

The composition of posthuman bodies

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Introduction and Context

The present investigation is propelled by two distinct comments on bodies and their prostheses, read contrapuntally: the first that

the musical instrument is a prosthetic augmentation of the human body, enabling the body to exceed itself (to sound faster, higher, louder than any voice, and to enable the individual to do so often in multiple parts simultaneously) (Johnson 2015, 142)

and, second, that

the posthuman view thinks of the body as the original prosthesis we all learn to manipulate, so that extending or replacing the body with other prostheses becomes a continuation of a process that began before we were born (Hayles 1999, 3).

Accordingly, one might add that music and musical practices both extend bodies and permeate them. This is most readily apparent in the boundaries between musical instruments and instrumentalists that are complicated through acts of performance: the instrumentalists' gestures become, through the instrument, expressive output; in a feedback relation the instrumentalist also responds to the sound produced – and to the sum sonic total fashioned by all the instrumentalists in their ensemble – such as to modify their bodily gestures and hence the sonic outcome once again. The role of sound *production* here points to a second bodily extension: the sound of music itself is something that extends and permeates bodies through both enveloping them and blurring boundaries such as to deny their autonomy. So here one encounters a field of interconnected bodily extensions: instrument-as-prosthesis and sound-as-prosthesis.¹

Prostheses and bodily extensions are now everyday occurrences (at least within the Global North): nonhuman elements are routinely incorporated into human bodies in medicine; bodily presence is complicated daily by presence online; near ubiquitous access to digital and communication networks is afforded by portable technologies such as smartphones. In this article I explore extensions across the body-instrument-sound field mentioned above. However, I turn from the contemporary moment to argue that it is productive to consider a longer history of bodily extensions; this enables us to better appreciate the emergence of more recent posthuman trends

and, further, allows us to consider how these extensions engage longstanding politics and antagonistic conceptions of the body. Accordingly, I situate this discussion in relation to musical modernism, which has itself sometimes had a problematic relation to the body. I begin by considering what musical treatments of extended bodies tell us of our anxieties about and desires over bodies and their constitutive matters. I suggest that compositional practice enables an elaboration of bodies and materialities that are in a historical condition of crisis. I go on to argue that critical musical attention to prosthetic bodily extensions refer us back to what Hayles suggests is the 'original prosthesis', the body; ones comes to know, to feel, what a body is insofar as it is prosthetic – through exploring instrumental and sonic extensions that are exterior to though intersect with it. Drawing on posthuman and psychoanalytic theory, I claim that, through losing one's body into its extensions, one paradoxically discovers what bodies are, and what they might do. A contemporary posthuman condition, in which extensions raise questions about the body's unity and autonomy, are – and have been for some time – the means by which potential answers to these questions are also explored.

I take a seminal work as a case in point: Brian Ferneyhough's *Time and Motion Study* cycle (1971-77). This cycle is indicative of a marked shift in a number of composers' attitudes towards instrumental practice in the 1970s, as a forebear to more recent instrumental, electronic, and digital practices that seek to investigate and defamiliarise the relation between the human and the nonhuman in musical composition and performance. Ferneyhough has been called a "postmodern modernist", in that his compositional approach bears hallmarks of a critical modernist sensibility, within developing postmodern contexts (see for discussion Feller 2002; Fitch 2009). "Complexity" – which manifests in often labyrinthine textures and intricate notation – is a word regularly associated with his music. His influential *Time and Motion Study II*, for singing cellist and live electronics (1973–76), is notable in that the player and instrument are taken as a human-machine hybrid. The cellist is integrated into a network of equipment: two tape systems capture sounds and reproduce them in delayed form from the speakers; these systems are controlled by the performer's two foot pedals and with the help of (at least two, preferably three) assistants responsible for the work's electroacoustic elements; two contact microphones are attached to the cello and another to the throat of the cellist; a directional microphone is also placed in front of the instrumentalist; and the sounds captured are filtered not only through the tape loop but through a ring modulator.ⁱⁱ Martin Iddon's (2006) suggestion that this work be understood productively in terms of a cyborg identity is explored further below; towards the end of the article I also extend this idea, in reference to the third *Time and Motion Study* (1974), for sixteen solo voices with percussion and electronics, to consider what a posthuman reading might mean for bodily extensions in vocal music.

My argument will show how this specific music might be interpreted in posthuman terms (building on Iddon 2006), serving to develop conclusions about the changing significance of bodies

and their extensions in late twentieth-century music and culture more broadly. As Johnson (2015, 142) puts it, 'Instrumental music, by definition, embodies modernity's contradictory relation to technology and blurs the boundary between organic human agent and its own mechanical invention.' If one takes music critically – in the Adornian sense that it embodies society's contradictions – one might suggest that music emboldens us to see and hear the human and posthuman conditions in which its composition and performance takes place. The human-nonhuman entanglement that takes place in the body-instrument-sound field is pronounced in works such as Ferneyhough's that critically stage the ("natural", organic, biological) body as intersecting with technologies that bear the mark of an electronically (now digitally) enmeshed society.

Hayles' suggestion that the body is the 'original' prosthesis is important in that it emphasizes a *temporal*, historically originary aspect of any *spatial* body-instrument-sound field; the former term in this field is a learnt – yet naturalised – model of what constitutes extensions and their capacities for manipulation. Hayles' words also mark that, as with bodies, prostheses constitute sites shaped by ideological and historical conditions. As such, when one reads that one learns to 'manipulate' one's body, this may lead one to ask: *to what end?* This initial question invites others about politics and powers of (self) control and (self) domination – questions asked in reference not only to one's body as prosthetic but also, in the case of music, to instruments and sounds as bodily extensions. There is much at stake in bodies' making of music – and through music, I argue, bodies are made also.

The extended body in Ferneyhough's "postmodern modernist" work contrasts starkly with earlier modernist practices of bodies in music. Igor Stravinsky's infamous view of the performer provides a ready example of the ideological content of bodies' musical "doing", under another regime of musical modernism; this might be taken also as a lesson more broadly that bodies come to act as extensions that constitute apparently abstract aesthetic goals as concrete acts. Stravinsky made the demand that the performer undertake an "execution" of the text – as opposed to an "interpretation": a "strict putting into effect of an explicit will that contains nothing beyond what it specifically commands". The performer should act as a "transmitter" of a "pure music", he argued, in an "objective" manner, and eschew especially interpretations that draw on "extramusical" ideas beyond the domain of the musical work itself (Stravinsky cited in Taruskin 1996, 129). The performer – and their docile body – is commanded by this explicit will. This manifests a longstanding notion of the body 'as a passive medium or instrument awaiting the enlivening capacity of a distinctly immaterial will', as Judith Butler (2006, 12) puts it; in addition to the musical instrument, the body itself is taken as an instrument and put to work by a commanding force. The musical text, under this regime, instructs the activation of a performing body that is otherwise withdrawn from activity and presence. Furthermore, the autonomy of the subject – a Cartesian will that animates an otherwise inanimate body – is reproduced in this conception of the musical text itself, an autonomy that is mirrored in a "purely" musical object that one must resist contaminating with the

“extramusical”. Indeed, this supposed autonomy has a long history that goes back at least as far as the beginning of the nineteenth century (Goehr 1992; Bonds 2014). In sum, body-instrument-sound events play out on a stage whose dynamic backdrop includes ideologies of mind-body relations and the aesthetics of autonomy. This tableau might be, at times, naturalised as unchallenged conventions that remain part of the setting; elsewhere this scene is thrown into stark relief by what compositionally stands before it, such that the performance events come to foreground the very conditions that themselves made their staging possible.

However, bodies – and their extensions – might also assert themselves and resist manipulation. If the materiality of bodies and sound has been inhibited in some music and its discourses, there are also possibilities for a return of the repressed. Julian Johnson (2015, 279, author’s insertion) has suggested that,

The eruption of sound over grammar, the insistence on the physicality of sound [that one encounters especially in some twentieth-century music], might well be understood in Freudian terms as the breaking out of a repressive force, not just because Freud’s theoretical model was contemporary with this aesthetic shift but because, like the linguistic order of the mind, musical order was challenged by the physicality of the world that holds it in check.

The physicality of bodies and sounds – in accordance with pervasive Cartesian thinking – have in the past been dominantly conceived of as raw materials subsequently shaped by cultural forces. What Johnson draws attention to is that this physicality has more recently become recognised as resisting the complete command that this presumed passivity would seem to imply. I say this not to ascribe an emancipatory role or Dionysian essence to the physical body – to pose it as a “pre-cultural” alternative to an ordered mind, from which it promises a path of liberation. Instead, I take it, as many composers have, as a productive site for problematising cultural and aesthetic concerns *that are at first sight abstractly divorced from their bodily constitution* – as a site for critical insights that encompass order and disorder, constraint and excess (see also Wilson 2013). As I argue below, this is apparent where bodies are extended through instruments and sound such that it is unclear what constitutes the body in the first place.

Crucially, I want to sketch some specific aspects of posthuman musical bodily extensions within broader cultural and historical contexts. Without this contextualisation, when exploring the *posthuman* one is otherwise in danger of repeating a problem Fredric Jameson (1991) identified in numerous discussions of the *postmodern*: a tendency to reduce postmodernity to a list of aesthetic and cultural symptoms – intertextuality, pastiche, and so on, its “stylistic” features – *without positioning these within the historically dominant material and cultural conditions which these “stylistic” features manifest*. To borrow a phrase from Patricia Clough (2010, 207), here I take the

body – and its extensions – as ‘a historically specific mode of organization of material forces’. I argue that the “composition” of the body – *how* it is written into music and the possibilities of *what it might be* at a historical moment when its constitution is in question – is negotiated where bodily concerns and extensions expressed musically, something encountered prominently in some twentieth-century art music, such as in Ferneyhough’s *Time and Motion Study* cycle. Music can draw attention to the paradoxes of bodies extended through it, encompassed “within” it. This goes for both bodies unfolding gestures and interactions, and in their historical dimension – that we have come to learn habitually that bodies in music mean and do certain things. (They also *do not* do certain things: in concert music of the Western art music tradition the visibility of individual performers’ bodies is normally minimised through clothing them in uniform dress, generally all black; the audience’s bodies also recede from presence where concert hall lights are dimmed.) Twentieth-century music, especially modernist music, has a difficult relationship with the body (for instance, Stravinsky); though there is no monolithic “modernism” just as there is no unitary “body” in the singular. Some twentieth-century art music – and some modernist music – does, however, enable us to hear aspects of our recent historical and cultural conditions, and the body’s constitution through and extension across them.

Problematic Materialities

As has been chronicled widely, the notion of a stable, unitary body becomes awkward in twentieth- and now twenty-first-century modernity.ⁱⁱⁱ I suggest that music’s problematic relationship to the body can be understood most productively by framing it in two complementary ways: its historically inherited relation to language and its more urgent relation to the material conditions of recent modernity. Andrew Bowie has argued that in the late eighteenth century the relationship between music and language changed. He sees this as an important component in the formation of (musical) modernity. He writes that, ‘[t]he decisive factor is that *it ceases to be clear what language is*. At the same time the significance and nature of music itself changes, so that it is no longer clear what music is either.’ (Bowie 2007, 48) I argue that a correlative gesture occurs in the later period of modernity focused on here. This principally concerns not music’s relationship to a destabilised language, but *music’s relationship to a now-problematic concept of materiality*.

The context of late twentieth- and early twenty-first-century music-making is one in which the late modern subject holds a problematic relationship with matter: this subject relies on material commodities and systems of exchange so as to locate itself, yet it also senses the alienation that comes with commodity forms; mass-production intensifies the quantity and diversity of objects and materials on offer; a post-industrial, informational society promotes a reality constituted by services for consumption and, even more recently, an ephemerality of goods and digital “objects” produced. Contemporary with Ferneyhough’s musical developments in the 1970s was an ongoing

transformation of the character of capitalism, a ‘shift from selling products to manipulating affect, an expansion of the service economy and the technological autonomization of its functioning’ (Clough 2010, 220) – and I argue below that related concerns (such as questions of production, efficiency, and the role of information) inform Ferneyhough’s approach to extended bodies in performance. Indeed, even more fundamentally, one could consider how these changing socio-economic conditions transformed music’s ontological character during this time, how assumptions around music’s immateriality changed in relation to the transformation of the material conditions that constituted this “immateriality”. To state this relationally and emphatically: as the material conditions changed, so did that which was previously deemed its immaterial other.

During the same time, the notion of the body itself also became unclear – a body which could perhaps have been the subject’s saving grace, a material touchstone onto which the subject could have grafted a stable existence. Bodies are now conceived in multiple and contradictory terms (physiological, fashionable, medical, aesthetic...). ‘The body’, writes Rosi Braidotti (2011, 192-193, author’s insertion)

emerges at the center of the theoretical and political debate at exactly the time in history when there is not more single-minded certainty or consensus about what the body actually is.... Modernity is... the age of simultaneous inflationary overexposure and yet absence of consensus as to the embodied, material nature of the subject.

Some take this as a historical limit: “If, today, there can be such an intense fascination with the fate of the body, might this not be because the body no longer exists?” (Arthur Kroker and Marilouise Kroker cited in Hayles 1999, 192-193) Others emphasise the body’s multiple nature – that it does not exist as such but rather lies in a multiplicity of performative utterances: ‘A body... does not exist – a body *is* not, it *does*.... (Erin Manning cited in Hickey-Moody and Page, 2016, 3) Paradoxically, this seems to imply that we can only (re)discover the body through its “*doing* in the world”, its extension into the world, through which it retroactively comes to be recognised as “being” a body in the first place. My suggestion is that music becomes a focal (or aural) point of these late modern problematics of bodies and materials. More specifically, by exploring bodily extensions in musical performance – as I suggest Ferneyhough does below – I argue that one (re)discovers possibilities of what bodies are. To put this even more starkly: in a time when it is unclear what constitutes the body, *one may paradoxically locate the body through gestures of dislocation, whereby one poses an extended body beyond oneself – “out there” in the world – that one may find it again, and determine what a body now is.*

Johnson has suggested that music is well placed to trace the effects of changing material and technological conditions on the body. As he puts it, music’s longstanding connection with

sensibility means that ‘its responsiveness to bodily perception makes it particularly well-tuned to register the effects of technological change on the modern sensorium’ (2015, 142). What should be added here is that music, as a cultural practice and place of subject formation also *contributes* to what sensible bodies are, in addition to tracing its effects. My reading here can be compared to Hayles’ reading of the cyborg: the cyborg registers transforming intellectual and technological conditions in society, but one also comes to know what it is through science fictions. Thus, as Hayles argues, one can learn something of it through thinking about these fictions. Similarly, the musical body marks the conditions of (a now late) modernity while also enabling us to imagine and enact the late modern body as such. Despite historically situating her study predominantly in the second half of the twentieth century, Hayles also points out that, ‘we have always been posthuman’ – that is, subjectivity prior to cyborgs and informational flows have always been enmeshed within, distributed throughout, and emerged in relation to the technological conditions of modernity (1999, see 279 and 291). The modernist composition of posthuman bodies similarly draws on and extends longstanding legacies of relations between the human and the nonhuman.

I will focus on the second two of Ferneyhough’s three studies; these foreground problematics of historically, materially, and technologically changing bodies. That said, a detail from Ferneyhough’s (1979) programme note to his *Study I* (1971–77), for solo bass clarinet, is pertinent to these issues across the entire *Time and Motion Study* series:

The title is intended to suggest both a desire to integrate the concept of efficiency as applied to the relationship between the performer, notation and realisation more explicitly into the fabric of the material and its organisation than is perhaps customary, and the conviction that time is most usefully conceived of, not merely in a linear but also in a vertical fashion (i.e. as a function of the mutual interaction of several distinct and layered process-types).

Echoing Hayles, above I argued that bodies – as the original prosthesis – and their later extensions are not ideologically neutral but trace and enact the socio-cultural priorities of the conditions that make them. The concept of efficiency is clearly of interest to Ferneyhough; so too, I suggest, is the concept’s relation to the extended body. “What might the term [efficiency] mean when applied to aesthetic production, reproduction and reception?”, he asked (Ferneyhough cited in Iddon 2006, 95). Clearly the series title evokes Taylorism and its practices of scientifically managing bodies in time and motion in pursuit of maximising productivity; one might also consider the modern management of bodies in both industrial and musical contexts. A precursor is found in the organisation of the orchestra, which has been said to echo the organisational dynamics of industrial society: ‘The increasing specialization of the orchestra (complete with its hierarchy of principal and rank-and-file players)... reflected a division of labour occasioned by the mechanized process of the

industrial revolution.’ (Johnson 2015, 147-148) Indeed, as has long been recognised, a division of labour propagates a division of the self – and the disjunction between mental and physical labour identified by Marx is intensified under logics of rationalisation. This “industrial” organisation and a culture of specialisation is resisted musically in fantasies of synthesis and reversion to myth – Wagner’s concept of the *Gesamtkunstwerk* in the nineteenth century provides a notable point of reference. Below I suggest that Ferneyhough’s works elaborate on these interconnected issues in a later, *post*-industrial context of the 1970s that marks and makes its material bodies differently from this earlier time. The performer’s body not only sits in a prosthetic relation to their instrument and its sounding; I argue below that the concept of the extended body became something new in a late twentieth-century context characterised by the requirements of efficiency, a rethinking of bodies’ relations to technologies and one another, and presumptions about autonomy and “disembodied” information.

Music-making and Body-making

The *Time and Motion Study* pieces are clearly not music-drama or musical theatre. Despite this, it is worth noting that through their theatricality they do make very clear their indebtedness to staged sounding bodies. Indeed, in the preface to the score of *Study II*, Ferneyhough states explicitly that this work must not be presented as music theatre, as this would strip it of ‘alternative layers of import’. ‘At the very most it might perhaps be termed an “allegorical action”’.^{iv} Ferneyhough’s resistance to a theatrical – and, by extension, representational – interpretation owes perhaps to this framework’s potential foreclosure of aesthetic autonomy (discussed below), a concept traditionally aligned with “pure” instrumental music and precluded by theatre’s multimedia character. Elsewhere he writes that ‘the work can in no sense be said to be improvisational’ yet that its inherent indeterminacy in execution, distributed across the cellist and assistants, means that, in Ferneyhough’s view, ‘the piece resists regulation to the status of a predictable and informationally static product’ (1995, 108).

It is notable that Ferneyhough cites the “informational” here – and that he poses a materialising and somewhat indeterminate performance event as in some ways at odds with this ‘static product’. Drawing on Hayles’ writing, one might point out that this statement appears within a late twentieth-century context in which information became dominantly ‘viewed as pattern and not tied to a particular instantiation’, as something that ‘lost its body’ (Hayles 1999, 13 and 291). Autonomy from constitutive contexts – especially material, bodily contexts – is not only an apparent characteristic of information: classic claims about the autonomy of modernist artworks are also well-established. This is pronounced were the body merely becomes the means *through which* the “information” of the work is presented (Stravinsky’s performers). As Hayles notes of information, this imagining forgets that ‘for information to exist, it must *always* be instantiated in a medium’ (Hayles

1999, 13). One might interpret Ferneyhough's interest in the work's existence in the indeterminate act of performance, over the work as static information, as an attentiveness to the constitutive acts through which musical "information" is instantiated materially. This can be taken not only as a repudiation of the static, eternal, and "informational" character of the musical work, but also of the classic image of this (modernist) musical work's autonomy.

Ferneyhough's scores are notoriously complex.^v A number of commentators have suggested that this complexity not only presents a challenge to the performer but that this challenge defamiliarises the performer's conventional actions. The scholar-performer Ian Pace attests from experience that the difficulty of executing Ferneyhough's scores 'negates more habituated patterns [of performance], and as such encourages more creative approaches on the part of the performer' (2015, 42). Iddon (2006, 96) similarly suggests that this complexity plays a more direct role for the performer than for the audience-receiver. The musical instrument, as a bodily extension, a prosthetic mastered through training and self-discipline, is also rewired through extended techniques that see the instrumentalist produce sounds through a choreographed deviation from habitualised norms. These techniques are "extended" in that they seemingly push at the boundaries of conventional instrumental techniques. But in doing so they arguably also defamiliarise the normative bodily extension that is the musical instrument itself: they remind us that the instrument was a once foreign (nonhuman) object that was only later naturalised as a medium of expressivity (and thus in a sense "humanised"). Furthermore, the composer seems to introduce layers of friction encountered by performers in their "production" of sound. Rather than working together, multiple actions occur simultaneously such as to complicate one another – as for example at the opening of *Study II* when the cellist realises four separate staves of notation: one for each hand, which stop and pluck the strings, and one for each foot, which utilise pedals that control the tape delays and microphones. These problematise the synthesis of the musical work that is being realised ("work" in a dual sense: as "artwork" and as practice of production).

These techniques engage a longstanding tradition of the virtuoso performer. Indeed, it has been suggested that *Study II* is 'a parody of nineteenth century virtuosity' (Pace 2015, 9; Reynolds 1983). The virtuoso, a figure crystallised during the nineteenth century, reproduces a certain modality of the extended body that espoused a fluent and dextrous use not only of an instrument but also of the synthesis of bodily actions that engaged it. One might here note that the "*Study*" of the title also invokes the *etude* as a musical form associated closely with developing mastery over one's instrument. The virtuoso culminates two nineteenth-century preoccupations, the hero and the individual's relation to a transforming society during the industrial revolution. They are each a figure who 'extends the boundaries of human endeavour like some aesthetic explorer' yet that evokes 'machine-like precision and speed' (Johnson 2015, 144). In a studied mastering of time and motion, highly developed feats of technically skilled ability are ideally staged with natural fluidity. The

nineteenth-century virtuosic body – ‘a body-as-organism that, by the late nineteenth century, had become the model of what a body is’ (Clough 2010, 207) – was here placed in a paradoxical position: the “organic” body became machinic in an effort to make the mechanical appear natural. The performer is heroic in that they overcome, through struggle, their own body and its objects in order to produce and display a self-mastery that is consumed socially as musical performance. One could even suggest that a kind of master-slave dialectic plays out, where the once subservient body, thought to be working under the direction of the mind, becomes recognised as constitutive of the musical labour taking place. The posthuman virtuoso inherits these two modalities of the performing body – as human-machine hybrid and hero-performer.

What is different about the posthuman virtuoso, compared with its earlier incarnation, is the composition’s staging of a subject’s intimate entanglement with its objects – that this becomes part of the compositional *problematic*. Indeed, Ferneyhough said, in reference to *Study II*, that he wished to envision the performer as ‘one of the objects which the environment is conditioning’ (Ferneyhough speaking in Van Noortwijk 1997, at 3:02). This arrangement of materials extends the sonic capacities of these intertwined materials and our presumptions about the body’s naturalness, passivity, and pliability. Ferneyhough’s original subtitle for this piece, “Electric Chair Music”, resonates figuratively with the Foucaultian “disciplining” of the performer’s virtuoso command of the body. But here the modern’s docile body is extended. Rather than the metaphor of the electric chair, Iddon (2006, 94) argues that a more productive interpretative point of departure be found in the figure of the cyborg; he suggests that *Study II* puts the cyborg identity of the performer in stark relief. Iddon’s interpretation provides insight into how this performance of cyborg identity manifests in a specific organisation of the human-machine. This is founded in an interreliance between these elements. As Iddon writes, ‘The respective demises of both cellist and electronic other are intimately interwoven’ (2006, 100): material produced by the cellist forms the basis of the tape loops; at the same time, this recorded material does more than simply provide traces after the fact and is central to the work the cellist performs. I want to extend Iddon’s cyborg reading with reference to broader posthuman theoretical and historical contexts. Or to put this another way, I now want to consider what is *at stake* in the exploration of this hybrid identity.

In addition to the arrangement of human and nonhuman materials that Iddon observes, one could note here that this specific organisation is contingent on particular historical circumstances – that ‘*the cyborg was created as a technological artifact and cultural icon* in the years following World War II’ (Hayles 1999, 2) – and that this has consequences for music’s autonomy. The musical work’s autonomy, embraced emphatically by a number of modernists after the War, came to be increasing hard to maintain towards the end of the century. Both the autonomy of the musical work and the autonomy of the self – and as many scholars point out, the former enables the performance of the latter (notably Burnham 1995) – are challenged in the composition of extended posthuman

bodies. The autonomous liberal subject is problematised in cyborg identities that demand we rethink our claims that our bodies, our original prostheses, are totally our own. As Hayles notes, 'If owning oneself was a constitutive premise for liberal humanism, the cyborg complicated that premise by its figuring of a rational subject who is always already constituted by the forces of capitalist markets' (1999, 86-87). The 'dispossession of the body' that Henri Lefebvre (2004, 75) identified as part of the experience of everyday modern life – that our bodies are not fully our own when they are caught in a web of antagonistic rhythms that arrange them socially in time and motion – is intensified in bodies now crisscrossed by technological networks. Both industrial and post-industrial capitalism provides us, as producers and consumers, with specific modalities of organising our relations to and in technology. If the highly specialised arrangement of the symphony orchestra echoed the organisational dynamics of industrial society, then, in *Study II*, in a manner echoing the dynamics of post-industrial society, the cellist – the posthuman virtuoso who sits centre stage – is flanked by technicians ('assistants' in the score) who maintain and alter the technological relations that enable the cellist to be productive as a human-machine entanglement. The cyborg identity thus extends not only across the cellist and electronics, but also across these technicians; all contribute to the distributed task of arising sonic output in a study of time and motion. Through foregrounding the heterogeneity of sonic production and musical product, the autonomy of the work (again in the dual sense of the "musical work" and of practices of production) and of the "individuals" that produce it is again questioned.

All performers know and rely on the fact that the body is a place of memory – hence one's practice to make scales and arpeggios automatically reproducible. The problematics of embodied memory for an extended, posthuman body is explored in *Study II*. This is in part undertaken through, as explored above, a defamiliarisation of habitual patterns of performance. Indeed, this defamiliarisation is doubled: first, the expressive capacities of the instrument, as prosthetic object, are reappraised; second, the performer's body – the original prosthetic – comes to be regarded as 'one of the objects which the environment is conditioning' (to quote Ferneyhough once again). Both instrument and body, as prosthetic and relationally constituted, are denied their autonomy. Autonomy is further blurred where tape loops capture sonic outcomes of bodily gestures (as a kind of memory or "congealing" of the musical labour) and reproduce and intermix these with events in the present. As Sylviane Agacinski writes, 'The material trace serves to support the subjective recollection of old experiences, but the memory is also freed from its responsibilities by *externalising* itself in the support materials (writing, pictures, computer data)' (2003, 89). Ferneyhough's tape materials could easily appear on this parenthetical list. The danger here is that, in the externalisation of memory into these materials, bodily memory and the body itself are hidden; much like Hayles' information, in these materials they lose their characteristic embodiment. At the same time, Iddon (2006, 94) argues that the tape loops act as an 'entropy circuit', not so much marking

memory as constituting a process through which gestural energy is both preserved and destroyed. I suggest that these two potential interpretations of the place of technology – as externalising memories and gestural energies – are not necessarily mutually exclusive: just as energetic gestures are contoured by habits and memories, so too can memory manifest itself gesturally. A number of examples of the latter process are found in psychoanalytic literature. The most famous is Freud's description of the infant's *fort-da* game in *Beyond the Pleasure Principle*. Here the young child sublimates fears about the mother's absence through hiding and finding an object, thus actively undertaking through play the gesture of her return in a symbolic form (Freud 2006).

Indeed, through extending the body in the artwork – in the theatricality of a mechanistic virtuoso performance and through the work's more literal technological aspects – *here the fort-da game is imitated writ large*: our late modern anxiety over the dispossession of the body plays out through our losing of it into the artwork (one proclaims: "no one knows what the body is anymore", *fort*"gone"), before we locate it once again ("the bodies are enmeshed technologically", *da*"there"). Furthermore, once we "discover" this body, we realise, echoing Hayles, it was never what we thought it was (... "We have always, it turns out, been posthuman"). This, one might reasonably speculate, is a condition more broadly encountered in twentieth- and twenty-first-century music that critically explores expressions and capacities of the body; these works *do not merely mark that the body and its matters are in crisis* but, through aesthetic play, *they enable a practiced experimentation with what bodies now are or could be*, in the contexts of their technological enmeshing and social constitution. By aesthetically stating that one knows not what bodies are – a gesture of apparent denial – one begins to guard against this anxiety while simultaneously something is actively crafted. Through losing the body into a larger field of instruments, sounds, and nonhumans, it rematerialises anew.

Extended Voices

The voice, resonating both within and extending beyond bodies, may also act as this "instrument" that sounds bodies. Some psychoanalysts have suggested that, in early childhood experiences, the voice enables an bridging of primal separateness, the divide of our body and that of our mother's, which were once one; the mother's voice can hold and comfort the child even without direct physical contact taking place, and the child's and the mother's voices can envelope one another, facilitating their imagined unity (Spitz 1987; Stein 2007; Wilson forthcoming). Later, in adult life, the sound of music, like the sound of the voice, derives from the exertions of the body, and extends itself to envelop the bodies of performer and audience alike. Furthermore, in everyday life, one now encounters recordings and telephone calls that engender new meanings and possibilities in vocal extensions of the body and bodily touch.

The voice is also a “classical” extension of the body that might be read retrospectively in posthuman terms where this is focused through its technological mediation. The ubiquity of electronic and (now digital) media in recent modernity is also brought into focus in *Time and Motion Study III* (1974), for sixteen solo voices with percussion and electronics. Here the basic organisation and distribution of the musical and technological material are simple by the standards of *Study II*, although complexity results. As Ferneyhough (Online, English language programme note) explains:

The singers are divided into four independent formations of unequal size, which are placed at the four corners of the performance space. Behind each group is located a loudspeaker reproducing the sounds produced by the choir placed diametrically opposite, with the result that complex patterns of mutual interference and spatial distribution are evoked.

As Iddon (2006, 97) has noted, Ferneyhough often poses the human and machine oppositionally in his written discourse. He wrote the following on *Time and Motion Study III*:

In the electroacoustic transmission of human sound, I always saw much more – in certain regards also a bit less – than a simple extension of the limits assigned to the voice. The voices and their reproduction by mechanical channels constitute in my eyes two very different domains of expression: this work proposes to highlight aspects of their opposition (French language programme note, my translation).

Rather than trying to synthesise the paradox of the oppositional (human vs. machine) in his writing and the cyborgic (human-machine) in his music, it is more productive to embrace this apparent disjunction as antagonistic. One could consider Ferneyhough’s paratextual pronouncements the flipside of his compositional practice: both point to an underlying anxiety about the interpenetration of human and nonhuman. To vehemently deny the opposition of biological and mechanical in language, while intersecting them in compositional practice, is comparable to the psychoanalytic subject whose voice affirms one thing and whose actions assert quite another: “it can’t be that, it is anything but that; the man in my dream was anyone but my father”. Freud’s essay on negation (2006, 96-100) might suggest that a pronounced denial – that the human is definitively not the machine – is only another affirmed expression of some underlying neurotic cause of both one’s words and actions. Ferneyhough’s contradictory words and compositional actions manifest but one expression of collective anxieties over a historical-technological situation in which the ontological status of bodies and “matters” are in question more broadly. (Hence this is not to diagnose Ferneyhough as neurotic; these anxieties are socio-historical in origin.)

Language also plays a role within both *Study II* and *III* – of specific focus is the materiality of language's sounding and its bodily production. Consistent with his interest in reorganising 'the molecules of meaning, which for us constitute reality' (Ferneyhough speaking in Van Noortwijk 1997, at 0:34), Ferneyhough breaks down language into its constituent sounding elements through using the International Phonetic Alphabet (IPA) to organise his texts. In both works, though differently, one encounters an intense focus on practices of vocal production – and reproduction. This reproduction of language is first epistemological, in its rationalisation through the IPA – its asignifying sounding becomes quantified as objects of knowledge with systematisable relations. Secondly, as indicated already, the reproduction of voices technologically becomes a problematic for compositional elaboration. In *Study II* the cellist vocalises, but his or her 'voice is only ever heard in its ring-modulated form, combined with the sound from the air microphone in front of the instrument' (Iddon 2006, 96-97).^{vi} The voice is engaged as an extension of the body, both as sound and as technologically mediated expression. Joseph Auner has written of how in some popular music, 'elaborate production featuring electronic noises, unexpected and densely layered effects, and other distancing techniques... provide what might be thought of as technological quotation marks around the more familiar materials' (2003, 115). Similarly, in Ferneyhough's setting, the voice extends the body not only through sound, but through the instrument and other apparatus; the mediation of this sonic extension by ring modulation and microphone technology is marked such as to render the voice neither familiarly human nor simply that of the nonhuman.

The vocal sound becomes an extension across different bodies, and also a way to explore and blur the boundaries between bodies and machines. This is developed in particular in *Study III*, in which Ferneyhough advanced his interest in the 'computer-like precision' of particular vocal techniques (1995, 93). The composer here drew on textual fragments from numerous contrasting sources on themes such as categorisation and knowledge, the myth of efficiency, and industry.^{vii} In the final part of the piece, to quote Ferneyhough, 'all voices participate in a confused and variegated "sound carpet", in which individual, manically executed vocal details are drowned out by the continuous tutti roar' (Online, English language programme note). This "sound carpet" perhaps recalls the "oceanic", prelinguistic state experienced by the young infant, as theorised by Freud and then Lacan, a state in which the boundaries of the self are exceeded: the world seemingly extends into the self and the self into the world.

This oceanic quality could be identified in a great variety of musical works (and has been said by some psychoanalysts to be a characteristic of music in general). What is distinctly posthuman about this compositional strategy is that it engenders not only new relations of exteriority – between bodies and nonhuman objects – but also traces changing relations *interior* to bodies themselves. On *Study III* Nicholas Cook (2014, 282) cites Ferneyhough himself referring to his "notating the tension of the throat muscles, position of the tongue and the shaping of the lips, etc. as

separately-rhythmicized parametric strands". Cook suggests provocatively that it 'is as if the composer is bypassing the singer as a person and scoring directly for his or her vocal organs' (2014, 282). To put this in explicitly posthuman terms, it seems that the singers become taken as heterogeneous bundles of fleshy part-objects rather than as unified subjects. Not only is the body extended as a part *within a system* of technology, but the body itself comes to be thought of as a *system* of constituent parts.

Much like the cyborg self that Haraway articulated so exquisitely, one encounters the performer as an arrangement of parts that might become recomposed and repurposed. Under this logic, '[a]ny objects or persons can be reasonably thought of in terms of disassembly and reassembly; no "natural" architectures constrain system design' (Haraway 1991, 162). This accords with what Hayles (1999, 3) has suggested elsewhere: the 'posthuman subject is an amalgam'. This compositional technique of bodily de- and reassembly has since been further developed by those like Klaus K. Hübner in the 80s (and Aaron Cassidy more recently), who

built on ideas already present in works by Xenakis, Lachenmann, and Ferneyhough,... to conceive of the playing of an instrument not as a combination of actions towards a single end (i.e. sounding a particular note) but as a polyphony of different moving body parts – left hand, right hand, mouth, diaphragm, and so on – that might be "decoupled" from one another and composed separately (Rutherford-Johnson 2017, 103-104).

Indeed, here an antagonism is again explored between the (modernist) body in composition and performance: the body is scripted into a musical score – as separable parts – in composition; in performance, however, this alliance between reorganised elements is one that gives rise to unpredictable interactions and interferences of one component by its others. Rather than forging autonomous subjects and objects, one encounters an unfolding interaction of bodily and technological elements, such as to enact 'the transformation of one's sensorial and perceptual coordinates, in order to acknowledge the collective nature and outward-bound direction of what we still call the self' (to adopt a phrase from Braidotti 2013, 193).

If music and its instruments have always been posthuman bodily extensions, these prostheses have more recently been instrumental in enabling us to posit and interrogate the body in a historical moment in which its matter is itself in question. Music's genealogy as an art form that intersects the material and immaterial primes it as a productive site in which problematics of materiality might become subject to transformation and critique. Ferneyhough's *Time and Motion Study* cycle provides but one compositionally influential response to the conditions of late twentieth-century modernity. The problematics of extended bodies have here been recast in changed body-instrument-sound fields. In the case of the cyborg, owing to machines' entanglement with a no-longer-separable "human", Donna Haraway suggested that 'we are they' (1991, 180). Something

similar can be said of musical sounds and practices in which boundaries between bodies and their extensions have been blurred; one could state that we have come to practice ourselves, materialise ourselves, in technological-aesthetic practices such as the making of music.

Notes

ⁱ In preparing this article, I am indebted to Sita Popat, Sarah Whatley, and the peer reviewers for their insightful comments.

ⁱⁱ Van Noortwijk 1997 includes a performance of *Study II* by Reynard Rott.

ⁱⁱⁱ My use of the term ‘modernity’ signifies a longstanding historical era and set of socio-cultural practices, in line with the work of Jameson, Adorno, Horkheimer, Marshall Berman, and others.

^{iv} A phrase he also used to describe *Study III*. See Ferneyhough 1995, 93.

^v In a lengthy review article, Pace (2015) has identified a number of trends in scholarly discourse about Ferneyhough and his music, including contrasting characterisations of this “complexity”.

^{vi} In *Study II*, Ferneyhough draws on a source text from Artaud. For a more detailed discussion of Ferneyhough’s treatment of this text see Iddon 2006, 97-103. Iddon also reflects briefly on the gendering of the voice (endnote 3).

^{vii} Ferneyhough mentions as specific sources Duchamp, Christopher Marlowe, as well as classical philosophy (1995, 94 and 97).

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