Theses on liveness

JOHN CROFT

School of Arts, Brunel University, Uxbridge, Middlesex UB8 3PH, UK
E-mail: john.croft@brunel.ac.uk

In the domain of music for performers and electronic sounds (whether fixed or live) there are various paradigms of interaction: the performer(s) may be situated in an electroacoustic 'environment'; there may be a primarily responsorial or 'proliferating' relationship; or the relationship may be closer to the traditional one between soloist and accompaniment. These paradigms preserve a relatively unproblematic dichotomy between performer, whose sound is inextricably linked to a sense of action, presence and spontaneity, and fixed or treated sound, which is more or less de-coupled from this presence. Once one tries to create a continuous, intimate relation between the two, so that one is dealing with an extension of the instrument rather than an emulated 'other' or environmental context, one is confronted with a fundamental difference between a sounding body whose physical properties transparently determine its sonic possibilities, and the loudspeaker, which can produce practically any sound at all. This paper interrogates this dichotomy between the fallible-corporeal and the fixed-disembodied, activating questions both about the social fact of live performance and about the compositional practices which give rise to a sense of extended instrumentality.

1. LIVENESS AND CORPOREALITY

When it comes to the use of new technologies in music, or in art more generally, the first question we ask should surely be, 'Why?'. In the domain of live electronics, this question is especially urgent; for nowhere is there a greater tendency for technical developments to charge ahead of the necessary attention to the poetics of their use. There are now sophisticated modes of *technical* relation between performer and computer, both in terms of the live treatment of sound and of the collection of non-sonic information by means of sensors. But the *poetic* relation between the two too often tends either to the banal or the meaningless. The *idea* of interaction is seductive; it is also understandably attractive in an arts funding environment which favours a superficial and naïve notion of 'innovation'. But the material result rarely measures up the appeal of the idea.

I do not mean to suggest that the problem is simply one of composers attempting to compensate for creative mediocrity by capitalising on technology fetishism. That happens often enough, of course. But there are also fundamental structural problems to which I mean to draw attention. While these problems are acute in the case of live interaction, they are also manifestations of general questions about the nature of performance and the ontology of musical works. From the composer's point of view, the encounter between performer and computer transforms these basic philosophical questions into concrete poietic problems.

The classical model of musical performance, whereby the performer communicates the composer's intentions (reified in the score) to the audience, with the addition of some personal nuances or 'interpretation', has been questioned often enough. For example, in the case of very complex scores (those of Brian Ferneyhough being paradigmatic), musical notation is best regarded not as an encoded representation of sound, but as a stimulus or provocation for the performer to react to and against. Since the precise realisation of the notation is in practice (or even in principle) often impossible, the performer must form a pathway through the work from the many possibilities presented in the score (in a rather different sense to that involved in 'mobile form' works).[1] This means that the physical and mental labour of the performer become an integral rather than supplementary aspect of the piece. To give another example, Mauricio Kagel often emphasises the aesthetic significance of the performer's bodily presence as an integral aspect of music irreducible to instructions in the score. As Björn Heile points out,[2] Kagel is challenging a historical process in Western musical history whereby the bodily presence of the performer had come to be regarded as a kind of *contamination* of musical experience, almost as a necessary evil. This tendency, as Adorno notes, is a musical manifestation of commodity fetishism, whereby the 'immaculate performance … presents the work as already complete from the very first note. The performance sounds like its own phonograph record'.[3]

If composers like Kagel and Ferneyhough have challenged this purification of music from bodily

[1]Ferneyhough has himself endorsed something like this view of notation, both in his performance notes in scores, and in his *Collected Writings* (Amsterdam: Harwood, 1997) *passim*.
[2]See Heile (forthcoming).
[3]'On the fetish character in music and the regression of listening', in Adorno (1991: 44).

Organised Sound **12**(1): 59–66 © 2007 Cambridge University Press. Printed in the United Kingdom. doi: 10.1017/S1355771807001604

presence, the development of *musique concrète* and of electronic music, by contrast, was perhaps the final step in the elimination of the labour of sound production from the experience of the musical work: indeed, the term commonly used today for music composed for loudspeakers alone – *acousmatic* music – is a reference to Pythagoras's practice of lecturing from behind a screen so that his audience could attend solely to his words. This acousmatic character is often cited as one of the difficulties with the reception of acousmatic music – not, it has to be said, so much because it erases the labour of production, but more often because 'there is nothing to look at'. Thus there have been various attempts to reintroduce the visual, from video projections to a focus on the person behind the mixing console as 'diffusion artist'. The former addresses the perceived need to accompany sound with images, without attempting to address the aforementioned de-corporealisation. The latter, in contrast, is borne of the desire to re-incorporate human performance, but it encounters a familiar problem: while there is a body, there is only a generalised mapping of the physical movements of such a body (pressing keys, moving faders, and so on) to the types of energy and gesture present in the music – the music remains, in essence, acousmatic, in the sense that what is known to be the source is visible but remains perceptually detached.

This has led some electroacoustic composers to the point of asserting that the ideal medium for listening to such music is on CD, through headphones, alone. According to this view, the only coherent response to the dislocation of sound and source – and thus of *musical* gesture and present *physical* gesture – is to proclaim the age of the concert over: the very social phenomenon which attended the rise of music as 'purely' sound is rendered irrelevant by the completion of that process.

Music for instruments and electronic sounds finds itself at the frontier – or in the no-man's-land? – between these two opposed tendencies of music in the twentieth century: between the attempt to reassert the importance of bodily presence and performance, and the purgation of that presence in favour of a disembodied sound production in which, in principle, anything at all is possible. It is hardly surprising if *la musique mixte* so often simply *presents* this gulf, casting the performer adrift in, or in wretched competition with, a sea of electroacoustic sound, which in turn exposes the limitations of the instrument as sound-source (for, despite everything, traditional instruments are so much more than producers of sound, and therefore also so much less).

2. WHAT IS 'LIVE' ABOUT LIVE ELECTRONICS?

If the combination of instrument and tape can sometimes content itself with a never-the-twain-shall-meet stance towards the two types of material, this is no longer a legitimate possibility when it comes to live interaction, at least if we take the 'live' part seriously. Of course, in terms of synchronisation, there are often logistical advantages to breaking up the tape part into events to be triggered by means of score following, but this is a pragmatic matter and is hardly relevant to the poetics of live interaction, unless the sounds are designed to simulate a fine-grained responsiveness to performer gesture (the issue of simulation is discussed below). But there are also pieces which use live processing to generate a generalised texture or environment whose relation to the energetic characteristics of the performer's sound and action is so remote[4] that the effect is barely distinguishable from fixed tape, and could be more easily achieved thereby. I say 'so remote', but in fact (and this takes us to the heart of the problem), the relationship does not need to be very remote at all before this disjunction takes place and the poetic significance of 'liveness' is lost. In other words, the range of musical situations which actually *call for* live interaction[5] on a more than pragmatic level – in which interaction is *aesthetically* relevant – is in fact rather narrow.

The nature of transformation has two limiting cases – no transformation at all (live sound only); and the triggering of soundfiles or synthesised sounds, which is also no transformation, or which perhaps might be regarded as maximal transformation (in the sense that it takes no characteristics from the live sound). But here we are dealing with the 'real' process only; this range of possibilities should not be confused with the range of perceptual relationships: clearly, a technically simple transformation can yield results that are perceptually distant from the live sound, and soundfiles can be perceptually very close. In fact, most transformations can be realised equally well, or better, by means of pre-composed sounds. In terms of the spectromorphological

[4]The notion of remoteness from physical gesture recalls Smalley's (1986: 83ff) notion of *surrogacy*: in Smalley's terms, I am suggesting, roughly, that the instrumental paradigm is the domain of first- and second-order surrogacy and excludes remote surrogacy; but also that a new instrument in this sense might collapse the distinction between first- and second-order surrogacy, since it depends not on prior familiarity with the spectromorphological characteristics of a sound (which will tend to make of the instrument an acculturated semiotic entity as discussed below), but on the interrogability of the relation between performing body and sound.

[5]By 'interaction' here I refer to any causal connection between a performing body (with or without a physical sounding body) and a sound-producing system whose observable physical characteristics do not determine the characteristics of the sound produced – for instance, a computer. I am *not* here considering the notion of the computer as a kind of improvising partner, where the interaction extends to the human performer's response to novel output from the computer. This, however, does not imply that the interaction is unidirectional, since, as with any instrument, the performer may respond in a very fine-grained way to the response of the computer to his or her own action – thus a response loop is formed. Indeed, the fine-grainedness is, as I suggest below, one measure of the instrumental quality of an interface.

relationship between a sound generated by an instrument and that played through a loudspeaker, 'liveness' is hardly the issue. I therefore draw a distinction between *procedural* liveness (defined as the material fact that live sound is being transformed in real time) and *aesthetic* liveness, by which I mean a situation in which, first, aesthetically meaningful differences in the input sound are mapped to aesthetically meaningful differences in the output sound, and second, this mapping can be achieved only (or at least, most reliably) by means of procedural liveness. (The second condition is needed, because the first can in many contexts be simulated by means of pre-recorded sound.)

Thus the onus of justification of liveness is shifted to the causal link between the performer's action and the computer's response. It is a question of the specificity of the relation: if many perceptibly different inputs generate outputs with no pertinent differences (in other words, if the aesthetically pertinent mapping is many to one),[6] then the liveness is merely procedural and not aesthetic – pre-recorded sounds would do the job as well or better. At the other extreme, if the mapping is too explicit, too transparently one-to-one, the result is not only tedious but may have the effect of shifting the procedural into the foreground, turning the piece into a lamentable 'showcase' of the technology. ('Look – I do this, and the computer does that!')

My contention is that the space between these two is surprisingly narrow. If there is a delay between original sound and response, the space is very narrow indeed: unless the transformation preserves in a perceptible way the low-level expressive characteristics of the input (that is, unless it preserves the details that change from one performance to the next), we have an instance of the many-to-one problem, and the sound might as well be made in advance. In an improvisatory context, of course, this space broadens again; but in the case of a fixed score, the range of treatments which preserve these 'accidental' characteristics to a perceptually pertinent extent is small.

While I do not want to rule out that there might be mileage in delayed responses which still necessitate live treatment, it seems clear that the difference between simultaneous and delayed treatment is aesthetically crucial when it comes to live electronics. It hardly needs saying that this significantly broadens the range of treatments that necessitate procedural liveness, since the precise synchronisation between live performer and pre-recorded sounds is impossible for many kinds of musical material. But simultaneity is also closely linked to two fundamental principles of live performance: first, we expect a meaningful relationship between what we see the performer do and the sound that this action generates; second, as Simon Emmerson points out, '[w]e expect a type of behaviour from an instrument that relates to its size, shape, and known performance practice'.[7]

The most extreme example of the problems that arise when the first principle is disregarded is the ubiquitous 'laptop artist': if the relationship between the energetic and gestural characteristics of the performer's action and the sound generated is opaque, then most of the point of live performance is lost. But this is only a limiting case of a problem that exists in any live interaction with electronics, including the case in which a traditional instrument is present. In short, we expect a sound proportionate to the energetic characteristics of the performer's action. This is closely related to the second principle, that we expect the sound to have a more or less transparent relation to the properties of the sounding body we see before us.

It might be objected that the relation between bodily action and sonic result can sometimes be relatively opaque even in the case of traditional instruments, when the perceiver has little understanding of the mechanics of the instrument. Such a listener might rely more on acculturated notions of virtuosity than on an awareness of the physical characteristics of the instrument. (Consider, for instance, the fact that so few balk at the pitiful synchronisation between movement and sound in some films where an actor attempts to simulate the playing of an instrument.) There are three points to be made in response to this: first, even for the non-expert audience member, the relation is surely still somewhat more fine grained than that involved in many opaque electronic interfaces. Second, even when a fine-grained relationship is not perceived, there remains a mapping of energy and effort, and a sense of limits and impossibilities. But most importantly, in the case of traditional instruments, the relation is interrogable – there is the possibility to strip away the layers of culture and expose the materiality of action and effort, as much contemporary music and the most engaging performances of earlier music do.[8] Another way of putting this is to say that if there are problems with the opacity of the body-sound relation in live electronics, the same problems exist in the case of any reception of music which is more informed by a stereotyped notion of virtuosity than an engagement with the energetics and physicality of sound production. On this view, the subsumption of bodily action under codes of virtuosity and the disjunction of body and sound in live electronics are variants of the same tendency.

[6]This way of putting the matter was suggested by Jonathan Owen Clark (private conversation).

[7]Emmerson (1998: 148).

[8]This final point is in fact a version of the argument presented below in response to d'Escriván.

3. PARADIGMS OF THE RELATION BETWEEN PERFORMER, INSTRUMENT, AND ELECTRONIC SOUND

I do not mean to suggest that all music must seek to activate this connection between bodily effort and sound. When it comes to music for instruments and live electronics, whether we ought to be concerned about these principles depends on what I would call the *paradigm* exemplified by the work. This concerns the nature of the relation between performer, instrument and electronic sound (whether procedurally live or pre-recorded). A taxonomy of paradigms might be as follows.

- *Backdrop*. This is the most remote relationship, whereby the electroacoustic sound functions as a kind of background; the image suggested is something like someone playing the horn on a stormy coast, or the flute in the rainforest, and so on. There may be points of contact between the two worlds, but these are not perceived as causal. This kind of relation will rarely necessitate live electronics, being equally achievable using fixed sound.
- *Accompanimental*. This is where the sound from the loudspeaker functions as a kind of accompaniment in a more or less traditional sense; this might necessitate score following to trigger soundfiles, and perhaps real-time processes of an accompanimental nature (such as harmonisation). In much of Manoury's music, for instance, score following is used to step through a series of predominantly accompanimental relationships.
- *Responsorial/proliferating*. The electroacoustic sound has an antiphonal relationship to the live sound; this may be a pre-composed event or a treated (or, as a limiting case, an untreated) version of the live sound, perhaps with increased complexity. This is a very common procedure, and as noted above, with regard to liveness, its aesthetic pertinence is determined by the extent to which the response varies in a perceptible way with the noticeably 'accidental' characteristics of the performance (as mentioned above), and (less interestingly) the extent to which the precise timing of the delay is essential to the effect. The archetype of this relation, and still one of the most successful examples of it, is probably *Répons*.
- *Environmental*. This is the creation by electronic means of the characteristics of various acoustic environments (whether the spaces emulated are materially possible or not): generally this will involve resonators, reverberance and filtration. This is rarely the sole basis for a work, but might coexist with the others, especially the 'environmental', and may approach at times the 'instrumental' paradigm.
- *Instrumental*. This is the attempt to create a composite instrument. The relation that normally exists between a player and her instrument is extended to include the live electronics: the performer plays the instrument-plus-electronics in a way somehow analogous to the way in which she would normally play the instrument alone.

These paradigms may of course be combined in a single piece, and there is not always a clear distinction between them. That aside, the instrumental paradigm is clearly unique in the above taxonomy in the applicability of the principles of proportionality and transparency in the performer-computer relation. It is the most difficult relation to achieve and maintain, and for this reason the most interesting to discuss. I would also argue that it is rarely convincingly achieved, because of the many difficulties associated with the very idea.

The first problem is that the claim that I just made – that it is possible to combine these paradigms in a single piece – is not really true of the instrumental paradigm, but only of the others (notwithstanding the possible fuzziness between environmental and instrumental resonant properties). An instrument that can become its own background or accompaniment or environment is not really an instrument. This is just one instance of a general principle, namely that the *limits* of an instrument are essential to its being perceived as an instrument at all. A loudspeaker can, in principle, produce any sound; on an instrument, almost all sounds are impossible, and of those that are possible, some are more difficult to produce than others, and this difficulty is patent in the act of performance. This is surely why performance engages us in a way that cannot be accounted for in terms of the sound alone: the difficulty, the impossibilities, the encounter with limits, the *finitude* of the instrumental performance resonates with wider human experience. This dimension of instrumentality is precisely what needs to be understood if 'live electronic performance' is to mean anything beyond the trivial fact of someone pushing buttons while we listen.[9]

This takes us back to my initial point: we have seen in the twentieth century a bifurcation in the conception of what music is, with some composers turning to the investigation of sound under idealised acousmatic conditions, others seeking to reassert the central importance of the performing body. One might even regard these as different *ontologies* of music: on the one hand a notion of music as identical with its sound; on the other a conception of music which cannot be separated from the physical conditions of its production, from the intersubjective and social act of performance, with the significance of effort, labour and

[9]It may perhaps be possible to combine two distinct identities – instrument and, say, accompaniment – in the electronic output, but this would require a radical perceptual disjunction in the two types of sound material, if the sense of limits is not to be lost.

expenditure, and indeed with the erotics[10] of physical engagement. These ontologies collide in any music for live performer with electroacoustic sounds: a corporeal, fallible, limited human is pitted against a disembodied, 'infallible'[11] and potentially infinite generator of sound. There is an analogous problem with the instrument itself: there is a fundamental difference between a sounding body whose physical properties transparently determine its sonic possibilities, and the loudspeaker, which can produce practically any sound at all.

The problem, then, for any live electronic music that would realise the instrumental paradigm, is to address not only the gestural, morphological and spatial disjunction in purely aural terms, but somehow to create the unified expressive persona normally associated with a solo performance, which is so easily destroyed by the rigidity and disembodiment of the electroacoustic sound. This rupture, which for the other paradigms listed above may be a source of interesting tensions, must be overcome if the aim is to incorporate electroacoustic sound as a continuous extension of the expressive performance of the performer.

4. DOES EFFORT REALLY MATTER?

There will be some who would take issue with the very idea that there is something problematic about this disembodiment in the first place. Julio d'Escriván puts this objection as follows.

> Since the advent and popularity of the Nintendo™ computer games system in the early 1980s, so many new ways of human-computer interaction have sprung forth that a generation brought up on a diet of video games is, in my opinion, ready to accept the rupture of what we could call the 'efforted-input paradigm'.[12]

According to this view, the demand for a connection between bodily effort and acoustic output is a form of nostalgia for a traditional form of musical performance; listeners who are not subject to such nostalgia have no problem with effortless, invisible performance:

> Those who have been brought up with personal computers and video games could be more open towards effortless performances. People of an older generation may tend to require an old-school paradigm of performing virtuosity, where perceived effort and dexterity on behalf of the performer are paramount to the enjoyment of music. What is certain is that our appreciation of performing skills has widened to accept all kinds of live music-making as valid. To paraphrase Collins (2003), today we may be quite content to stare at the back of a laptop or at musicians who are staring at laptop screens. If the music captures our imagination, it does not really matter whether the laptop musician is sweating.[13]

Whether one is persuaded by this argument depends ultimately on one's conception of what music is *for*. Certainly it is true that there are many people who are 'quite content to stare at the back of a laptop'. There are also many people who are quite content to live most of their lives 'virtually', and to forgo normal human interaction and to content themselves with online relationships. The only response I can see to this objection is that it might equally well be taken as *supporting* my thesis that there is something problematic about the disengagement of musical performance and corporeal energy.

Fredric Jameson, in *Postmodernism, or, the Cultural Logic of Late Capitalism*, argues that the postmodern, the cultural manifestation of late capitalism, is characterised by cultural products which deny the

> … capacities of the human body to locate itself, to organise its immediate surroundings perceptually, and cognitively to map its position in a mappable external world. It may now be suggested that this alarming disjunction point between the body and its built environment … can itself stand as the symbol and analogon of that even sharper dilemma which is the incapacity of our minds, at least at present, to map the great global multinational and decentered communicational network in which we find ourselves caught as individual subjects.[14]

Jameson goes on to ask what might be a progressive artistic response to this condition which does not endorse or celebrate this disjunction as much as postmodern cultural production does. He proposes an 'aesthetic of cognitive mapping' – a model of art with a pedagogical dimension, an art which would 'disalienate' the subject, and enable the individual to 'map and remap' the relationship to the environment[15] by means of a broadened conception of representation which works against the loss of the capacity for representation symbolised by the 'computer, whose outer shell has no emblematic or visual power'.[16]

Jameson's examples are primarily visual and architectural, but it is perhaps not implausible to regard the disjunction of body and sound that I have been discussing as a musical manifestation of the tendencies Jameson associates with the postmodern condition, and the 'back of a laptop' which many listeners are 'quite

[10]For a suggestive, if speculative discussion of the erotics of musical performance, see Rebelo (2006).

[11]Infallible, that is, barring the problem of technical failure. While a case has been made for an aesthetically relevant role for technical problems (for example, by Richard Barrett in 'Illusion and reality in electronic performance', talk delivered at the conference 'Live Electronics and Performance', St Luke's Old Street, Februry 2006), it would seem that the arbitrariness of such failure makes it an unlikely candidate for an 'instrumental' relationship.

[12]d'Escrivàn (1996: 188).

[13]*Ibid.*: 190.

[14]Jameson (1991: 44).

[15]*Ibid.*: 51.

[16]*Ibid.*: 37.

content to stare at', as a striking example of an 'outer shell' with 'no emblematic or visual power'. If we accept this parallel, then it might well be argued that a music which seeks not merely to affirm this postmodern *status quo* but to find a response to it, must find a means of 'disalienation' and of relating the body to its environment. A music which merely *accepts* or indeed *celebrates* an arbitrary relation between bodily action and the acoustical effect on that environment is surely not a progressive response in this sense. In short, the extent to which d'Escriván's statement should lead us to consider the disjunction as unproblematic depends on the extent to which we are happy for music to reflect the Nintendo™ paradigm of the relation between subject and world.

5. CONDITIONS FOR INSTRUMENTALITY

If we are not happy with this paradigm, we must ask ourselves what compositional approaches and performance practices would allow the performer's action to be perceived as the source both of direct sounds from the 'real' instrument and of those from the loudspeaker. The most obvious solution is to restrict the range of processes to the relatively transparent: filtration, reverb, transposition, and so on. In this case we have no problem identifying performer gesture with the processed sound, and the relationship between this sound and the physical properties of the instrument remains perceptible. Of course, so patent a relationship runs the risk of being uninteresting if applied uniformly; however, it remains the case that the instrumental paradigm demands a certain *purification* of the relation between performer and electronics; I therefore posit the following conditions for an instrumental relationship:

(1) *The response of the computer must be proportionate to the performer's action*. This point has been made above. In particular, a small gesture on the part of the performer should not trigger an avalanche of sound.

(2) *The response must share some energetic and morphological characteristics with the performer action*. For instance, a difference between continuous bowing and tremolando on a string instrument might be reflected in the iterative characteristics of the response.

(3) *The onset of the response must be synchronous with the performer's action*. A delayed response disconnects the performer's energy from the resulting sound, and thus undermines the instrumental relation. It also reduces significantly the range of responses that actually require live treatment as opposed to pre-composed sounds.

(4) *There must be a timbral continuum, affinity, or fusion between the untreated instrumental sound and the response of the electronics*. This is the spectral correlate of the energetic-morphological condition (2). Instruments have timbral properties determined by their physical construction, and in general will not produce two or more completely unrelated tone colours: rather, there will be a continuum between the timbres (as in the case of normal and *sul ponticello* bowing) or, where timbral discontinuities do occur (as in keyboard instruments with stops or brass instruments with mutes), there remains a scrutable relationship to the nature of the sounding body. If the treated sound is timbrally distant from the instrumental sound, it may be possible to maintain a sense of instrumentality by effecting a continuum between them, so that the most distant timbres are seen as the outer limits of a timbral range (just as the most extreme *sul ponticello* playing is timbrally distant from the normal sound of a string instrument, yet is perceived as part of a coherent instrumental identity in part because our mental representation of the instrument includes a filled-in timbral space), or by effecting a spectral fusion, so that even in the absence of a clear affinity or timbral continuum, the sound complex is perceptually unified.

(5) *The relationship between the performer and the computer must be stable*. This may seem an extreme or even perverse condition, given than so much research has been directed at getting software to track the performer's position in a piece. But the distinction between piece and instrument is central to the schema of the instrument as an intelligible 'tool' on which a piece is realised. (Instruments do not know where in the piece they are; nor does a viola turn into an oboe at a certain point in a piece.) An instrument is neutral with regard to time elapsed. Moreover, if the instrument can change its capabilities in response to the requirements of the piece, one runs the risk of losing the sense of limits and of finitude that I have suggested is central to instrumentality.

(6) *The relationship must be scrutable*. It must be possible to perceive a consistent relationship between a performer's action and the response.

(7) *The relationship must be learnable by the performer*. The performer's connection with his or her instrument is an intimate one, learned over many years; while this level of connection would be an extravagant demand for this broader form of instrumentality, something resembling this must nonetheless be sought from the relation between performer and computer.

(8) *The mapping must be sufficiently fine-grained*. The response should not be crude and generalised, but capable of responding to expressive intention;

> in other words, in at least some ways a small difference in performer action must make a perceptible difference in the quality of response.

It will be objected that such purism is too literal an attempt to assimilate live electronics to the concept of *instrument*. Indeed, perhaps a strict observance of these principles would be unattainable. But I would suggest that a consideration of the necessary conditions for such a relation is instructive, even for composers who do not seek a pure form of this relation in their music, just as an understanding of strict counterpoint may be instructive for composers who do not aspire to the creation of a purified form of sixteenth-century polyphony. Conversely, for the reasons set out above, the more one departs from a recognition of, if not a strict adherence to, these principles, the more the meaning of the 'live' in 'live electronics' becomes merely procedural and loses its aesthetic difference from the instrument-and-tape paradigm.

More fundamentally, these principles embody a recognition that *there is nothing inherently interesting about the fact that a computer can generate a sound in response to a person's action*; this is why the triggering of sounds using sensors is often dull – or, at best, *merely* interesting. The questions raised by live electronics are specific versions of the question of what *more* there is to music than sound. Any answer which seeks to address, rather than to dispense with, the complexities of the instrumental relationship must take us beyond simple mappings between gesture and musical parameters that remain essentially at the level of the Theremin and which serve only to remind us of the richness of physical sounding bodies.

6. PERFORMANCE AND 'GRAIN'

My strategy has been to set out what it might mean to be truly serious about the idea of an instrumental relation between performer and live electronics; and, while not claiming any exclusivity for such an aesthetic (which would be truly perverse, since it is quite likely that there is no music which fulfils all these requirements), I have suggested why we might consider this relation to be important. It may well be objected that I have identified liveness so closely with an impossible conception of instrumentality that other forms of electronic performance, which lie somewhere between the fixed and the instrumental, are excluded. While I have argued that the pole of fixity tends to attract much music which falls short of instrumentality, it would be rash to deny the possibility of legitimate forms of performance which do not observe all my conditions of instrumentality; I would, however, urge that these conditions are fundamental considerations for any attempt to unite bodily action and sonic result. in contrast to Franziska Schroeder's claim that '… our technologically informed lives have immensely altered the ways in which "instrumental" music is being performed, and indeed defined',[17] I am suggesting that the notion of instrumentality is resistant to redefinition, and that we must find a way to treat it as a resilient and humanly significant reality and that any performance using electronic means must establish and comprehend a relationship (which is not to say a subservience) to it.

What if we were to observe all the principles above? Would we have a relation between performer and computer that is comparable, in terms of expressive potential, to that between the performer and a conventional instrument? Of course, in the traditional sense of *espressivo*, one can program something of the sort (this is the domain of phrasing, vibrato, and so on – on this level one can be 'expressive' on the Theremin). But I am alluding to something uncodifiable, and perhaps unprogrammable. It is what Barthes calls the *grain*, or (borrowing from Kristeva) the musical *genotext*, which, unlike the phenotext, escapes reduction to a sign, a meaning, or a 'known, coded emotion'. It is, as Barthes puts it, 'the space where significations germinate from within language and its very materiality; it forms a signifying play having nothing to do with communication, representation (of feelings), expression'.[18] In other words, it is the appearance of the *body* in the (musical) text – the body of the performer, and the *sounding body* of the instrument. The grain, the 'imperfections', the unrepeatable, constitute, I would argue, the reason for the continued importance of performance. It also therefore has implications for the meaning of liveness in the current discussion. The grain of performance is the outcome not just of the physical nature of the instrument, but of its physical limitations – the threat that the high notes might break, the unavoidable scraping and breath sounds, the slight roughness of a strong attack. The things which in learning an instrument we are taught to minimise, but which remain as an ever-present sense of fragility, the appearance of human fallibility and corporeality.

It goes without saying that any sonic tendency can, in principle, be designed into the output of live electronics, and that the relation between the performer's action and this output can be arbitrarily fine grained and complex. Given this, could one not design such imperfections, and build 'grain' into the relation? It is hard to give an affirmative answer without a certain uneasiness, a feeling that there is something wrong with programmed imperfection, designed difficulties, and simulated limits. For one thing, the Barthesian idea of grain that I have been referring to precludes the possibility of systematising it; but even without appealing to this notion, it remains that the simulation of physical limitations is somewhat absurd – since we know these limits are now

[17]Schroeder (2006: 1).
[18]Barthes (1977: 179).

arbitrary, the attempt to imitate the resistances of physical bodies has something second-rate about it.

This is part of a more general problem. Whatever comes out of the loudspeaker, the fact remains that it could, in principle, be anything.[19] Having set out such demanding conditions for a pure form of instrumentality in live electronics, I must now acknowledge the prospect that the entire project might be in vain: the fact that we have to ask the question of how to make gesture and result relate in a meaningful way should perhaps lead us to question whether a *simulation* of perceptible causality and physical resistance is really what we want; and whether, when we do achieve it, it has anything like the same meaning for us once we are aware of the contrivance involved in forming this 'natural' relation.

Is there any way out of this bind? If the idea of liveness is only fully realised in the 'instrumental' paradigm, and if, however, this paradigm leads only to an unsatisfactory simulation of what we find most meaningful about live performance, should not live performance and electroacoustics go their separate ways, or at least resign themselves to a coexistence in which the liveness of the latter is not an issue (as in the other paradigms in my taxonomy)? Or have we just been so ambitious that we have missed more subtle possibilities? Might we have been dazzled so much by what is possible that we lost sight of what is essential? Consider, for example, the way that Nono extracts and carefully modifies breath sounds, upper harmonics, and whistle tones in works such as *Das atmende Klarsein* and *A Pierre*. Here the electronics are truly live and neither respond to codified parameters nor track the progress through the score, but enter into a direct relation with the transitory elements of performance. The electronics barely assert their presence, and surely such a rarefied incorporation of 'technology' would not attract funding in today's atmosphere. But these works do show that the grain and the ineffable are not anathema to electronics, but that live treatment can *draw out* the vicissitudes and frailties of live performance. In our well-intentioned search for reliability and repeatability, perhaps we forgot what performance meant, and development ran ahead of poetics to create an impressive (if still unreliable) array of score-following algorithms and a multitude of remarkable (all too remarkable) transformations. But perhaps we need to step away from all this. It is inevitable that aesthetically pertinent 'liveness' involves relatively simple relations between input and output. There may be more work for the programmers, but not nearly as much as we would like to think as we fill out our funding applications.

[19]This is not to deny that there will always be limits to the ability of any array of loudspeakers to reproduce all characteristics of all sounds; nonetheless, the principle of a loudspeaker is that it can reproduce sounds of diverse characteristics whose physical origin has (almost) nothing in common with the physical characteristics of the loudspeaker itself, or with other sounds that the loudspeaker can reproduce. An electroacoustic system of course has limits, and the exploration of these may indeed imbue such a system with this aspect of instrumentality; but since these limits are incommensurable with those of the physical instrument, it is hard to imagine these limits combining into a single instrumental identity.

REFERENCES

Adorno, T. W. 1991. *The Culture Industry,* ed. J. M. Bernstein. London: Routledge.

Barthes, R. 1977. *Image Music Text,* trans. Stephen Heath. London: Fontana.

D'Escriván, J. 2006. To sing the body electric: instruments and effort in the performance of electronic music. *Contemporary Music Review* **25**(1/2): 183–91.

Emmerson, S. 1998. Acoustic/electroacoustic: the relationship with instruments. *Journal of New Music Research* **27**(1–2): 146–64.

Ferneyhough, B. 1997. *Collected Writings*. Amsterdam: Harwood.

Heile, B. 2006. *The Music of Mauricio Kagel*. Aldershot: Ashgate.

Jameson, F. 1991. *Postmodernism, or, the Cultural Logic of Late Capitalism*. London: Verso.

Rebello, P. 2006. Haptic sensation and instrumental transgression. *Contemporary Music Review* **25**(1/2): 27–35.

Smalley, D. 1986. Spectro-morphology and structuring processes. In S. Emmerson (ed.) *The Language of Electroacoustic Music*. London: Macmillan.

Schroeder, F. 1986. Bodily instruments and instrumental bodies: critical views on the relation of body and instrument in technologically informed performance environments. *Contemporary Music Review* **25**(1/2): 1–5.