Instrumental, Hermeneutic, and Ontological Indeterminacy in Hugh Davies's Live Electronic Music

James Mooney, Owen Green & Sean Williams

Published online: 04 Jul 2022.

Submit your article to this journal ⬀

Article views: 163

View related articles ⬀

View Crossmark data ⬀

Instrumental, Hermeneutic, and Ontological Indeterminacy in Hugh Davies's Live Electronic Music

James Mooney , Owen Green and Sean Williams

While many previous studies have explored indeterminacy as a compositional technique, in this article we explore the concept of indeterminacy, not only from the perspective of the composer, but also from the perspectives of performer and archival researcher, drawing upon our experiences of researching and performing several live electronic music compositions by British experimental musician Hugh Davies (1943–2005). Our core argument is that beneath the surface level of composed indeterminacy—that is, beyond the notations and instructions that a composer employs to prescribe indeterminate musical results—there exist further 'nested' planes of indeterminacy that reveal themselves through the acts of archival research, rehearsal and performance. 'Instrumental' indeterminacy has to do with the instruments that are used to perform the music, and specifically to situations where the boundaries of the instruments are experienced (by performers or audience members) as ambiguous, fluid, reconfigurable, or undefinable, or where the behaviour of the instrument(s) is unpredictable or uncontrollable in the moment of performance. 'Hermeneutic' indeterminacy concerns the composer's intentions and the ways in which these are revealed, through the processes of archival and performance research, to be incompletely, ambiguously, contradictorily, and/or diffusely represented in documents (including but not limited to scores) and material configurations (including the instruments and apparatus used to perform the music). 'Ontological' indeterminacy is signalled by uncertainty (on the part of the researchers) about the ontological status of the piece to be performed. By sharing these perspectives, we aim to contribute to scholarly understandings of the 'afterlives' of indeterminacy, beyond the circumscriptions of a composer.

Keywords: Indeterminacy; Live Electronic Music; Archival Research; Performance Research; 1960s; 1970s

Introduction

In this essay, indeterminacy provides the lens through which we view our experience of staging several performances of experimental live electronic works by the English composer Hugh Davies (1943–2005). The three pieces that we discuss were composed by Davies between 1967 and 1969. Our performances were staged in 2015–2016 as part of JM's[1] AHRC project 'Hugh Davies: Electronic Music Innovator'. Timings in the text refer to video-recordings of our performances, which are available to view online, along with pre-concert lectures and programme notes that futher describe and contextualise the pieces (see Mooney 2016a, 2016b, 2016c).

Davies's compositions feature the use of performance indeterminacy, improvisation, and text notation, and are thus stylistically consistent, broadly speaking, with what Anderson has called the classic, post-Fluxus period of British experimental music (Anderson 2009, 275–276). In our discussion, however, we look beyond the surface details of 'composed indeterminacy' to explore the ways in which indeterminacy was experienced by the ensemble members in the process of preparing and performing these pieces. As such, we take up the mantle of 'understanding indeterminate music through performance' (Thomas 2013).

Our core argument is that beneath the surface level of composed indeterminacy—that is, beyond the notations and instructions that a composer employs to prescribe indeterminate musical results—there exist further 'nested' planes of indeterminacy that reveal themselves through the acts of archival research, rehearsal, and performance. In particular, we posit the existence of 'Instrumental', 'Hermeneutic' and 'Ontological' planes of indeterminacy that reveal themselves through the performing of Davies's music. Indeterminacy in the instrumental plane has to do with the instruments that are used to perform the music, the extent to which their boundaries may be perceived (by performers or audience members) as being ambiguous, fluid, reconfigurable, or undefinable, and the extent to which their behaviour may be unpredictable or uncontrollable in the moment of performance. Indeterminacy in the hermeneutic plane concerns the composer's intentions, the ways in which these are revealed to be incompletely, ambiguously, contradictorily, and/or diffusely represented in particular documents (including but not limited to scores) and material configurations (including the instruments and apparatus used to perform the music). Ontological indeterminacy is signalled by uncertainty about the ontological status of the piece to be performed. Before we explore how we performed indeterminacy, however, it is first necessary to explain how Davies composed indeterminacy.

Background: Davies's Approach to Indeterminate Composition

> I might say that I have never regarded my music as aleatoric, but rather what one calls statistic, that is to say one knows exactly *how* a work will turn out in performance, but there will always be pleasant surprises in the way individual details appear in a particular performance. (Davies 1968c)

As a composer of live electronic music, Hugh Davies was not particularly interested in randomness or chance selection. Rather, he was interested in specifying ranges or fields of musical probability—an approach that he described in his unpublished notes (quoted above) as 'statistic'.

Davies sought to compose probabilistically by deploying a range of techniques that were oriented towards harnessing the statistical potentials inherent in the bringing together of specific instruments—often non-standard instruments that Davies built himself or required the performers to build—specific performers (or specific *kinds* of performer), and instructions contained within a (typically text-based) score.[2] Of course, orienting the statistical tendencies of particular instruments and performers, via instructions contained in a score, toward increasing the probability of particular musical outcomes would be one way of describing the work that any composer does. But like many composers of experimental music, Davies was more interested in circumscribing indeterminacy than eliminating it entirely. To achieve this, he developed a distinctive approach that involved designing sociomaterial situations[3] that exploited the combined probabilistic tendencies of non-standard instruments (typically of his own design), individual performers, and scores.

One way that Davies circumscribed ranges of musical probability in his compositions was by prescribing the use of non-standard instruments. Davies's instruments were designed to present the player with a comparatively narrow range of timbral or interactional possibilities, notionally increasing the statistical probability that certain kinds of sounds or sonic behaviours would emerge in performance. It was for this reason that Davies referred to his instruments as having 'personalities' (Davies 1972). In Davies's live electronic works, the instruments tended to be electro-acoustically coupled in some way to form an inter-connected system or 'distributed instrument'—a topology that Davies had first encountered when performing Stockhausen's *Mikrophonie I* (1964) in the mid-1960s.[4] Sonically, Davies's instruments were oriented toward the production of unpitched sounds (i.e. noisy spectra), electroacoustic feedback, or sounds resembling those obtained via tape manipulation in *musique concrète*.

Davies further delineated the ranges of musical probability in his scores. These tended to include instructions that required the performer to explore the full range of sonic and interactional possibilities offered by the instrument—possibilities which, of course, had been tightly circumscribed by Davies in the design of the instruments themselves.

A significant consequence of Davies's approach was that his poietic intentions ended up being inscribed partly in his scores and partly in the instruments themselves—which, in turn, served as a proxy for the kinds of sounds and emergent musical behaviours that Davies imagined would result from the players' interactions with these instruments during performance. Of course, precisely *which* sounds or behaviours will emerge in a given performance depends upon, amongst other things, the players' interpretations of the instructions in the score.

Davies's statistic approach to composition was also reflected in the way he conceptualised the interactional dynamics of musical free improvisation in an ensemble context. As a member of the Music Improvisation Company and Naked Software —improvisation groups with which Davies regularly performed in the late 1960s and early 70s—he wrote that 'In both groups you could play in the secure knowledge that one or more of the other players, almost always particular players that one was "aiming at", would react to you in a particular way, without necessarily playing the sort of thing that you might have expected them to play' (Davies 1975, 10). This suggests that Davies regarded musical improvisation as a statistic process of sorts, 'almost always' predicable in the emergent tendencies of musical behaviour but 'without necessarily' being predictable at the level of precise musical details. Like instruments, Davies considered individual performers to have 'musical personalities' that enabled improvisational dynamics to be loosely predictable in this way (Davies 2002; Mooney 2016d). Davies was interested in embedding processes of improvisation in his compositional work, and this sort of 'statistic' predictability, arising from the interactional dynamics of ensemble improvisation, was an implicit feature of his live electronic works, which invariably involved an element of improvisation.

Preparing and Performing the Pieces

We now turn to the specific pieces that we performed: *Quintet* (1967–1968), *Interfaces* (1967–1968), and *Not to be Loaded with Fish* (1968–1969).[5] These represent Davies's first live electronic compositions and his earliest compositional explorations of the statistic potentials of the instrument-performer-score as socio-technical nexus.

The preparation and performance of the pieces took place in the context of a fifteen-month AHRC research project entitled 'Hugh Davies: Electronic Music Innovator', led by JM, in collaboration with the Edinburgh-based ensemble Grey Area. The group comprised Nikki Moran, Emma Lloyd, Shiori Usui, Armin Sturm, Dave Murray-Rust, OG, and SW, and had come together some years previously to explore repertoire that combines notation and improvisation. Whereas the group members usually play their 'normal' instruments, a striking feature of this project was the extent to which each of the pieces necessitated the building and playing of non-standard instruments.

JM engaged Grey Area to develop a concert of Davies's work, which was curated in collaboration with SW. The programme was performed twice: once in Leeds, and once in Edinburgh. Naïvely, one might suppose that such concerts could have served just as a representation of the fruits of JM's archival research, of questions already answered. However, as will become clear, the group's practical engagement with the pieces generated questions and uncertainties, prompting a more dialogical understanding of the relationship between archival and practical work in this project. We discuss the pieces in turn, in a rough order of how much supporting material there was at the outset (such as scores and archival documents, for example), and so, how much we believed we knew.

Our discussion focusses on two key issues: material and technological choices that must be made in sourcing or building the (often) non-standard instruments and other apparatus required to perform this kind of music; and the significance of the musical backgrounds of the performers in the preparation and execution of a performance. Both variables, we argue, have substantive implications for the way that the music unfolds in performance.

Quintet

In *Quintet*, four players (Players I–IV) stationed around the audience produce and play feedback, according to instructions in the score that describe the pitch (high, medium, or low) and other characteristics of the desired sound, using a microphone-loudspeaker setup, routed via a central player (Player V) who can adjust not only individual levels but also microphone-loudspeaker routings. A detailed discussion of this piece is given by van Eck (2017), who notes that the character of the piece arises from the way the configuration gives rise to a set of cross couplings that puts players in a position of having to search for their sounds. In particular, feedback systems tend to be very sensitive to even small changes in microphone position.

This configuration forms one example of what we're calling a 'distributed instrument', one that exhibits couplings at a variety of scales. Players I–IV are all coupled to Player V. Changes to volume levels made by Player V may interrupt or otherwise transform the sound of one of the microphonists, giving the possibility that these players might end up in a kind of 'dance' with Player V as each tries to fulfil their scored instructions. Furthermore, the instrument also couples to its acoustic environment: the feel and behaviour of the individual feedback systems is changed by the acoustic qualities of the hall. Player V, meanwhile, has their hands full: not only must they be attending to and dancing with each of the streams from Players I–IV, but they also have additional sound making duties involving a further microphone-loudspeaker system, as well as a tone generator used to produce modulation effects with the feedback sound.

In practice, it turns out that the selection and setup of microphones and amplifiers also has a profound effect on the behaviours of the overall distributed instrument. For our performances, we elected to use guitar amplifiers, as these were readily available. Moreover, we found in rehearsal that to produce feedback at sound levels that the players could cope with, we needed to overdrive the signals. However, the consequence of such a move is to render the microphone-loudspeaker system even more sensitive and unstable, and the effect of changing acoustic environment is amplified as a result. Concretely, the behaviour of the system will tend to move away from a simple one where the resultant pitch is a predictable function of the distance between the loudspeaker and microphone, to a more complex behaviour where the pitch is increasingly liable to jump suddenly in response to small movement.

It is perhaps partly due to these dislocations that we felt neither of our two performances of *Quintet*—in acoustically different venues—went as well as expected. Whilst we had reached a point in rehearsals where we felt comfortable with the

piece, that we could produce something that felt musically coherent and compared well with Davies's recorded version,[6] the performances felt less focused and less structured. One component of this was that Players I–IV were having to, in essence, re-learn their instruments in the new acoustic surroundings, such was the sensitivity of the systems. Another more subtle aspect possibly lies in the fact that it is simply harder to hear what is going on overall in larger, more reverberant spaces. Despite the score stipulating that Players I-IV are not to coordinate with each other (implying that Player V takes responsibility for the overall sonority and shaping of gestures), we had, nevertheless, become used to hearing each other in our acoustically immediate rehearsal space and did not give this instruction due consideration. In particular, the sounds of the other players turn out to be helpful in locating oneself in the overall score (even though we all had stopwatches), especially at the boundary points between sections.

Finally, even after rehearsal and performance, there remained a couple of points of mystery in *Quintet* that subsequently discovered archive material helped shed some light on. The first of these concerns the final two sections of the piece (08:50–10:30 in the online video recording of our performances), where Player V re-routes the connections between microphones and loudspeakers using the mixing console. We found that the effect of doing this is that feedback ceases unless the original feedback path is maintained, as the increased distance between a microphone and loudspeaker means that considerably more gain would be needed to set the system in motion. Whilst the score seems to suggest that feedback between these more distal points should still be possible, our gain structure did not afford this, and we decided that this section was more poetic: Players I-IV should be *seen* to be searching for their feedback loops.[7] However, we later discovered in a letter from Davies to Jaap Spek that

> The switching unit is optional (small halls only); in one section the microphone connections are switched round aleatorically, so that a performer may find that he can no longer get feedback with his own speaker, but that it does work with someone else's loudspeaker. (Davies 1968d, 5)

Similarly, the final section (from about 10:30 in the video) calls for low frequency feedback to be produced. We found this hard to achieve in practice, even when boosting bass controls as Davies suggests, because it requires greater distance and greater gain, and the overdrive we added also tends to attract the system to feedback at higher frequencies. We did, nonetheless, find that by moving our microphones to face the rear of the loudspeakers we could produce lower sounds, albeit without much variation. However, in the same letter to Spek, Davies suggests that he was able to achieve much more dramatic effects, perhaps again due to having more headroom in his gain structure (and possibly more drastic equalisation controls):

> After the comparatively high pitched sounds for most of the piece, it ends with the lowest sounds that each player can get, with the amplifier and mixer volumes full on. The whole place vibrated when we did it! (Davies 1968d, 5)

Not to Be Loaded with Fish

Not to be Loaded with Fish is a piece for a soloist with record player and electronics. Among its unusual features is that fact that it requires that one has first interpreted another Davies piece, *Voice* (1969), for a solo vocalist and vinyl cutting machine.[8] In *Voice* the performer is instructed to make a gramophone recording in a public recording booth.[9] In Davies's performance notes, the solo vocalist is instructed as follows:

> The record is to be made vocally, with as much variety as possible (e.g. breathing, growling, murmuring, whistling, intoning, etc.) but excluding conventional singing. No intelligible words are to be used, though some passages may sound as if they are in a foreign language. In particular vary the speed of articulation and the use of pauses. (Davies 1969)

Not to be Loaded with Fish requires a record player that has been modified so that the record made for *Voice* can be played both forwards and backwards at the flick of a switch. The performer plays the record, ad lib, forwards and backwards, such that the performance lasts approximately twice as long as the record itself, that is, about 5–7 min. The performer also modifies the sounds played back from the record using a 'pulsing unit', constructed using two dials culled from old rotary telephones. This pulsing unit chops up the sound, so that repetitive silences are introduced. The performer also has additional controls that influence the volume and left/right balance of the sound, via two loudspeakers.

Given that public record-cutting booths are no longer to be found, we had to exercise some licence with how we produced the disc for *Voice*. For the Leeds performance, Aleks Kolkowski used a portable lathe live on stage to cut a disc of Phil Minton performing a vocal improvisation (this disc was also used in the second performance in Edinburgh). Whilst this tactic had the palpable benefit of underlining for the audience how the two pieces are connected, and perhaps making the role of the other electronics more scrutable, it did also mean that the performer (SW) had only his memory of Minton's performance to go by when performing *Not to be Loaded with Fish*. In this sense, *Not to be Loaded with Fish* reveals a different kind of distributed instrument, in that there is now this temporally displaced connection between what was recorded, and how that recording is used to structure a performance. The score makes few suggestions about the actual character of the gestures or sounds a performer might aim for. Whilst Davies does instruct the player to 'vary the frequency of reversal of the turntable and the operation of each set of controls and their different combinations as much as possible', it's unclear to what degree he expected a performer to have learnt the repository of gestures available on the disc, or to have scripted the performance.

Something that does become clear through practice is that, in common with *Quintet*, the electronics performer is given quite a bit to do; between two telephone dials, volume faders for the left and right channels, and manipulating the turntable,

considerable dexterity is required. To help with this, SW used a fader setup for the volume controls borrowed from Stockhausen's *Mikrophonie I*[10] and techniques used by Rolf Gelhaar in that piece to control the left and right volumes with a single hand.

In rehearsals, SW found some effective combinations by using the faders to create deliberate fast and slow envelopes with well controlled attack or decay shapes—sometimes using the dials to cut the sound, raising the faders and then using the dials to switch the sound in and pulling the faders back very quickly to create percussive sounds, although these didn't translate into the performance, mainly due to the different reactions provoked by the completely new material recorded immediately prior to performing the piece. Possibly the most effective deliberate result was achieved by holding the dials so that the sound passed through but in a position such that a small hand movement could cut the sound off (01:40–02:00 in the Leeds video).

Interfaces

In contrast to *Quintet* and *Not to be Loaded with Fish*, *Interfaces* doesn't have a published score or a complete set of materials and, as such, we were engaged in an attempt at reconstruction as well as interpretation. This in itself yielded a very particular kind of indeterminacy, as uncertainty over what there was to be found in the archives led, unsurprisingly, to uncertainty about how the piece is meant to come together. To add to this confusion, *Interfaces* also has two incarnations, for six people and for two people. The six-person version, which we were attempting, may not have been publicly performed more than once,[11] and Davies had not regarded that performance as a success.

What is clear enough is that the six-person version of *Interfaces* is for a collection of small instruments, played by four people, with tape and electronics operated by an additional two performers. Our starting materials were an equipment list (see Figure 1) and a selection of sound files transferred from tapes held at the British Library, as likely candidates for *Interfaces*' tape parts. The equipment list suggested some similarities in configuration to *Quintet*: four loudspeakers, a variety of devices for routing signals, tone generators, signal processors, and an instruction to devise a selection of small instruments from different materials. However, we were missing any indication of how the various electronics were to be interconnected, or any kind of score that indicated when or how to deploy these resources.

The lack of a score and a signal flow was especially troubling because there are so many elements at play. Each small-instrument player has two instruments, plus a variety of exciters; the tape parts are very dense indeed, and include highly varied materials; and there are a great many ways that the various electronic components can be interconnected and routed. Our early rehearsals were, for this reason, slow, as we trialled different possible signal flows, and tried to make sense of how these materials could work together, although the programme note from the 1968 performance had a small hint:
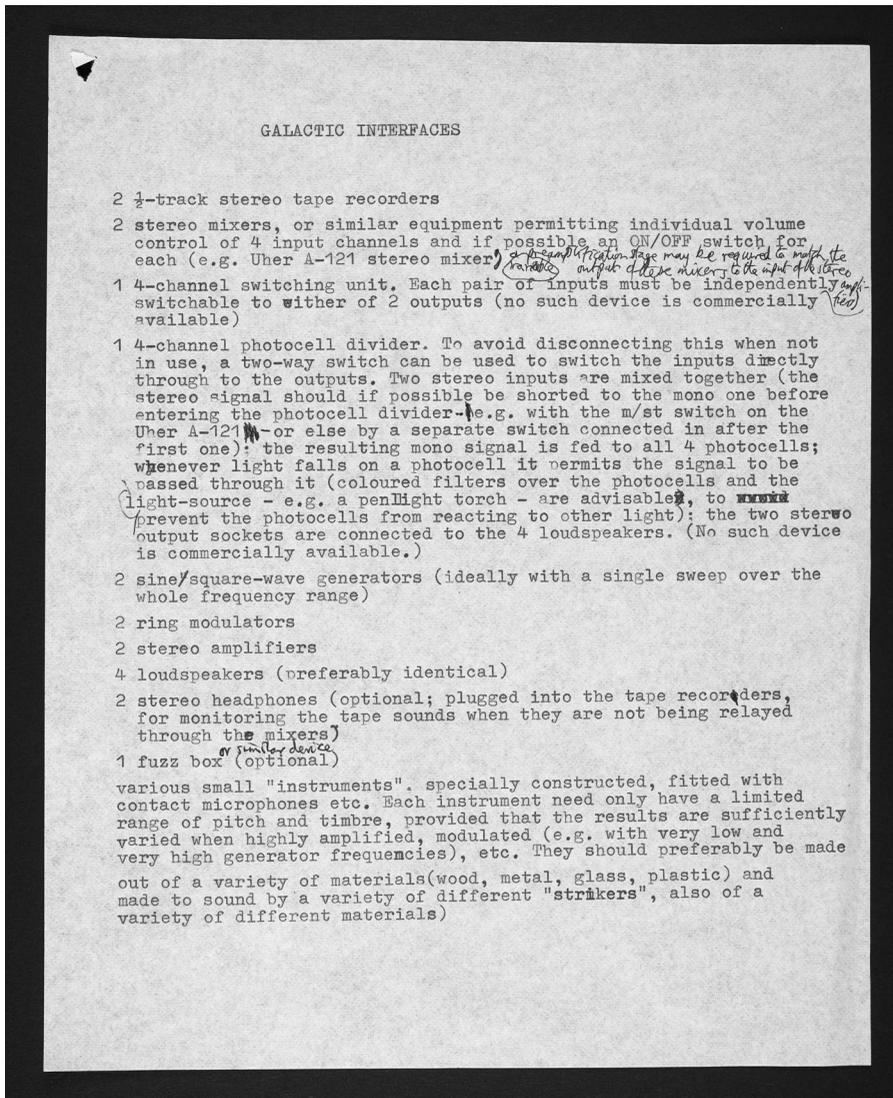
Figure 1. Equipment list for *Interfaces* (© British Library Board, MS Mus.1803/1/10/1, 'Interfaces (Galactic Interfaces)').

> The title refers to the combination and contrast of the sounds on four tape tracks with each other and with live sounds produced by the four performers, as well as to the varied use of modulating, mixing and switching devices. (Davies 1968a)

However, perhaps in part due to the amount of uncertainties we had about the piece, it wasn't until the second performance that we properly started to get a grasp on *Interfaces*. Even the first performance, although tempered by apprehension and somewhat

messy, had felt like an improvement on our rehearsal attempts, perhaps because performance in front of an audience forced us to focus on finding the musical potential in the setup that we had settled upon. The big shift between the two performances really centred on deciding to 'invert' the material driving the piece: instead of letting the tape drive the small-instrumentalists, we instead opted to make much less use of this, and to have the four players (now working as pairs) assume a driving role, as well as paying more attention to how electronic processing could help thin-out the dense sound-world.

From what we have since learned from archive materials, particularly the especially valuable correspondence between Davies and Spek (Davies 1968d), the trajectory we pursued is somewhat in keeping with what Davies had in mind for the piece. For instance, from the letter we learned both that the tape was meant to be used sparingly, and that the panning effects were only to be engaged in the final section of the piece (Davies 1968d, 6). Also, from some handwritten notes (Davies 1968b), we learned more details about the distribution of small instruments among players (see Figure 2). Davies clearly intended for there to be some built in differentiation between the microphonists, by suggesting that each is limited to a different pair of materials, and providing suggestions for possible instruments.

As it stands, however, we remain uncertain about the ontological status of *Interfaces*, including being uncertain about whether it is (or was) a *work* as such, or remained a work in progress. Whilst it appears in Davies' published and personal work-lists (Roberts 2001; Davies 2003), and has a date and a programme note, the fragmented and provisional nature of the archival documents that have been found so far casts some doubt on how finished it ever was. There is something particularly vexatious about trying to settle this for indeterminate works such *Interfaces*—which might include performance instructions, signal flow diagrams, equipment lists, among other resources—in that one is always going to be unsure that all the different types of documentation have been found. In this sense, interrogating the piece through practice has proved fruitful in helping to resolve some questions and to focus others.

Experiencing Indeterminacy in Performance

Each of these pieces brings forth indeterminacy for performers in some ways. Furthermore, there appear to be multiple indeterminacies at work, on different levels. We want to argue here that these are, in some sense, *nested*, and that while such nesting is a conspicuous feature of live electronic pieces, we ought not foreclose the possibility that it could be a feature of any other kind of musicking. Rather, coming to terms with the ways in which indeterminacy is experienced in these sorts of piece might contribute to a more shaded vocabulary and conceptual apparatus for analysing musical indeterminacy in general. The following analysis suggests some planes of indeterminacy at work in these pieces of Davies's by considering them, broadly, in systemic terms: comprising in each case some network of people, an 'instrument', and constraints that may (or may not) be taken to add up to a 'work'.
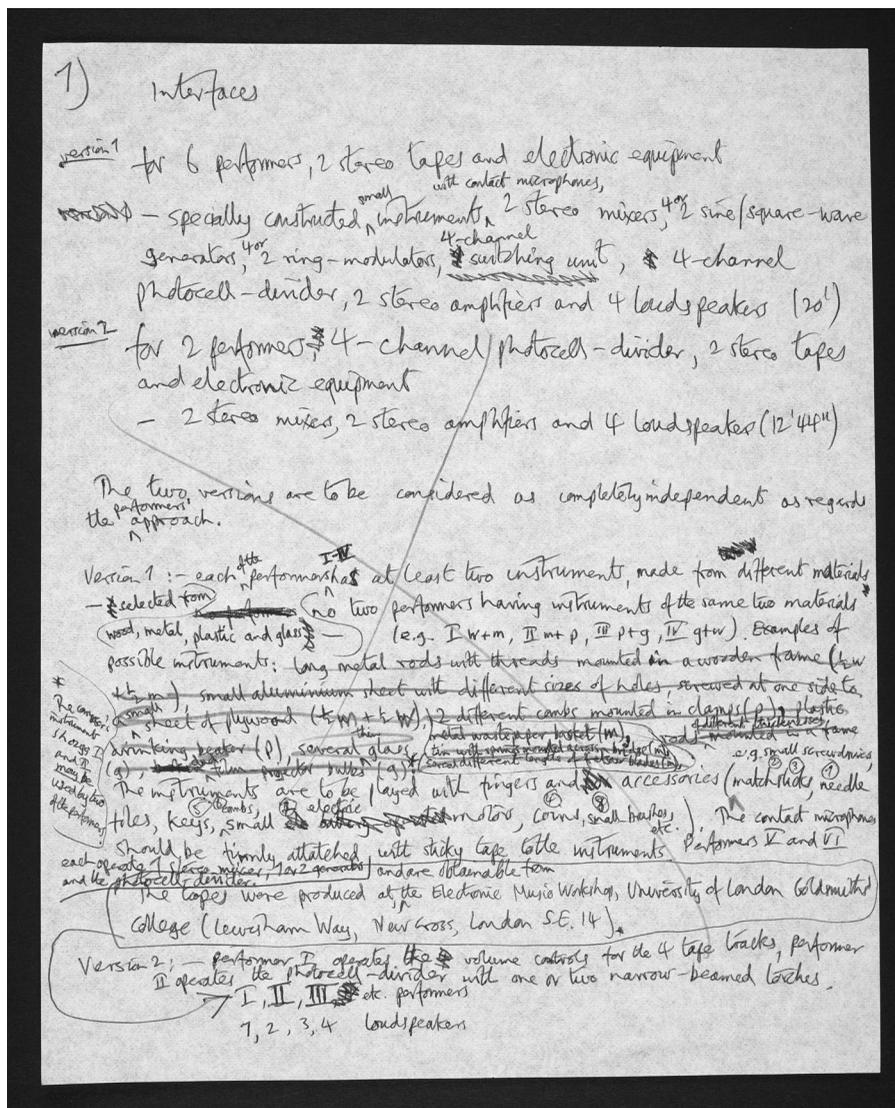
Figure 2. Handwritten draft performance instructions for Interfaces (© British Library Board, MS Mus.1803/1/10/1, 'Interfaces (Galactic Interfaces)').

The Edges of the 'Instrument'

Something that stands out among these pieces, and among pieces for electronics in general, is that the notion of the instrument becomes less firm than we are accustomed to. 'Electronics' denotes, in very broad terms, a medium rather than a particular configuration of materials that crop up repeatedly within a body of music. Indeed, electronic music doesn't seem to have associated with it a stable repertoire of

instruments to the same extent as, say, western chamber music or rock. However, its *instrumentarium*, taken as a repertoire of tools that may be combined in practice, is more stable: almost all the components of the pieces discussed above are still routinely used in contemporary electronic music practice.

What is conspicuously hard to pin down, though, is where the boundaries of the instruments are in these pieces. Each of them comprises, in some way, what we have been calling a *distributed* instrument, in that the piece is defined in part by a coupled material system across which agency is shared, but that can also be viewed as a collection of sub-instruments that individuals interact with. In *Quintet* this distributed agency is built in by the way that Player V mediates the feedback loops of Players I–IV, so that the sound at any given moment is a function of the coupled decisions of Player V with each of the others. In *Not to be Loaded with Fish*, by contrast, the coupling of agency is deferred through the act of recording but, nonetheless, the musical affordances of the overall instrument arise through the coupling of two sets of action. For *Interfaces*, partly because of all that we still don't know about it, the potential space for different types of coupling is larger, as each of the microphonists has (at least) a pair of sub-instruments, that are available for *ad hoc* coupling with other players' (as we saw in the Edinburgh performance), as well as the potential distributions of agency through the combined actions of the electronics operators.[12]

This instrumental indeterminacy can be said in each case to form part of the aesthetic themes of a piece. For instance, the way that *Quintet* is structured offers an audience different glimpses of the underlying agential network as the performance unfolds: at the very opening, as Players I–IV search for and gravitate towards a tonal reference from Player V—'Gradually find the same pitch as [player] V', as the score instructs—we can hear a system of distinct but coordinated actors. Conversely, in the later sections, Player V acts upon the network in progressively more disruptive ways, first by modulating levels and assuming control over the spatial modulation of the overall sonority, and then by changing the interconnections themselves, revealing the more complex distribution of agency at work.

The 'Instrument' and Musical Time

Because each piece involves building, and combining in to an overall system a series of sub-instruments, it also involves, by extension, learning to play these things. At one level, this introduces a very clear species of indeterminacy for performers, insofar as there is a diminishing—yet lingering—degree to which one is always coming to terms with the musical affordances at hand. Moreover, precisely because of the ways in which these pieces hinge on the combinations of sub-instruments, the learning process isn't simply a matter of coming to terms with the sonic-gestural vocabulary of a thing-in-isolation, but also with the combinational possibilities of the thing in concert with other things-at-hand, and with things that other people are bringing to the overall assemblage.

As such, there is a conspicuous degree to which players in this situation are always learning, and always improvising. Because these pieces all leave certain details undetermined of how instruments are to be played or constructed, the articulation of time and timbre are also undetermined, albeit in different ways for each piece. Going through these pieces iteratively, in close succession and association with each other, and with different degrees of specification allows us to make some useful comparisons.

There can sometimes be a sense, when watching—or doing—improvisation in the build-your-instrument-as-you-go genre that the results are somewhat aimless. For instance, we may feel as if the performance is simply a sequence of discovered moments that don't seem to refer to each other, or that among a polyphony there doesn't seem to be any deliberateness to ways that voices might push and pull at each other. Arguably such structures are fairly normal in (post-)Cageian experimental music.[13] Nonetheless, in *Quintet* and *Interfaces* we were able, albeit to varying degrees, to move ourselves from this kind of morass to episodes that felt more deliberate, and more *musical*,[14] but still indeterminate.

First, there is a sense in which one's sense of musical time relates to how much one has come to terms with the instrument. Almost involuntarily, the horizon of our attention can collapse down somewhat when we're still orientating ourselves to the basic possibilities in front of us, and in this way can give rise to this somewhat disconnected result as we, quite contentedly, experience a series of 'oh-I-can-do-this' moments. *Experientially*,[15] we could suggest a reasonably straightforward relationship between the temporal-horizon of our musical thinking[16] and the degree of contextual fluency we've established with our materials: what characterises increasing fluency is being able to grab at things (Sudnow 2001) in a *more timely* way, where timeliness is, of course, conditioned by what else is happening.

Second, there is a sense in which this sort of fluency is accelerated by the particular constraints offered by the score (in the case of *Quintet* and *Not to be Loaded with Fish*) or notes (in the case of *Interfaces*). Importantly, whilst the way in which these pieces comprise sub-instruments that all need to be learned, one can see that Davies took some care in thinking about the degree of complexity each component might introduce. The individual components tend to be *infra-instruments* (Bowers and Archer 2005): things consciously selected because they appear to offer very limited musical possibilities when taken on their own, but that offer (potentially many) ways to be playfully coupled and combined. This is strikingly true of the instruments and exciters that Davies suggests for *Interfaces*, as they all exhibit strictly limited timbral and gestural scope, can readily be explored in combination with each other and with additional signal processing, and—crucially—wouldn't take at all long to learn.

The directions that Davies provides in the scores re-enforce this pattern by placing limits on what players are suggested to do with their components. In *Quintet*, Players I—IV are, for the most part, exploring a very limited gestural and sonic space between two registers and a small number of simple patterns; Player V has appreciably more work to do, but is still constrained by the score to a subset of the many possibilities

that being able to route-freely between all the microphones and loudspeakers would bring. In *Not to be Loaded with Fish*, the player is given an explicit suggestion of how to interact with the telephone dials, whilst also being prohibited from certain moves (touching the stylus of the record player).

From this, we can account for some of the differences in how *Quintet* and *Interfaces* came together. Part of the viscosity we experienced with *Interfaces* can be attributed to the open-endedness that comes from the limited documentation we were able to draw upon, and from the need to conjure-up and learn parts of an indeterminate-whole *ex nihilo*. In the trajectory between the two performances, we can see how the outwardly shifted attention, in combination with some added constraints of our own, sharpened the precision and extended the horizon of the ensemble's grasp of musical time. Conversely, with *Quintet*, the availability of some constraints in the score meant that we had a shorter journey to feeling as if we had become fluent. Yet, in performance, we discovered that the boundaries of our instruments had shifted due to less hospitable acoustic conditions—and nonlinear instruments—and so the experience went the opposite way, with attention falling back in towards the local and immediate, having to re-learn on the fly. We may assume that this kind of re-learning was anticipated by Davies, at least for Players I–IV, since in the performance directions he notes: 'Players I–IV need not be trained musicians and should be able to get good results after one rehearsal'.

To the extent that this concern with timeliness might be revealed in performance as an aesthetic theme related to the indeterminacy of these pieces, we would suggest that in pieces such as these, that involve self-consciously experimental conjunctions of material in lieu of established instrumental technique, part of the performative work lies in a somewhat intangible negotiation with the audience that what is happening is music and that, at some level, this involves establishing some degree of trust. Further, in pieces where the moment-to-moment details are indeterminate, it might be argued that *when* something happens is more important than precisely *what* happens[17] in terms of establishing and cementing such trust. As such, we could regard the kinds of constraints that Davies introduces as being geared towards leaving space for the players to attend precisely to this timeliness.

What Are We Doing?

Our final plane of indeterminacy occurs at the ontological level: indeterminacy about what it is, in broad terms, that we're performing. On the one hand, we are concerned with these pieces as historical artefacts, and by performing them, trying to discover otherwise elusive aspects of their nature. On the other, we are engaging with them as artefacts in the musical present, where a great many of the techniques present in these pieces have become more commonplace than they were in the 1960s, clichés have been established, and the technological landscape has shifted markedly. On the one hand, using period technologies to perform such works, as media archaeologists have suggested (Fickers and van den Oever 2013), can help to (re)produce

knowledge about interactions with the technology that would be missing if modern-day alternative technologies were used. This approach is useful, we argue, not only from the perspective of research and interpretation, but also because works of live electronic music are often defined sonically, performatively, or ontologically by the sonic-tactile affordances of *specific* instruments and equipment. On the other hand, sounds and sound technologies have cultural meanings that change over time (Bij-sterveld and van Dijck 2009), and attempts to re-enact 'historic' sounds and perform-ance practices in the present day, as critics of historically informed performance have passionately argued (Taruskin 1995), will inevitably yield cultural meanings different from those that might have been produced at the time of a work's inception.[18]

In either case, we are left with hermeneutic indeterminacies, in trying to puzzle out how these pieces may have functioned in the late 1960s or how they may be made to function in the 2020s. We are surely not the first to consider these questions in relation to work from this period; Simon Emmerson (2006), for instance, provides a useful overview of many of the issues at hand for this generation of live electronic music. Here we use a productive model from Nikki Losseff, who suggests a 'musical Johari window' as a schema to help relate the different knowledge positions of interpreters and composers (Losseff 2016). Losseff suggests four categories: the *Arena* forms a basis of common knowledge between a composer and interpreter; the *Façade*, those things only known to a composer; the *Blind Spot*, those things known only to the interpreters; and a final, Rumsfeldian *Unknown*—things that nobody knows. This provides a productive model, allowing for a certain degree of contingency in what it might mean to 'know' something in the first place when dealing with complex phenomena.

Clearly, certain things can move from the Façade into the Arena, through further trips to the archives, re-examinations of materials, or by talking to those people still available to tell the tale, and we have seen, in the case of *Interfaces* how many useful pointers have since emerged. Nevertheless, even in the case of *Quintet*—the most for-malised and 'work-like' of these pieces—key performance issues remain behind the Façade. For instance, *how loud was it*? Davies comments in his letter to Spek, that the room could be felt vibrating at the end of one performance (Davies 1968d) which suggests that it may have been quite a bit louder, or at least with much more headroom, than we performed it. However, approaching it this way—possibly more 'authentically'—would imply quite significant changes to how we approach it. Would the performers need hearing protection? Would the audience? Is authenticity worth pursuing under such circumstances?

When it comes to relating how *Quintet* might be received in a contemporary setting, Losseff's model yields interesting interactions between the Façade and the Blind Spot. What interpretative emphasis might one put on the piece being concerned with the sonic character of its materials versus the materiality of its performance scheme? Does the sound world still hold interest for a contemporary audience con-siderably more exposed both to relatively simple electronic sound, and to feedback pieces? Would updating it in any way be tasteful, ethical, even? Clearly, 1968-

Davies had no possible way of knowing how well particular sounds would age, but on the other hand, a later-Davies would have had plenty of opportunities to revisit a piece should he have felt it to be a matter of any urgency (Façade).[19]

Clearly, in the case of *Interfaces* there is a great deal more that is left to be resolved, sitting behind the Façade. Some of it may even be in the Unknown: we don't know that Davies ever actually finalised a version of *Interfaces*, despite it being included in his work-lists. The greatest lacuna remains the score and, whilst we can only speculate at what it contains (if it exists), our work on the other pieces means that we can possibly make quite informed speculations. One possible path, starting with Davies' observation to Spek that the scores for *Quintet* and *Interfaces* were quite similar (Davies 1968d),[20] would be to base a putative score for *Interfaces* on some set of interpretations (viz. guesses) about aspects of *Quintet*.

We could identify one thread in *Quintet*, for instance, that seems to be concerned with moving steadily away from the sound of feedback in its plain form: in the earlier stages of the piece we have slower moving gestures, turning into arpeggios, then being interrupted first with hands and then by Player V, and finally settling on the elusive low tones that may well have been outside people's routine associations with the sound of feedback. Another thread might be concerned with how the directness of performance gestures were made apparent, and how the network of connections reveals itself over the course of the piece, as noted above.

What might a score for *Interfaces* along similar lines be like? We can certainly imagine how similar trajectories might be enacted, perhaps with the microphonists remaining relatively un-processed at the start, and the sound world becoming increasingly abstract as the piece unfolded. We know, again from the letter to Spek (Davies 1968d), that the panning device was only to be engaged at the end of the piece, which perhaps suggests another similar trajectory at work as the network of connections is only gradually revealed. It is also possible that a set of numbers next to instrument-exciters in Davies's handwritten notes could have been related to sections of the piece (Davies 1968b), which might indicate that different sections achieved some coherence by having the microphonists coordinating over how they drew sounds from their instruments.[21]

Whilst such an undertaking is clearly *possible*, then, the question remains of whether such an undertaking would be of value. Besides helping to produce a more engaging performance of *Interfaces*, albeit one that has a more problematic set of claims to make with respect to 'authenticity', re-approaching *Interfaces* in this way may well turn out to reveal further areas of indeterminacy.

Conclusion

We return now to our core argument. Davies composed indeterminacy by producing scores whose instructions indexed the indeterminate, 'statistic' behaviour of complex systems comprising multiple players and spatially (*Quintet*, *Interfaces*) and/or temporally (*Voice/Fish*) distributed instruments. But beyond this level of composed

indeterminacy, our practice-research has uncovered three further species of indeterminacy—Instrumental, Hermeneutic, and Ontological—that reveal themselves through the iterative processes of assembling Urtext materials (Emmerson 2006), constructing (distributed) instruments, and rehearsing and performing pieces.

Instrumental indeterminacy manifests itself as uncertainty about just where the boundaries of the instrument—and by extension, the boundaries of the individual performer's agency—lie. Indeed, this locus may shift within the duration of a performance (Mooney, Parkinson, and Bell 2008). A corresponding uncertainty about the boundaries of the instrument may also be experienced by the audience, and to remedy this it may be deemed necessary for the players to 'perform' (in a demonstrative sense) the boundaries of the instrument. Did Davies (and do other composers of this kind of repertoire) have this in mind when he composed these pieces? We suggest that this is a poietic and aesthetic dimension of indeterminate live electronic music that would be worthy of analysis in future studies of this kind of repertoire.

In the performance of music for non-standard instruments, and even more so in the case of *distributed* non-standard instruments, indeterminacy may be experienced by the performers as uncertainty about the operational affordances of the instrument at hand. This, in turn, may affect the performer's 'phenomenological experience of musical time' (Théberge 1997, 170) and, by extension, the form and content of the music as it unfolds in time. Again, this has aesthetic ramifications for how an audience may experience and appreciate (or not appreciate) this kind of repertoire.

Hermeneutic indeterminacy—or, perhaps, under-determinacy—is signalled by the absence (or ambiguity) of information needed to make a satisfactory interpretation of a work. Performers may experience hermeneutic indeterminacy when evaluating a composer's ambiguous prescriptions or non-determinations, deciding which of these might have been part of the poietic intent *qua* indeterminacy (whether actively or passively (Butt 2002, 89–91)), and devising practical ways of resolving them.

In the case of *historic* live electronic music—a category into which all the pieces we performed fall—a further dimension of hermeneutic indeterminacy arises from the fact that the cultural meanings of media and telecommunications technologies (such dial telephones and 'Record your Own Voice' booths) and performance practices (such as those associated with live electronic music) shift over time, so that the cultural meanings that had currency in the 1960s—when live electronic music was a little-known experimental medium and dial phones were a banal fact of everyday communication—are different from those that obtain in 2016, where live electronic techniques have long been ubiquitous in popular and academic music cultures and dial phones signify as 'retro'. For the performers of historic live electronic music, hermeneutic indeterminacy may thus present itself as a lack of information about the composer's intentions vis-a-vis these kinds of cultural meanings. Insofar as the interpretation of indeterminate scores already requires the performers to interpret the composer's intentions *qua* indeterminacy, this situation, we can say, means that the performers have to negotiate an *additional* indeterminate parameter (viz. the composer's orientation toward cultural signification) that presumably would not

have existed for performers interpreting the work during the 1960s. Of course, similar kinds of observations have been made—and critiqued—in the context of academic discussions around the 'authentic' performance of early music (see for example Taruskin 1984).

Ontological indeterminacy is signalled by uncertainty about the ontological status of the piece to be performed and is perhaps best illustrated by the case of *Interfaces*. On the one hand, there is archival evidence to suggest that Davies considered this piece to have the ontological status of a *work*. He included it in several of his written work-lists and wrote a programme note in which he stated when the piece was 'composed' (Davies 1968a). On the other hand, the appearance of subscribing to a more-or-less traditional notion of the work concept does not necessarily prove that Davies genuinely regarded his creative practice in that way (see Goehr 2007, 243–286), and the nature of the archival documents themselves—their fragmented state and messy, 'provisional' appearance—perhaps suggests that *Interfaces* was never any more than a *work-in-progress*, fossilised in the archive in a state of permanent provisionality.

Of course, the potential for this kind of ambiguity is not unique to musical works and could arise in relation to other forms of creative practice when their material traces make their way into an archive. But the potential for ontological indeterminacy may be particularly pronounced in the case of indeterminate musical scores, and this has precisely to do with the indeterminate nature of the poietic intent and the fact that indeterminate scores often rely upon the artful omission of information and/or the use of deliberately ambiguous or 'provisional-looking' notations as a way of representing this poietic intent (Cardew 1961; Behrman 1965). In this situation it may be difficult for the researcher to distinguish between the traces of a work-in-progress—such as sketches of a work that was subsequently completed—and the traces of a finished work that merely have the *appearance* of incompleteness or provisionality because of the forms of notation that the composer has used to achieve the desired indeterminate effects.

For these reasons, reconstructing an incomplete score of indeterminate music can be a vexed process, and again, this is illustrated by the case of *Interfaces*. Knowing what we know about Davies's musical aesthetics, the idea that Davies may have composed a live electronic work where the materials given to the performers consisted of nothing more than an equipment list and a rubric about the interrelation of narrowly-defined instrumental sound worlds and the distinctive musical personalities of the performers, the rest being left down to the 'statistic' determinations of improvised performance, seemed *plausible*—in a way that it would not have done had Davies been a staunch advocate of more deterministic compositional approaches (in which case the materials might have more decisively announced themselves to us as 'incomplete'). On the other hand, the statistic nature of Davies's approach affords the possibility of approaching a reconstruction of what we now understand more clearly to be an incomplete score, since the statistical tendencies inherent in the bringing together of the prescribed instruments and the generative tendencies of performers

(*qua* musical personalities) can be used to approach a plausible solution empirically via the emergent behaviour of the system itself—in a way that would not have been possible had Davies's poietic object been represented in the score simply as a sequence of note tokens.

Finally, in practice research of this nature, indeterminacy may be experienced by the researchers (who in this case are two performer-researchers and one non-performing archival researcher) as a certain ontological plurality vis-a-vis the objects of study (i.e. the works), which must simultaneously be viewed as historical artefacts and artefacts in the musical present. While this is broadly true for any 'historic' repertoire, the performance of *indeterminate* historic works, which, furthermore, involve the use of non-standard electronic and electro-acoustic instruments whose 'statistic' potential, moreover, is an integral object of the composer's poietic intent, poses a particular set of problems that perhaps *are* unique to this kind of repertoire.

Disclosure Statement

Funding

Notes on Contributors

James Mooney is Associate Professor of Musicology and Music Technology at University of Leeds, UK. His research explores histories of electronic music and sound technologies. He has published on mid-century electronic music instrumentation, sociotechnical/sonic imaginaries, technological affordances in music-making, noise music, electronic music on television, and multi-loudspeaker sound systems, as well as on the work of experimental musician Hugh Davies.

Owen Green is an improvisor, systems builder and theorist, interested in the entwining of the social and technical in music technology research. He currently works at the University of Huddersfield, UK, as a research fellow on the ERC project 'Fluid Corpus Manipulation', developing platforms for musical creative coding research with machine listening and machine learning.

Sean Williams is a senior lecturer in Music at the Open University. His main area of research is in electronic music technology and practice in the second half of the twentieth century. As a practice-led researcher he builds, maintains and customises analogue electronic instruments, using them to realise and perform new and existing pieces. He performs internationally and runs the Free Range Orchestra.

Notes

[1]   We use initials to refer to each of the three authors when required.
[2]   For further discussion of Davies's self-built instruments see Mooney (2017).
[3]   In sociology and organisation studies, the term 'sociomateriality' connotes the idea that 'ontologically, the social is so implicitly entwined with the material that distinctions between the two are artificial' (Jarzabkowski and Pinch 2013, 581). We use the term here

to highlight the way Davies leveraged, as a compositional technique, the probabilistic tendencies of constitutionally entangled networks of humans and materials.

[4]   A filmed performance of *Mikrophonie I*, including Hugh Davies on potentiometers, was produced by Dhomme and subsequently released on DVD by the Stockhausen Foundation (Dhomme 1966). At the time of writing, this film is also available online (Zoy 2012). The three pieces that we discuss here all involve the use of distributed instruments topologically similar to the one used in *Mikrophonie I*. A particularly good example of the distributed agency that characterises such instruments can be seen in our Edinburgh performance of *Galactic Interfaces*, where one performer strikes a bell-like instrument and the sound is simultaneously ring-modulated by another (SW) (5:55–6:35).

[5]   Instrumentation as follows: *Quintet*, for 5 performers, 5 microphones, sine/square-wave generator, 4-channel switching unit, potentiometers, amplifiers, and 6 loudspeakers; *Interfaces*, for 6 performers, 4 self-built amplified instruments, 2 stereo tapes and electronic equipment; *Not to be Loaded with Fish*, for solo performer, record player, 2-channel pulsing unit and electronic equipment.

[6]   Davies's recorded version of *Quintet* is available on the following compilation *CD: An Anthology Of Noise & Electronic Music / Second A-Chronology 1936–2003*, Sub Rosa SR200 (2003).

[7]   Cathy van Eck interprets this part of the piece similarly (van Eck 2017, 86–87). While no explicitly theatrical performance directions are included in the score for *Quintet*, our interpretation is in line with Davies's approach to performance aesthetics as seen in his other works, such as *The Birth of Live Electronic Music* (see Mooney 2016c). We are grateful to Scott McLaughlin for useful discussion around this point.

[8]   Video recordings of our performances of both *Voice* and *Not to be Loaded with Fish* may be viewed online (Mooney 2016c), so that the relationship between the two pieces as we performed them can be better understood.

[9]   Such booths were, at one time, reasonably common, for example in train stations; one would insert a coin, record sounds for three minutes or so, and a gramophone record would drop out. They are no longer common nowadays, and for our performances, a disc-cutting lathe was used to cut the sounds produced by the vocalist directly to disc.

[10]   Which, as Stockhausen's assistant between 1964 and 1966, Davies had performed extensively (Mooney 2016d).

[11]   At the London Planetarium on 22 March 1968 (Park Lane Group and Society for the Promotion of New Music 1968).

[12]   Weinberg (2005) outlines a useful vocabulary for starting to describe these various topologies. *Quintet* has something in common with what he calls a 'flower' (p. 35), in that a series of unconnected agents are mediated by some central agent; the temporal displacement in *Not to be Loaded with Fish* could be represented by a simple 'wheelbarrow' (p. 34); and the possibilities of *Interfaces* could be modelled in terms of a hybrid topology that the dynamic scope of the assemblage. However, to be more generally applicable, Weinberg's framework needs to be decoupled from two unneeded moves in the text. First, a narrative of technological-musical progress that takes a priori that more modern technologies present richer topographical possibilities that lead to richer musicking; and, second, an over-simple coupling of 'social philosophies' to types of topology that seems to assume that the political character of these things can be assessed independently of the concrete social and historical circumstances in musical acts occur.

[13]   We are grateful to Scott McLaughlin for this observation, though we also note that a 'post-Cageian' reading is not the only, nor indeed the most accurate way of interpreting Davies's work. As JM has noted elsewhere, influences upon Davies's work in the late 1960s were many and varied. Cage was among them, but it would be erroneous to assume that Cage was a more significant influence than, say, Stockhausen, Max Neuhaus, Gordon Mumma, or the many

composer-performers and improvisers that Davies worked together with as a member of Gentle Fire, the Music Improvisation Company, and Naked Software. For further discussion, see Mooney and Pinch (2021) and Mooney (2022).

[14]   What we mean is that, through rehearsal, we were able to reach a point where our engagement with these pieces felt more musical to us as performers. Implicit here is the assumption that 'musicality' is contingent on (historically situated) social negotiation which takes place through musicking itself (in Small's wide sense [Small 1998]).

[15]   Viz., this is not a psychological claim.

[16]   'Thinking' is not to imply that we are reducing musicking to a purely 'mental' process or engaging in any other form of Cartesianism; 'thinking-doing' might be better.

[17]   This is more our interpretation than a specific directive gleaned from Davies's scores.

[18]   Magnetic tape meant different things to audiences in 2016 compared to audiences in 1968, for example, as did the phenomenon of acoustic feedback, which represented a new and novel sound-world in the 1960s but has since been assimilated into the musical mainstream.

[19]   More playfully, we can wonder how *Not to be Loaded With Fish* could be 'translated': given the extent to which the material setup makes a feature out of using what were everyday technologies of the 1960s, in the form of record players and rotary telephone dials, what would the contemporary equivalent be?

[20]   Of *Interfaces*, Davies states that 'the 4 performers have identical parts with freedom for overlapping'.

[21]   It is, however, also possible that these numbers were intended as cross-references to photographs of the instruments, to be included in printed documentation for the piece that ultimately never materialised. Such a system was later used by Davies when documenting his 'Solo Performance Table' (see Toop 1974, 5).

ORCID

James Mooney http://orcid.org/0000-0002-7925-9634

References

Items labelled HSDP may be found within the Hugh Seymour Davies Papers, The British Library, London, UK. MS Mus. 1803. Music deposit 2005/29.

Anderson, Virginia. 2009. "Comfy Cushions and Golden Grandiosi: Instruments of British Experimentalism." *The Galpin Society Journal* 62: 273–286.

Behrman, David. 1965. "What Indeterminate Notation Determines." *Perspectives of New Music* 3 (2): 58–73. https://doi.org/10.2307/832504.

Bijsterveld, Karin, and José van Dijck, eds. 2009. *Sound Souvenirs: Audio Technologies, Memory and Cultural Practices. Transformations in Art and Culture*. Amsterdam: Amsterdam University Press.

Bowers, John, and Phil Archer. 2005. "Not Hyper, Not Meta, Not Cyber but Infra-Instruments." Proceedings of the 2005 International Conference on New Interfaces for Musical Expression (NIME05), 5–10.

Butt, John. 2002. *Playing with History: The Historical Approach to Musical Performance*. Cambridge: Cambridge University Press.

Cardew, Cornelius. 1961. "Notation—Interpretation, Etc." *Tempo* 58: 21–33.

Davies, Hugh. 1968a. "Galactic Interfaces Programme Note." HSDP, MS Mus.1803/1/10/1, Interfaces (Galactic Interfaces), 1967–1968.

Davies, Hugh. 1968b. "Interfaces: Handwritten Notes." HSDP, MS Mus.1803/1/10/1, Interfaces (Galactic Interfaces), 1967–1968.

Davies, Hugh. 1968c. "Verbal Note on Quintet." HSDP, MS Mus.1803/1/10/1, Quintet (Alstrabal), 1967–1968.

Davies, Hugh. 1968d. "Letter to Jaap Spek, August 18, 1968." HSDP, MS Mus.1803/7/33, Correspondence SPA-SZL.

Davies, Hugh. 1969. "Voice (1969) / Not to Be Loaded with Fish (1968–9)." HSDP, MS Mus.1803/1/10/1, Voice, 1969. Score also includes *Not to be Loaded with Fish*.

Davies, Hugh. 1972. "Gentle Springs, for Gentle Fire." HSDP, MS Mus.1803/1/11, Gentle Springs (for Gentle Fire), 1972–1973.

Davies, Hugh. 1975. "Stockhausen's Intuitive Music." *Musics*, May, 10–11.

Davies, Hugh. 2002. "Improvisation, Indeterminacy and Intuitive Music (1970)." In *Sounds Heard: A Potpourri of Environmental Projects and Documentation, Projects with Children, Simple Musical Instruments, Sound Installations, Verbal Scores, and Historical Perspectives*, edited by Hugh Davies, 27–30. Chelmsford: Soundworld Publishers.

Davies, Hugh. 2003. "Hugh Davies—Worklist." HSDP, MS Mus.1803/11/2.

Dhomme, Sylvain. 1966. *Mikrophonie I*. DVD. Stockhausen Verlag.

Emmerson, Simon. 2006. "In What Form Can 'Live Electronic Music' Live On?" *Organised Sound* 11 (03): 209–219. https://doi.org/10.1017/S1355771806001427.

Fickers, Andreas, and Annie van den Oever. 2013. "Experimental Media Archaeology: A Plea for New Directions." In *Techne/Technology: Researching Cinema and Media Technologies, Their Development, Use and Impact*, edited by Annie van den Oever, 272–278. Amsterdam: Amsterdam University Press.

Goehr, Lydia. 2007. *The Imaginary Museum of Musical Works: An Essay in the Philosophy of Music*. 2nd ed. Oxford and New York, NY: Oxford University Press.

Jarzabkowski, Paula, and Trevor Pinch. 2013. "Sociomateriality is 'the New Black': Accomplishing Repurposing, Reinscripting and Repairing in Context." *M@n@gement* 16 (5): 579–592.

Losseff, Nicky. 2016. "Curiosity, Apathy, Creativity and Deference in the Musical Subject–Object Relationship." In *Creative Teaching for Creative Learning in Higher Music Education*, edited by Elizabeth Haddon, and Pamela Burnard, 197–214. SEMPRE Studies in the Psychology of Music. London: Routledge.

Mooney, James. 2016a. "Hugh Davies, 'Galactic Interfaces', 'Mobile with Differences', and 'Printmusic'; Alex McLean, 'Printmusic—Live Coded'; and David Keane, 'Les Voix Spectrales': Performances by Grey Area and Alex McLean, with Pre-Concert Lecture by James Mooney." University of Leeds. http://doi.org/10.5518/57.

Mooney, James. 2016b. "Hugh Davies, 'Quintet' and 'Music for a Single Spring'; Stockhausen, 'Verbindung' and 'Intensitat' from 'Aus Den Sieben Tagen'; Christian Wolff, 'Edges'; and Owen Green, 'Neither the Time nor the Energy': Performances by Grey Area, with Pre-Concert Lecture by James Mooney." University of Leeds. http://doi.org/10.5518/38.

Mooney, James. 2016c. "Hugh Davies, 'Voice', 'Not to Be Loaded with Fish', and 'Birth of Live Electronic Music'; plus Improvisations: Performances by Steve Beresford, Phil Minton, Aleks Kolkowski and Sean Williams, with Pre-Concert Lecture by James Mooney." University of Leeds. http://doi.org/10.5518/58.

Mooney, James. 2016d. "Technology, Process and Musical Personality in the Music of Stockhausen, Hugh Davies and Gentle Fire." In *The Musical Legacy of Karlheinz Stockhausen: Looking Back and Forward*, edited by Morag J. Grant, and Imke Misch, 102–115. Hofheim: Wolke. http://eprints.whiterose.ac.uk/80572/.

Mooney, James. 2017. "The Hugh Davies Collection: Live Electronic Music and Self-Built Electro-Acoustic Musical Instruments, 1967–1975." *Science Museum Group Journal* 7. https://doi.org/10.15180/170705.

Mooney, James. 2022. "'Made as They Are from Unconventional Objects and Found Materials': How Hugh Davies Instrumentalised Electronic Sound." In *Rethinking the Musical Instrument*, edited by Mine Doğantan-Dack, 257–283. Newcastle upon Tyne: Cambridge Scholars Publishing.

Mooney, James, Adam Parkinson, and Paul Bell. 2008. "Sound Spatialisation, Free Improvisation and Ambiguity." Proceedings of the Sound and Music Computing Conference (SMC2008), Berlin, Germany.

Mooney, James, and Trevor Pinch. 2021. "Sonic Imaginaries: How Hugh Davies and David Van Koevering Performed Electronic Music's Future." In *Rethinking Music Through Science and Technology Studies*, edited by Antoine Hennion, and Christophe Levaux, 113–149. London: Routledge.

Park Lane Group and Society for the Promotion of New Music. 1968. Concert of Electronic Music Presented Jointly by the Park Lane Group and the Society for the Promotion of New Music, London Planetarium, Marylebone Road, NW1, Friday, 22nd March 1968, at 7.30pm." Chagrin Collection, MS Mus 82, pp.154–156. The British Library, Music Collections.

Roberts, David. 2001. "Davies, Hugh (Seymour) (ii)." In *The New Grove Dictionary of Music and Musicians*, 2nd ed., edited by Stanley Sadie, 61–62. London: Macmillan.

Small, Christopher. 1998. *Musicking: The Meanings of Performance and Listening*. Hanover, NH: Wesleyan University Press.

Sudnow, David. 2001. *Ways of the Hand: A Rewritten Account*. Cambridge, MA: MIT Press.

Taruskin, Richard. 1984. "'The Authenticity Movement Can Become a Positivistic Purgatory, Literalistic and Dehumanizing'." *Early Music* 12 (1): 3–12.

Taruskin, Richard. 1995. *Text and Act*. Oxford: Oxford University Press.

Théberge, Paul. 1997. *Any Sound You Can Imagine: Making Music/Consuming Technology*. Hanover, NH: Wesleyan University Press.

Thomas, Philip. 2013. "Understanding Indeterminate Music through Performance: Cage's *Solo for Piano*." *Twentieth-Century Music* 10 (01): 91–113. https://doi.org/10.1017/S1478572212000424.

Toop, David, ed. 1974. *New/Rediscovered Musical Instruments*. London: Quartz/Mirliton.

van Eck, Cathy. 2017. *Between Air and Electricity: Microphones and Loudspeakers as Musical Instruments*. London: Bloomsbury.

Weinberg, G. 2005. "Interconnected Musical Networks: Toward a Theoretical Framework." *Computer Music Journal* 29 (2): 23–39.

Zoy, Winterstein. 2012. *Karlheinz Stockhausen—Mikrophonie 1—Film 1966*. https://www.youtube.com/watch?v=EhXU7wQCU0Y.