline, controversies and aborted paths would all have to be chronicled. Rather than see them as contaminations of a simple self-identity that can be defined by reference to a set of stable descriptive features, the task is to account for the multiple mediations that the object or concept undergoes as it makes contact with the world, is picked up, selectively interpreted, mistaken, and inflected with other influences that the original did not foresee. This is not to say that we should do away with abstract concepts altogether, or that we should accept every possible association equally. Some actors are more powerful than others. For example, whilst it is clear from the description so far that Cage and Xenakis represent important figures in the history of microsound, it is equally clear that their relative influence is contested. Where Xenakis is interested in micro-temporalities,⁴ Cage’s is a microsound of barely perceptible sound. Both visions inflect the concept, but they are not equals: why not?

To ‘follow the actors’, as the ANT directive goes, we could start by looking to the books that each composer authored. As Born (1995, p. 42) writes, theoreticism comes to play an increasingly significant role in modernism, with books and articles taking ‘on the ambiguous role of exegesis and criticism, of proselytizing and publicity, of both expounding and legitimating practice’. Cage wrote five sole-authored titles during his lifetime, of which *Silence: Lectures and Writings* is the most influential. Xenakis, on the other hand, wrote one, *Formalized Music: Thought and Mathematics in Composition*. Of course, neither author’s thought penetrates through to the present, unmediated. They undergo modifications as they are namedropped by artists, cited in their publications, translated into performances and recordings, and so on. The task, therefore, is to trace these associations and translations, inquiring not only into what the author meant, but also into the ways in which their text can be (and has been) used.⁵ Such an operation will give a clue as to the hesitancy around Cage’s role in microsound, as evidenced in the earlier Demers’ quote.

For instance, Demers’ concern that microsound’s specificity would be compromised by an over-emphasis on Cage stems in part from the fact that, as we discover in *Silence*, Cage himself did not

³ Of course, it could equally be argued that microsound’s deployment of nonreferential, precultural sounds is precisely where the connection with Cage comes in. As others have noted (Kahn 1997; Kim-Cohen 2009), Cage’s directive to ‘let sounds be themselves’ was as much a call to give up the musical desire to control sound as it was a transferral of the aesthetics of autonomous art to listening in the world. As Kahn writes, ‘after a certain point communication, ideas, and intention were also to be expunged so all that was left was a sound in itself (...) This tendency in Cage was a measure of the degree to which he was lodged within Western art music and how willing he was to carry further its processes of exclusion and reduction with respect to sound in general. It was as though he could legitimately extend the bounds of musical materiality only by proving an unflinching fidelity to musical areferentiality on its own turf’ (Kahn 1997, p. 559).

⁴ This is illustrated in his memorable quote that ‘music is like a multiple sandwich, but a transparent one. Whilst in the middle of it, one can see at the same time lower or higher layers everywhere’ (Xenakis 1996, p. 146).

⁵ For this idea I draw some inspiration from Piekut’s (2013) analysis of the circulation of Cage’s *Silence*.

separately theorise microsound. He did not see ‘small sounds’ as independent of a more general program of widening the palette of musical sound to the point where there would exist ‘no sonorous (or potentially sonorous) place outside music’ (Kahn 1997, p. 558). This is best illustrated by the role *Cartridge Music* plays in *Silence*. With its emphasis on amplified detritus, the piece represents the strongest statement of the notion of ‘small sounds’ in Cage’s body of work. But whilst *Cartridge Music* does make an appearance in *Silence*, it is far from the statement of intent, or post-hoc analysis, that somebody seeking the kernel of microsound might hope to find. Instead it appears in the guise of the essays ‘Where Are We Going? And What Are We Doing?’ (1960), and ‘On Robert Rauschenberg, Artist, and His Work’ (1961), each of which are conceived as instances of the piece rather than as commentary, being written in precisely the same way as the musical version is performed (by strict adherence to the score).⁶ Despite the abundance of literature Cage produced, then, we do not find any reflection on the use of small sounds.⁷

The difference between Cage and Xenakis becomes immediately apparent if we turn to *Formalized Music* in search of a theory of microsound. In the chapter on ‘Markovian Stochastic Music-Theory’ we find the following provocative statement:

All sound is an integration of grains, of elementary sonic particles, of sonic quanta. Each of these elementary grains has a threefold nature: duration, frequency, and intensity. All sound, even all continuous sonic variation, is conceived as an assemblage of a large number of elementary grains adequately disposed in time (...) A complex sound may be imagined as a multicolored firework in which each point of light appears and instantaneously disappears against a black sky. (...) A line of light would be created by a sufficiently large multitude of points appearing and disappearing instantaneously. (Xenakis 1992, pp. 43-45)

In contrast to the generic concept of art advanced in *Silence* – an art in which ‘small sounds’ number amongst a heterogeneous array of objects, processes, events and happenings, with no ontological priority granted to any – Xenakis presents a resolutely materialist ontology of sound, one with clear implications for music. By imagining sound as the sum of a combination of elementary grains, referentiality, sociality, indexicality and politics can all be conceived as a detour or drift that sound capitulates to, rather than as an ontological mark.⁸ Relatedly, the process of granulation he describes can be likened to a metaphysical disclosure, something close to a technoscientific translation of the phenomenological epoché. And as Whitelaw (2003), Demers (2010) and Hofer (2014) note, it is

⁶ Both essays appear in *Silence* (Cage 1961).

⁷ One place in which Cage does describe his interest in small sounds is in the conversation with Daniel Charles that was published in 1981 in the book, ‘For the Birds’. ‘We know the air is filled with vibrations that we can’t hear. In *Variations VII*, I tried to use sounds from that inaudible environment. But we can’t consider environment as an object. We know that it’s a process. While in the case of the ashtray, we are indeed dealing with an object. It would be extremely interesting to place it in a little anechoic chamber and listen to it through a suitable sound system. Object would become process; we would discover, thanks to a procedure borrowed from science, the meaning of nature through the music of objects’ (Charles 1981, pp. 220-221).

⁸ It should be noted that Cage is hardly free of modernist aestheticism. Douglas Kahn accuses Cage of simultaneously opening up and closing down sonic plurality: granting permission for all sounds to be accepted as music, whilst at the same time confining their meaning to the register of musical signification. ‘When he hears music everywhere, other phenomena go unheard. When he celebrates noise, he also promulgates noise abatement. When he speaks of silence, he also speaks of silencing’ (Kahn 1997, p. 558). However, this should not be confused with the medium specificity that Xenakis practices. As Branden W. Joseph writes, one of the strongest legacies of Cage’s work is the challenge it posed to the disciplinary status of the art object. He cites Cage’s admiration for theatre, noting that, where ‘music’ reduces what is happening, theatre admits ‘all of the various things [happening] at the same time’ (Joseph 2011, p. 82). The contradiction should be clear. For ‘high’ aesthetic modernism, sometimes referred to as ‘medium specific modernism’, theatre (or ‘theatricality’) was the enemy; it imposed a relativistic, banal heterogeneity upon art experience, compromising the specificity of the art object and its locatedness in space and in time (Fried 1998). One of the challenges that remains for Cage scholarship is navigating these contradictory paths as they played out in his work without compromising their complexity. The aesthetic formalism that Kahn notes co-existed with, or was carried over to, a situation that was antithetical to it.

precisely this sonic essentialism that comes to define microsound. For Hofer, microsound fancifully postulates sound ‘as a material object... on an imagined atomic level’ (Hofer 2014, p. 295); whilst for Demers, microsound ought to be theorised as a residue of ‘high’ aesthetic modernism and its associated ideologies of autonomy and medium specificity. ‘Rather than looking to Cage or even Schafer for orientation, we can better situate independent microsound amid key moments in the discourse of materialism surrounding visual-art movements of the twentieth century’ (Demers 2010, p. 79).

Yet despite the tremendous impact *Formalized Music* had in the 1970s, its influence was not as straightforward as it would seem. As Kyle Gann notes, ‘many composers were inspired by the book’s two philosophical chapters’, but were put off by those that contained ‘too much calculus for the nonmathematician’ (Gann 1996, p. 153). Xenakis needed a mediator to make it into the history of microsound, and one composer who was not deterred by *Formalized Music*’s vector matrices and calculus of probability was a young Curtis Roads. At a workshop Roads attended at Indiana University in 1972, Xenakis gave the same description as the one cited in the last paragraph. As Roads recalls in *Microsound*:

This description intrigued me, but there were no sounds to hear. Granular synthesis remained a theoretical topic at the workshop. Maestro Xenakis took us to the campus computing center to show us experiments in stochastic waveform generation (also described in his book), but he never realized granular synthesis on a computer. (Roads 2001, pp. 108-109)

Faced with an inheritance like this, it would be easy to slip into a narrative that figures technology as the primary driver of microsound’s advance. Histories of electroacoustic and computer music too often caricature invention along these lines: Xenakis as the composer with scientific ideas ahead of the technology of his era, and Roads and Truax as the latter day acolytes who carry them into the realm of realtime computing, making microsound composition a reality. Xenakis did see granular synthesis as calling forth the use of computers in composition.⁹ But there is a complexity here, for real-time granular synthesis by computer was achieved well within his lifetime. Barry Truax got there first with his GSX and GSAMX programs. Capable of producing twenty simultaneous granular streams, and up to a maximum density of 2375 grains per second, the techniques were first used on his influential 1986 composition, *Riverrun* (Truax 1988, p. 14). However, Xenakis was not impressed with the results he heard.¹⁰ At the time he was occupied with two quite different computer music projects: the UPIC system, which is essentially a graphical synthesis system that allows the user to compose by drawing pitch-time curves onto a tablet; and GENDYN, his algorithmic music system that pioneered the technique of dynamic stochastic synthesis. Both of these represent alternative engagements with the concept and implications of microsound than those embodied in granular synthesis. UPIC’s graphical representation and intuitive and flexible drawing interface provided a different answer to the problem of controlling vast quantities of elementary sounds to granular synthesis. GENDYN, on the other hand, attempted to achieve a wholly automated music, where large-scale musical organisation emerged as an epiphenomenon of micro-level instruction applied directly to a sound signal.¹¹ Indeed, describing what he perceives to be the failures of Xenakis’ earlier *Analogique B* – often seen to mark the birth of granular synthesis – Agostino Di Scipio (1997, p. 167) makes the compelling claim that it was not technology at all that hindered Xenakis’ attempts at granular synthesis, but rather the method of organisation he proposed: stochastics.¹² Di Scipio implies that, with dynamic stochastic synthesis,

⁹ ‘[I]n considering clouds of points and their distribution over a pressure-time plane, we can bypass the heavy harmonic analyses and syntheses and create sounds that have never before existed. Only then will sound synthesis by computers and digital-to-analogue converters find its true position’ (Xenakis 1992, p. vii).

¹⁰ According to Curtis Roads, Xenakis was less than enamoured with the sounds produced by his and Truax’s granular synthesis programs, although he deemed Roads’ efforts to be ‘better than Truax’s’ (Roads 2012b).

¹¹ These techniques were used to create compositions such as *Taurhiphanie* (1987), *Voyage absolu des Unari vers Andromède* (1989), *GENDY3* (1991), and *S.709* (1994).

¹² ‘However, a less obvious explanation could be introduced, according to which the particular strategies pursued by Xenakis – namely, the stochastics he applied – may be not suitable in determining the emergence of sonorities of second order: just as the string pizzicatos of *Analogique A* could not but remain string pizzicatos,

Xenakis simply found a more appropriate and sonically interesting means to unite his interests than he had managed with 'pure' granular synthesis. Rather than using probabilities to transition from one set of sonic grains to another, as he had done in *Analogique B*, in dynamic stochastic synthesis the overall shape of a waveform was governed by probabilities, with each repetition transforming it in time and amplitude through stochastic variations (Di Scipio 1997, p. 174).

The associations that the concept of microsound gathers together are therefore not a simple and straightforward case of one historical actor taking a baton and passing it on to another. At each link in the chain – from Xenakis to Roads, Xenakis to Truax, Roads to Truax – something is carried forward, something is lost, something is transformed, and something new is produced. Roads' version of microsound purges it of the cybernetics-inspired belief that large-scale form would emerge as a byproduct of micro-level instruction.¹³ Where Xenakis tried 'to generate by one and the same compositional gesture both complex timbral entities and the articulation of musical form' (Di Scipio 1997, p. 168), Roads is critical of this approach, treating micro and macro design as separate procedures, and thereby bringing microsound composition into alignment with the technique of *musique concrete*, for which the generation of sound and the generation of structure exist as two separate procedures. Truax's compositional work advances a similar approach, but differently to Roads and Xenakis, he has sought to bring microsound's formal medium specificity into contact with what he calls the 'outer complexity' of relationships in the real world, without one being subordinate to the other (Truax 1994). Truax's involvement with the World Soundscape Project, and his intent to unite it with microsound, can be seen as one of the ways in which Cage is again enrolled in microsound, albeit indirectly. Resistances and counteracting forces therefore abound.

Back to actor-network theory

A good ANT account is a narrative or a description or a proposition where all the actors do something and don't just sit there. Instead of simply transporting effects without transforming them, each of the points in the text may become a bifurcation, an event, or the origin of a new translation. (Latour 2005, p. 128)

ANT theorists have developed the concept of 'translation' to describe the drifts in meaning that temporal and spatial extension through networks of association incurs. Deliberately playing on the tension between fidelity and betrayal that the term calls forth, translation, according to John Law, 'is the process or the work of making two things that are not the same, equivalent' (Law 1999, p. 8). However, as he rightly cautions, translation 'tells us nothing at all about how it is that links are made. And, in particular, it assumes nothing at all about the similarity of different links' (Ibid.). Bruno Latour might argue that theory is not the place for questions of scale and association to be worked out; rather, it is in empirical work that associations are traced and the effects of mediation analysed. The admittedly partial aesthetic genealogy I have described so far follows this imperative, showing how stronger and weaker links were woven as microsound was assembled into a distinct genre. There is a tentativeness to Cage's influence on microsound: this weak link can be traced; there is a claim made for Xenakis as pioneer: the displacements and distortions that are necessary to make this into a strong link can also be traced. Such a methodology can produce rich 'genealogies of the present', to borrow a term from Foucault (1977), but it is not only in the present that effects are produced. Xenakis and Cage are themselves transformed through their retroactive 'summoning' by Roads and Cascone. For just as the inheritors carry microsound forward, as though responding in the present to a message from the past, there is a sense in which microsound, in 'hearing' the past a certain way, *configures its forebears*, positioning them as retrospective antecedents to an aesthetic formation that is actively being assembled.

the sinusoidal grains in *Analogique B* remained just grains, and do not build up a more global auditory image' (Di Scipio 1997, p. 167).

¹³ Roads (2012, p. 23) argues that 'simplistic bottom-up strategies of "emergent self-organization" tend to fall short due to their conceiving the relationship between timescales as a simple question of scale. Instead it 'is a question of creating coherent multiscale behavior extending all the way to the meso and macro time scales. Multiscale behavior means that long-term high-level forces are as powerful as short-term low-level processes'.

And it is on this issue of temporal mediation that the limits of an ANT-style analysis come to the foreground. For, aside from a few cryptic asides,¹⁴ time is conspicuously absent in the ANT vocabulary.¹⁵ The lack of explicit theorisation does not mean that an ANT analysis is timeless, however. In *Science in Action*, Latour gives a clue as to ANT's prevailing understanding of time when he declares that 'science has two faces: one that knows, the other that does not know yet' (Latour 1987, p. 7). The temporality that is implied in this deliberately blunt truism is simple, even if the workings of scientific practice that are discovered in the process are not. Scientific discoveries, for Latour, become accepted by the wider community through a set of technical, discursive and institutional alignments that take the form of an A to B progression: from 'weaker to stronger rhetoric', from 'weak points to strongholds', and from 'short to longer networks' (Ibid). Capturing this movement ethnographically is the complex part, temporally speaking. It is a question of 'timing', Latour obliquely states, later comparing this nimble operation to the cinematic tropes of 'flashbacks' and 'time travel' (Ibid, p. 2). So if time is not entirely absent in ANT, what we can say is that it is essentially constituted by a before state and an after state, which the ethnographer is able to 'move between' in the monograph they produce.

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I want to come back to some of the points raised here in closing, but for now suffice it to say that this marks an impasse in our attempt to bring ANT to bear on the social and historical analysis of music genres. For histories that go beyond the microsocial, we therefore need to turn to alternative accounts of mediation, notably the work of Georgina Born, drawing on Alfred Gell, and Michel Foucault.

Mediation across time and space: protentions and retentions

In 'On Musical Mediation – Ontology, Technology and Creativity', Born draws upon the cultural anthropologist Alfred Gell's analysis of social agency, creativity and the art object in order to advance a theory of creativity as a distributed entity, both in time and across 'animate' and 'inanimate' agents (Gell 1998, p. 123). There are clear similarities between Gell's initial theory and ANT,¹⁶ but where the latter method challenges the notion that differences in scale (between 'macro-actors' and 'micro-actors' etc.) warrant different forms of analysis, Gell recognises various orders of temporality – from the temporalities of an individual corpus, as in his analysis of Duchamp's oeuvre, to those of style, exemplified by his analysis of Maori meeting houses. Appropriating terms from Husserl's phenomenology of temporality, Gell's initial move is to theorise the implied thread that links 'preparatory' to 'finished' works, 'early' to 'late' style and so on, redubbing 'protention' the future-oriented relation wherein an earlier work appears to anticipate a subsequent one, and 'retention' the retrospective, backward-facing relation where traces of earlier works are found in later ones (Gell 1998, p. 235). Of course, the two clearly threaten to collapse into one another, for if a work successfully 'protends' a later one, then the latter must equally 'retain' the former. However, this assumption requires that we 'look back' upon the earlier protending work from the perspective of the present, the association between the two being already guaranteed. The situation during the 'now' of a (potentially) protending work is different, as Born writes, extending Gell:¹⁷

¹⁴ Latour (1998, p. 7) states simply that actors 'build their own temporality'.

¹⁵ Spatialities and topologies fare rather better, however: cf. de Laet and Mol 2000; Hetherington and Law 2000; Thrift 1996.

¹⁶ For instance, Gell writes that "social agency" is not defined in terms of "basic" biological attributes (such as inanimate thing vs. incarnate person) but is relational – it does not matter, in ascribing "social agent" status, what a thing (or a person) "is" in itself; what matters is where it stands in a network of social relations' (Gell 1998, p. 123).

¹⁷ It is in her emphasis on uncertainty, on the scaling up to processes of protention and retention to art and music history, and on linking these concepts to the theorisation of genre and genealogy that Born's account of what she calls temporal mediation departs from Gell's protention / retention schema. In *Art and Agency*, the self-contained unities of the artist's oeuvre or the Maori culture are always assumed as the achieved, teleological end point of the protention / retention web of relations. Yet, as Born emphasises (Born 2010, p. 239), attention to temporal mediation is generative for precisely the opposite reasons: it provides a means to produce non-teleological accounts of historical process that do not presuppose already-made unities of genre, style, oeuvre and so on. It is

The anticipatory is more speculative and uncertain. The new work can fail convincingly to become part of the overall *œuvre-in-formation*. It can fail also to open up new directions and to be generative of anticipations; that is, it can fail to be innovative. Moreover, not every work that opens out further possibilities will be innovative. Conversely, there are innovative works that fail to generate protentions – works that extend their creative possibilities (Born 2005, p. 23).

The novelty of this conceptual translation – from Husserl’s internal time consciousness, to Gell’s theorisation of oeuvre and style, and thence to Born’s expansion to art and music history – is in the recognition that not only does the protending work *modify* the future, but it may subsequently *be modified by* later occurring retentions. In other words, the temporal mediation characteristic of art and music histories is, in Born and Gell’s accounts, bidirectional. The innovative (protending) work opens up a ‘space’ of action that the later work may dwell within, albeit without ever being identical to it (for difference is always produced). At the same time, the later (retaining) work *acts upon* the earlier one in such a way as to frame it, retroactively, as being a more or less straightforward cause of the later work’s effect. Both sides, then, are performative, albeit not equally so. Referring back to microsound, we can see that this is exemplified in the latter day translation of Xenakis’s ideas by both Roads and Truax. In actualising a potentiality that Xenakis opens up, their distinctive retentions have the return effect of positioning Xenakis as their direct, natural precursor. Yet my earlier ANT analysis revealed a more complex picture, with Xenakis’ own late computer music developing microsound in different ways to that of both Roads and Truax. So without misrepresenting or distorting the forebear, there is nevertheless a certain violence entailed in the contract, as a speculative call to the future (a protention) is rendered concrete and irreversible – at least until the next retention positions the protending author differently.¹⁸

Conclusions: disciplinarity, authorship, time

This article has used actor-network theory (ANT) to trace two lines of inheritance in the genre of microsound: a ‘weak’ line associated with ‘quiet’ or ‘small’ sounds, and with clear links to John Cage; and a ‘strong’ line associated with microtime, sonic materialism, and the ‘granular paradigm’, for which Iannis Xenakis is the primary antecedent. While ANT’s emphasis on the contribution of nonhuman entities afforded a fuller analysis of the varied agencies that have consolidated the strong line, including the later take up of ideas published in Xenakis’s *Formalised Music*, the process also illuminated some blind spots in the ANT framework. How, as a ‘sociology of mediation’ (Hennion 2017), can it account for mediations that are of a much larger scale and temporality than the microsocioal associations and interactions that are the typical focus of an ANT analysis? Drawing on Born’s extension of Gell’s theory of protentions and retentions I was able to show how Xenakis, through his works, technologies, theories and pronouncements, anticipated (‘protended’) the aesthetic formation of microsound, and then how the later take up of these ideas by Roads, Truax and others

by expanding the protention / retention framework to art and music history in general, and by laying emphasis on the anticipations that are *not* taken up in subsequent works (as well as those that may be) that Born’s analysis of temporalities can account for the drifts, breaks and contingencies that characterise a genre like microsound.

¹⁸ Another way of understanding this circuitous structure would be via Jacques Derrida’s concept of teleiopoiesis, whereby ‘what happens’—in this case, the assembling together of a genre—is not ‘foreseen’ or ‘predicted’ but actually takes place, retroactively, by virtue of being called forth (cf Derrida 2005; 2007; Haworth 2014, p. 262). Derrida describes teleiopoiesis as a letter that ‘carries its address along and implies in advance, in its very readability, the signature of the addressee’ (Derrida 2005, p. 32). In this way, Xenakis’ protention of microsound – his claim that ‘only then (with granular synthesis) will sound synthesis by computers (...) find its true position’ (Xenakis 1992, p. vii) – can be conceived of as an ‘absolute performative’, whereby ‘the announcement or the prediction of the event will already have made it occur’ (Haworth 2014, p. 262). Reaching its addressees in Roads and Truax, the response, as we have seen, also affects the sending, in such a way that the chronological order of succession, from sender to receiver, is destabilised (Ibid). To paraphrase Derrida, time’s arrow here consists not in an unflinching forward movement, but in a return to the bow – ‘Fast enough, in sum, never to have left it’ (Derrida 2005, p. 32).

(‘retentions’) served to guarantee this transmission from past to future – even as it partially closed down other potentialities in Xenakis’ work. In concluding, I want both to clarify and extend my arguments about temporal mediation by considering the role of authorship in the protention-retention schema. As well as deepening the analysis of these processes, consideration of authorship can shed light on why such resources are absent from ANT.

Given the themes of the foregoing analysis, it should be obvious that the ‘Xenakis’ that is at the centre of these processes of temporal mediation is not meant to be synonymous with Xenakis the human individual, even if a certain sense of the person ‘behind’ the materials he authored is indissociable. Instead, ‘Xenakis’ should be considered, after Michel Foucault, a ‘function’—a bundle of texts, works, and theories that are bound to the name by a set of rights governing how they may be used. With the concept of the author function, Foucault sought to provide a para-humanist account of the new textual and discursive practices that emerge once the legal category of the author comes into being and writing and discourse transforms into ‘a product, a thing, a kind of goods’ (Ibid, p. 108). The most lucrative traders in this new market are what Foucault calls ‘founders of discursivity’: figures that, as well as being the authors of their own works, found ‘the possibilities and the rules for the formation of other texts’ and so create ‘a possibility for something *other* than their discourse, yet something belonging to what they founded’ (Ibid, p.114 my italics). The way discourse fields advance is effectively via retentions: continual returns to such founders which ‘never stop modifying’ the discourses they participate in. As Foucault writes, ‘re-examining Freud’s texts modifies psychoanalysis itself, just as a re-examination of Marx’s would modify Marxism’ (Ibid, p. 116). Translated into the terms of my earlier argument, this means that each return to Xenakis by Roads, Truax and others is bound to modify what ‘Xenakis’ means in the context of microsound.

Elsewhere in the same essay Foucault cautions that the author function ‘does not affect all discourses in a universal and constant way’. In the sciences, for example, ‘the act that founds it is on an equal footing with its future transformations’ (Ibid, p. 115). It does not proceed by reference to a founding author; rather, ‘it is in relation to what physics or cosmology is in (its intrinsic structure and normativity) that one affirms the validity of any proposition those men may have put forth’ (Ibid, p. 116). Foucault’s remarks are not intended to imply that scientific advance takes place in the absence of founding acts, or that influential figures do not exist in science. Rather, what he is saying is that these acts each abide by the same disciplinary ‘rules’. Thus, the substitution of one founder with another would not lead to a different version of, for example, quantum physics, and nor could further interpretation of the founder’s work transform the field as it is currently practiced – unless a new discovery was uncovered in that process that was not previously known. Founders may enable or accelerate scientific advance, but the theories or discoveries they are responsible for ‘shed’ the author once born. The absence of the retention, or the return that never stops modifying, is, then, one of the factors that produces the unidirectional temporal flow of the natural sciences, in contrast to art and music history. Similarly, the more unidirectional temporality of science may be one of the reasons ANT lacks more involved consideration of time.

In raising these path-specific discursive practices, my aim is less to critique ANT on the grounds of its blind spots and more to simply restate the post-positivist axiom that all theories and methods bear the traces of the epistemological contexts they derive from. Indeed, the very idea of ‘translation’ in ANT acknowledges the resistances and frictions that emerge when two things that are not the same – in this case, an empirical case (the history of microsound) and a method-cum-theory (ANT) – come into contact. Despite its myriad cross-disciplinary ‘applications’, ANT is not a universal, transcendental method or theory at all – it carries assumptions that pertain to science and technology studies, and that are cast in relief when shifted to a new disciplinary context. And this cuts the other way, too. The more complex bidirectional temporal mediations that Born identifies by extending Husserl via Gell (itself an example of the very mechanism!) are afforded by an author function that prevails in art disciplines but that would not tell us much about scientific progress. The conclusions I draw from my ANT analysis of microsound are, then, two-fold. At a substantive level, and echoing Piekut (2014, p. 213), richer analyses of art-historical ‘ecologies’ of the sort described in this article can benefit from an augmented ANT, one adapted to the study of temporal process and aesthetic inheritance by the

insights of Born, Gell and Foucault. At a methodological level, empirical work needs to exist in a co-constituting and occasionally agonistic dialogue with the theoretical frameworks that inform it: theory may guide research design, analysis, and writing, but it must be pliable enough to accommodate revisions and critiques that emerge from the empirical case.

Acknowledgements

I am grateful to Eliot Bates, Georgina Born, Agostino Di Scipio, Ben Earle, Michael Haworth, David Hesmondhalgh, Benjamin Piekut, and members of the Leeds Humanities Research Institute reading group for providing valuable comments, suggestions and critiques throughout the course of writing this article.

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