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Ecosystem or Technical System?
Technologically-Mediated Performance and the Music of The Hub

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Abstract

This paper represents the early stages of an attempt to think through technological mediation and temporality in electronic music; a vast question, and not one I can hope to do full justice to in these pages. But as a preliminary to further investigation, I want to take what I consider to be one of the most well developed recent theories we have for understanding and analysing highly-technologized music and essentially put it to the test: the notion of the man/machine/environment nexus as an 'ecosystem'. The talk gives a summary of the concept in contemporary music, followed by a brief genealogy of the ecosystem metaphor in the 20th Century. It then turns to the practices of The Hub, the Bay Area network music pioneers, who have since the mid 1980s occupied a precarious space right at the vanguard of new technology adoption. What I'll argue is that their music both utilises, and provides the basis for stretching and moving beyond, ecosystemic thinking in music.

The 'ecosystem' concept in music

Though not a new idea, the notion of the performance situation-as-ecosystem – a dynamic, interrelated collection of living and non-living components that together form a self-contained system – has really taken hold in the last decade, particularly through the writings and creative work of Agostino Di Scipio and Simon Waters. There are two strands to it. On the one hand - and this is more associated with Di Scipio's work – it represents a formal ontology in highly technologized music. The performance ecosystem describes a particular type of non-teleological governance that is at once "structurally closed" and "organisationally open" (Di Scipio, 2003, p. 275): 'closed' in the sense that the elements in the system – performer, instrument, environment, loudspeakers, and computer system – are inextricably linked via an information network, and any substitution of elements would destroy it or create a different system; and 'open' because these structurally coupled elements do not determine the ultimate sonic organisation. The system can creatively adapt to, and act upon, its immediate environment, so each installation of the work will create a different sounding outcome. In Di Scipio's work, the information network is audio feedback caused by a microphone placed before a loudspeaker. A computer mediates the feedback loop, automatically adjusting the gain so as to always be just on

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the edge of self-oscillation (it also does much more than this, but this is not the topic of my paper: see Di Scipio, 2003, 2014). The system is therefore in an ongoing process of tuning and self-regulation, and what we hear is this process as it unfolds.

The ecosystem concept here acts as a metaphor for a closed circular system organised by feedback mechanisms. It is a cybernetic experiment in an 'unknowable' system, which Di Scipio himself sees as overturning the linear and hierarchical "performer > instrument > environment" communication flow that much music that is called "interactive" implements (Di Scipio 2003, p. 270). Since each element in the network has a degree of autonomy, no single agent determines the system's behaviour. Control and guidance is possible, but self-organisation also takes place. But rather than 'representing' the ecosystem, or even using it as a loose conceptual framework, I'd argue that the audible ecosystems project actually *performs* it. It is an "ontological theatre", to use Andrew Pickering's terminology, staging "for us (an example) of how it (the ecosystem) might be brought down to earth and played out in practice" (Pickering, 2010, p. 22).

A second strand of thought goes further than this, seeing in the performance ecosystem a more general model for comprehending highly technologized music as – quoting Simon Waters – a "complex dynamical system in which the feedback loops and interpenetrations between agents are fully recognised" (Waters, 2013, p. 122). The ecosystem metaphor here is positioned as a panacea to at least two strong and opposing intellectual tropes in electroacoustic music. One is the tendency to instrumentalise technology, which can have the effect of masking the fact that what is perceived as skilful or virtuosic at any particular time is often that which lies outside the explicit design brief of an instrument or piece of technology (Water, 2007). Waters conceives of this instrumental transgression as an *emergent* behaviour of the system, and the mechanism by which it comes about – which is the culturally situated, embodied and worldly nature of creative performance – is the system's *feedback*. The second prevailing tendency the performance ecosystem aims to challenge is the longstanding fetishization of new technology in electronic music. Shifting attention towards the situated performance ecology – the complex interactions between performer, instrument and environment – has the effect of closing the gap separating highly technologized situations from the deep history of musicking. Evading the technology-based conceptual distinctions that carve up our musical imaginary, and that continue to organise (e.g.) degree programs, genre classifications and instrument design – 'acoustic' and 'electronic', 'analog' and 'digital' technologies, media and instruments and so on – the performance ecosystem model takes the system as a whole and the particular interactions it sets in motion as the point of entry. Ultimately, it is imagined as a way of bringing the body, cultural memory, and the social 'back' into electroacoustic and computer music performance, where other formalisms are seen to smother these.

Cybernetics

Re-emphasising the embodied nature of electroacoustic music is a laudable aim, undoubtedly. But the reliance on a set of conceptualisations inherited from cybernetics and information theory seems a strange way to achieve this. Control, constraint, feedback, structural coupling, dynamical complexes, information networks, emergence – this is the classic lexicon that Norbert Weiner, Jay Forrester and others established in the late 1940s to supplement the interdisciplinary

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metascience of, quoting Weiner, "control and communication systems in the animal and the machine". Cybernetic thinking has much to offer, some of which is demonstrated in the aforementioned work of Di Scipio, but a prevailing critique of the discipline has been its readiness to collapse distinctions between people and things in order to make their complex interactions mathematizable. The proposed interchangeability of man and machine has permeated cybernetics from the very beginning, and whilst it seems quite fashionable now - perhaps as we await the coming of the 'technological singularity' – it was in the first instance a product of intellectual expediency over principle. This is evident in a revealing passage from Norbert Weiner's memoir, where he describes his early formalisation of a 'system' comprising an airline pilot and a gun pointer. (Weiner had done anti-aircraft research for the US military during WWII.) He writes

> in order to obtain as complete a mathematical treatment as possible of the over-all control problem, it is necessary to assimilate the different parts of the system to a *single* basis, either human or mechanical. Since our understanding of the mechanical elements of gun pointing appeared to us to be far ahead of our psychological understanding, we chose to find a mechanical analogue of the gun pointer and the airplane pilot. (Weiner, 1956, pp. 251-52)

The ecosystem metaphor, too, is a product of cybernetics, information theory, and the machine analogy. Though coined some years before the discipline was founded, it was based on principles that would later be refined and reinforced by cybernetics. The basic conceptual move is to see the terrestrial ecosystem as a self-organizing network containing living and non-living parts, and regulated and governed by the circular exchange of materials, which constitute the system's 'feedback' (Odum, 1953). When ecosystems were disturbed, such as by technological advance or natural disasters, it was proposed that they would always return back to a steady state due to these inbuilt feedback networks. This machine analogy was dominant in the 1970s, but over the last twenty years came under strain. There is no need for a lengthy discussion here, but for those scientists and ecologists that do still subscribe to the notion of the ecosystem,

> the classical paradigm […] with its emphasis on the stable state, its suggestion of natural systems as closed and self-regulating, and its resonance with the non-scientific idea of balance of nature [has come to be replaced by an idea of the ecosystem as] disequilibrial, open, hierarchical, spatially patterned and scaled. (Pickett *et al*, 1992)

With it, the utopian notions of some high-level formal equivalence between social systems, economic systems, communications systems, computer systems, biological systems etc. has been discredited.

So where does this leave us? Does the performance ecosystem model for understanding and analyzing technologically mediated music performance need to be replaced? Or should it be updated to bring it into alignment with current thought on ecosystems, which deemphasizes stability and regulation in favour of imbalance, change and disorder? The concept has provided a fruitful tool for understanding works that implement a closed cybernetic system as their formal model of organisation: Di Scipio, David Tudor, Alvin Lucier and others. It is less strong when put to the larger task of understanding the social, historical, technological, or institutional arrangements that inform and sustain these practices, since it falls prey to the cyberneticist tendency to reduce different systems to a flat formal equivalence. In the last part of this paper I want to turn the discussion towards a case study in highly-technologised performance: the work

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of the Bay Area computer network music pioneers, The Hub. Having long exploited the non-hierarchical modes of organization that are afforded by computer networking, The Hub is superficially compatible with some of the notions the ecosystem metaphor incorporates. But what we will see is that this coexists with another very different dynamic: the logic of the 'technical system'.

The Hub

Emerging out of the avant-garde music scene of the San Francisco Bay Area, The Hub is in many ways an archetypal product of the region's distinctive mix of high-tech research and bohemianism: the group embody principles of anti-hierarchical organisation and collectivism whilst at same occupying a precarious space right at the vanguard of new technology adoption. Their name was conceived as a generic placeholder for a dynamic constellation of people, things and processes. It names at least three components: 1) the performers associated with the project (including Scot Gresham Lancaster, Mark Trayle, John Bischoff, Chris Brown, and Phil Stone); 2) the hard and software that they used; and 3) the practice of generating shared information which underlay their work. In an article for Leonardo Music Journal from 1998, Scot Gresham-Lancaster describes the aesthetics and history of the Hub alongside the effects of changing technology on network computer music. The influence of cybernetic and systems theory rhetoric on his thinking is clear from the very first line, when he asserts that "music is, at its core, a means of communication; computers offer ways of enhancing interconnection" (Gresham-Lancaster, 1998, p. 39). However, what he goes on to describe does not comfortably adhere to the world of feedback loops and self-organising networks that cybernetics envisages.

From the outset, Gresham-Lancaster associates the group with technological development. The origin of the Hub is linked to the advent of MIDI; it had "a major impact, enabling often-impoverished performers/composers to utilize these new, affordable instruments" (*Ibid.*, p. 41). In the early Hub performances, the group utilised a blackboard system for sharing data between distributed computers. A central memory space housed the active components of the piece, which each computer was able to remotely access. This centralised system – a client / server networking model – determined the style of communication between computers, and hence, the form of their interactions. One-to-one communication was not possible with the system; instead, all contributed to, and drew from, a shared data resource. When OpCode Systems released their *Studio 5* MIDI interface, the group opted to redesign the Hub (their hard- and software) around this new system. Each participant in the network could now directly 'play' the set-up of any other participant, which had not been possible before. The new Hub was a decentralised peer-to-peer network, which granted more autonomy to each player and also more direct interaction amongst players. Gresham-Lancaster notes the precariousness of this dynamic ecology. Utilising "the new possibilities the changing technological context brought to the work" whilst also maintaining a repertoire of works is depicted as a fragile balancing act, with "the shifting context of hardware and software constantly (updating) the sound of the ensemble" (*Ibid.*, p. 43).

If this sounds deterministic, a case of technology's march setting the tempo of the avant-garde, then it is worth noting that not all of the system updates The Hub implemented took hold. Both Matthew Wright and Gresham-Lancaster have independently written of a failed attempt to create

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an Open Sound Control (OSC) based Hub to perform over the Internet. Here, the problem was twofold: both that the new OSC-based system was so complex that the group were "unable to reach a satisfactory point of expressivity", and that the wider network of the Internet required different strategies and aesthetics than the Hub's creative methods afforded. Rejecting this particular update led to a reinforced sense of who the Hub is: a computer network music group with the "form and function of a conventional musical ensemble" (*Ibid.*, p. 44).

Conclusion

What is depicted here is, I think, quite different from the stable and self-regulating world that the ecosystem concept constructs. The Hub continually overhauled their technical setup to incorporate new technologies; in the process, new social arrangements, working methods, and sounds emerged, while old ones were changed in character or rendered obsolete altogether. Whilst there is, no doubt, a hint of techno-fetishisation to what they do, simply identifying this and subjecting it to critique ignores, in the name of a weak appeal to the 'music itself', the distinctly disequilibrial ecology the group occupied. The Hub's practice in fact highlights the estrangement of 'pre-modern' and 'modern' technical systems: it exhibits the distinct temporalities modern systems shape and the specific 'media ecologies' that they constellate. In Gresham-Lancaster's uncommonly open portrayal of the role of changing technology in their creative practice, what comes forward is a particular quality of time that is rarely bestowed with any agency whatsoever in music. It is the time of permanent innovation, the effects of which Bernard Stiegler has analysed in his *Technics and Time* project (Stiegler, 1998). Stiegler is one of a number of contemporary philosophers whose work can be read as an attempt to diagnose the outer-historical time of our present epoch. He has used the term 'hypermodernity' to describe the current stage of modernity, a concept he conceives in opposition to postmodernity (O'Gorman, 2010). In the first *Technics and Time* book he argues that it is the logic of industrial civilizations that the rhythms of cultural evolution and the rhythms of technical evolution become evermore out of sync, to the extent that "technics evolves *more quickly* than culture" (Stiegler, 1998, p. 15). He goes on,

> the temporal relation between the two is a tension in which there is both advance and delay […] it is as if time has leapt outside itself: not only because the process of decision making and anticipation has irresistibly moved over to the side of the machine or technical complex, but because […] our age is in the process of breaking the "time barrier". (*Ibid.*, p. 15)

When Gresham-Lancaster's remarks that "the trick has always been to get the tools working and then to find the music in the newly built context", I think it is this process of advance and delay that he describes: a product of the double, asynchronous evolution of technics and culture.

The temporal structure Stiegler portrays is an ever-more important dynamic in modern music practice. It is one that the ecosystem concept, through an over-emphasis on the contiguity of modern and pre-modern music technology, is structurally unable to address. In point of fact, The Hub was one of the first collectives to apply the ecosystem metaphor to technologized music. In an article from 1991, Mark Trayle described their organisational strategies of anti-hierarchy, self-organisation and emergence in the context of Gregory Bateson's ideas about the ecosystem (Trayle, 1991). But the complex relationship between technology and invention in their work,

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summarised in this brief paper, expose the weaknesses of the attempt to extend the notion beyond cybernetics, and have it operate as a generalised tool for understanding highly technologized music as a cultural practice. As an alternative, I've proposed that the spatial dimension of the performance ecosystem model can be more properly considered a type of 'media ecology', a term derived from the study of information environments. Situating technologically-mediated music in this discourse recognises that not all media are the same, and that emphasising the important continuities of modern and pre-modern musical technologies does not have to mean papering over their differences. Finally, I've argued that studying media ecologies as products of technical systems, with dynamics of change quite independent of artistic practice, is crucial to understanding technologically-mediated music as a cultural practice.

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