Listening as Covert Performance

IAN CROSS

(*Journal of the Royal Musical Association*, Vol. 134, Special Issue no. 1, 67-77)

THIS paper addresses the issue of listening as covert performance from four perspectives: critical, cognitive, neuroscientific and communicative. It devotes rather more space to discussing music from cognitive perspectives than from the other three. However, my suggestion is that listening to music is an active, interactive and, at root, communicative human behaviour, and I rely on evidence from all four perspectives to reach this conclusion.

Listening as covert performance in critical context

The notion of listening as a discrete activity that has value in itself is a potent aspect of Western intellectual engagement with music, with competing claims being made about the nature of listening and its relation to the practices and values of the art of music becoming strongly evident through the eighteenth century. In Strunk we find Quantz, as might be expected, taking a pragmatic stance in suggesting that 'we are not always satisfied that each performer whom we hear should be at pains to offer what lies within his powers; we often expect to hear more than we ourselves have been used to hearing'. He notes, however, that 'more modest listeners, who do not credit themselves with sufficient insight to judge a thing, often have recourse to a musician, whose word they accept as irrefutable truth'.[1] Rameau is more abstract but equally certain in claiming that

> we may judge of music only through the intervention of hearing and reason has authority in it only so far as it agrees with the ear; at the same time, nothing can be more convincing to us than their union in our judgments. Our nature is satisfied by the ear, our mind by reason; let us then judge of nothing except through their co-operation.[2]

Diderot is quoted in Downing A. Thomas as advancing a rather more nuanced position in claiming that 'the source of music is in the heart, and […] its central purpose is to speak to the soul and to the ear'. Thomas reads Diderot as indicating that 'many possible images […] might be evoked by the same music', but that 'particular musical progressions, interpreted differently by each listener, never remain meaningless'. In effect, although music is a representational art, the indeterminateness of sounds always leaves them open to interpretation: as Diderot is quoted as stating, 'every listener understands music according to the present state of his soul'.[3] Goethe, in a statement that seems to assert the triumph of autonomous music, claims that 'true music is just for hearing; a beautiful voice is the most abstract entity, and the most universal, one can

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[1] *Source Readings in Music History*, ed. Oliver Strunk (London, 1952), vol 3, pp4-5.
[2] *Ibid.*, vol 4, p207.
[3] Downing A. Thomas, *Music and the Origins of Language: Theories from the French Enlightenment* (Cambridge, 1995), 169.

think of, but when the person producing it makes himself visible to us in his physical individuality he destroys the pure object of that universality'.[4]

The valorization of the listener as an active influence within the broad cultural sphere of musical activities appears early in the literature of Western music. As Wegman notes in his discussion of late-medieval musical sensibilities, contemporary writers such as Tinctoris required that music should offer sensuous delight to the listening ear and, through the ear, sensible structure to the discerning mind.[5] This valorization becomes most explicitly and ideologically evident from the early nineteenth century through the influence of Goethe, Hegel and others, being fully established in later nineteenth-century discourse on music from within the musical establishment. However, it does not seem to be particularly systematized as a strand within musicological enquiry until the early to mid-twentieth century in the work of Besseler, which stresses the significance of the social context in which the act of listening takes place.[6] It has become central to much musical discourse, particularly that which aims to elucidate music as an aesthetic domain. So, for example, Stephen Davies, in discussing musical meaning, puts the act of listening at the heart of meaning in claiming that 'the ultimate test of a listener's understanding resides in his ability to describe relevant features of the music as a result of his experiencing them at first hand'.[7]

The notion of listening as a key component of musical discourse appears likely to be highly culture-specific, though it is undoubtedly evidenced in other cultures that provide appropriate contexts for the exercise of connoisseurship. It might be that the notion is correlative with the emergence in a culture of the notion of music as a specialized activity, with significant social and cultural constraints on its practice. In such cultural contexts the notion of listening as evaluative and as constituting the basis for critical action – the notion of the covert act of listening being translated into overt performance – may privilege listening as a major source of cultural energy. Listening is valorized as a cultural act, a behaviour that can restructure the cultural world when private, mental representations are transformed into public representations[8] – but only when performed in a context in which listening, and more specifically the representation of listening, has an acknowledged cultural or institutional role, which may be implicit or explicit. Hence conceptions of the value of listening concerning its roles in the dynamics of a musical culture are necessarily particularist and pragmaticist.[9]

However, the particular scientific perspectives with which I tend to engage are not best suited to the elucidation of specific cultural dynamics, as scientific perspectives bear on the general rather than the particular; somewhat like Quantz's 'more modest listener', I am happy to have recourse to a musicologist to engage in the disentangling of historical and cultural dynamics, though I would be unlikely to accept her word as 'irrefutable truth'. The synchronic and diachronic dynamics of a musical culture can be elucidated comprehensively only by taking close and critical account of specific historical and cultural facts and processes.

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[4] Marcello Sorce-Keller, 'Musicologists and the Radio: A Shortlist of Questions, Problems, and Issues', *Talk About Radio: Towards a Social History of Radio*, ed. Theo Maeusli (Zurich, 1999), 115–26 (p. 3).

[5] Rob C. Wegman, 'Sense and Sensibility in Late-Medieval Music: Thoughts on Aesthetics and Authenticity', *Early Music*, XXIII (2), (1995), 298–312.

[6] Heinrich Besseler, *Das musikalische Hören der Neuzeit* (Berlin, 1959).

[7] Stephen Davies, *Musical Meaning and Expression* (Ithaca, NY, 1994), p339.

[8] Dan Sperber, *Explaining Culture* (Oxford, 1996).

[9] Davies, *Musical Meaning*; Roger Scruton, *The Aesthetics of Music* (Oxford, 1997).

But there is at least one way in which all cultures share profound commonalities: all cultures are the consequences of the thoughts and acts of one biological species, *Homo sapiens*. It can be expected, then, that the particularities of human biology might have some principled relationships to culture *per se* – not to any specific culture, but rather to a *capacity* for culture.[10] And human biology bears a principled relationship to the biology of other, non-human species. From a materialist perspective, then, musical listening, if not the different roles and values accorded to it in different cultures, might be expected to be understandable at least in part from transcultural and biological perspectives. From another, more abstract, perspective, it can justifiably be claimed that without consideration of universal aspects of culture, close analysis, no matter how rich the representations that it yields, runs the risk of never quite escaping the clutches of mere description. A range of human sciences, including cognitive science, neuroscience, biological anthropology and evolutionary biology, has yielded significant findings that can help elucidate the dynamics of human listening from a generalizable, universalist perspective. The application of scientific perspectives to musical listening has to be broadly based; indeed, much of what the sciences have to say about musical listening applies to *all* listening. The findings of cognitive science and of neuroscience suggest that listening is an adaptive and inferential behaviour, and help to generalize the idea of listening as covert performance beyond the culturally particular.

Listening as adaptive and inferential

Many of the processes that can be identified as being involved in listening are not accessible to conscious introspection; they are best thought of as processes that constitute the substrate of our auditory (and musical) consciousness. Many of these processes are not unique to humans, but are also common to most other biological beings. Perhaps the most basic is that which can be described in associative (almost Humean) terms: an animal's behaviours will be mediated by the frequency of occurrence of biologically significant environmental events through processes of associationistic learning – and ultimately through processes of evolution, in that an animal's nervous system must link appropriate behaviours to the differential frequency of occurrence of environmentally significant events in order for the animal to survive and reproduce.

Associationist or connectionist models ('neural nets') have been developed as computational tools to model – with considerable success – animal and human behaviours in a very wide range of circumstances, including musical listening.[11] In probably the most comprehensive programme of studies of the processes involved in music listening, it has been found that listeners will tend to pick up the frequency of occurrence of different pitches and pitch *functions* in the music to which they listen;[12] the results of these active processes of event frequency detection are integrated into listeners' long-term memories and are brought to bear in subsequent listening. This process requires no formal musical training; it is largely preconscious, and appears to

[10] Michael Tomasello, Malinda Carpenter, Josep Call, Tanya Behne and Henrike Moll, 'Understanding and Sharing Intentions: The Origins of Cultural Cognition', *Behavioral and Brain Sciences*, 28/5 (2005), 675–91; Dan Sperber and Lawrence Hirschfield, 'Culture, Cognition and Evolution', *MIT Encyclopedia of the Cognitive Sciences*, ed. Robert A. Wilson and Frank C. Keil (Cambridge, MA, 1999), cxi–cxxxii.

[11] Jamshed J. Bharucha, 'Neural Nets, Temporal Composites and Tonality', *The Psychology of Music*, ed. Diana Deutsch (2nd edn, London, 1999), pp413-441.

[12] Carol L. Krumhansl, *The Cognitive Foundations of Musical Pitch* (Oxford, 1990).

derive from a generic capacity to link appropriate behaviours (in this case, attributions of structural function) to the frequency of occurrence, and frequency of co-occurrence, of environmental events.[13]

The process results in a principled, yet dynamic, way of hearing structure in music: principled, in that certain classes of events (here, pitches) will tend to be experienced as more stable, referential or closural than others; dynamic, in that the *schematicized* results of the long-term application of the associationist processes applied in music listening are themselves susceptible to change on the basis of what is heard. Hence musical listening, with associationistic processes as a preconscious substrate, actively seeks out structure on the basis of previous experience, yet reconfigures the representations of that previous experience on the fly as it encounters novel structures. It enables a listener to go beyond the given by inferring structure on the basis of incomplete musical information in the course of continual hypothesis generation and testing. Musical listening from this perspective is an active and dynamic behaviour, albeit one whose outcomes are largely internal to the perceiver.

This process of schematicization – of schema formation and real-time reconfiguration – is one of the few processes implicated in the experience of music that has good empirical evidence for cross-cultural generality; studies conducted on music and listeners from a range of cultures and in a range of cultural contexts indicate that it is an integral component of musical listening, irrespective of cultural context.[14] It is expertise independent, in that we do not need to learn how to do it.[15] Its expertise independence permits listening to music to yield outcomes that are at least as complex as those engaged in listening to speech, in terms of the cognitive, and probably neural, processes involved; for instance, in a recent series of experiments at the Centre of Music and Science, Cambridge University, we have demonstrated that listeners can be sensitive to relationships between non-adjacent musical events, a type of sensitivity that has hitherto been demonstrated only for the human language faculty.[16] Moreover, it seems likely that at least some of the complex properties exhibited by pitch structures in Western tonal music are emergent properties of interactions between the products of processes of the schematicization of musical pitch and cultural-historical processes.

Overall, the significance of this type of mental-cognitive process in musical listening is unsurprising, as associative learning is general across all animals, from seaslugs to humans.[17] However, it is likely to be special in humans because of the extensive capacity and complex linkages accessible to our working memory,[18] the area of mind where transactions between the *now* and the *then* result in experiential reconfiguration of both *now* and *then* in continual acts of listening as covert performance.

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[13] Jennifer R. Saffran, Elizabeth K. Johnson, Richard N. Aslin and Elissa L. Newport, 'Statistical Learning of Tone Sequences by Human Infants and Adults', *Cognition*, 70 (1999), 27–52.

[14] Mary A. Castellano, Carol L. Krumhansl and Jamshed J. Bharucha, 'Tonal Hierarchies in the Music of North India', *Journal of Experimental Psychology: General*, 113/3 (1984), 394–412.

[15] Barbara Tillmann and Emmanuel Bigand, 'The Relative Importance of Local and Global Structures in Music Perception', *Journal of Aesthetics and Art Criticism*, 62/2 (2004), 211–22.

[16] Matthew Woolhouse, Ian Cross and Timothy J. Horton, 'The Perception of Non-Adjacent Harmonic Relations', *Proceedings of the Ninth International Conference on Music Perception and Cognition*, ed. Mario Baroni, Anna Rita Addessi, Roberto Caterina and Marco Costa (Bologna, 2006), 1236–44.

[17] Henry Plotkin, *Evolution in Mind* (London, 1997).

[18] Alan Baddeley, *Human Memory: Theory and Practice* (rev. edn, Hove, 1997).

Associative processes are not the only aspects of active listening that are biologically general and have traceable evolutionary origins. Even more ancient preconscious processes are involved in the elicitation and experience of affect in response to music. Our engagement with music is, more often than not, motivated by a desire to be *moved* by it; as Diderot put it, 'the source of music is in the heart', or, in more accurately biologically grounded terms, in its powers to activate the limbic systems that link our sensory, visceral, musculoskeletal and central nervous systems and afford us the experience of emotion.[19]

Affects or emotions are mind–brain–body states. There are efferent and afferent neural connections between body and brain, between our sensory receptors and the brain and between our brain and our musculoskeletal system, our effector systems, the bits of us that we can control in order to act, to do things. Many if not most of these connections are to and from our cortexes. There are also connections between our central nervous system – our brains – and the rest of the body that belong to the autonomic nervous system, which connect the brain to body systems that control blood flow, digestive processes, hormonal processes as well as muscular processes. Autonomic nervous system signals arise in the amygdala, cingulate cortex and hypothalamus, and in the brain stem and the musculoskeletal (voluntary) nervous system (signals arising in several motor cortices and subcortical motor nuclei) – in other words, many of the autonomic nervous system connections are to evolutionarily 'old' bits of our brains. And there are also chemical connections between body and brain, pathways that permit the body to act on the brain by means of chemicals that flow via the bloodstream, and that allow the brain to act on the body by means of chemicals in the bloodstream such as hormones, transmitters and modulators.

The existence of all these brain–body connections suggests that emotions are specific and coordinated mind–brain–body states, but dynamic and changing states that arise because of interactions between what is going on in the brain in response to its interpretations of sensory information and what is going on in the body. In effect, our experience of emotion or affect – our experience of *feelings* – arises from the operation of systems that are evolutionarily designed to ensure preparedness for action.[20]

Music is a potent motivator of our affective systems.[21] The reasons for this are still not wholly clear despite a growing amount of empirical research, but it seems that both the ways in which music unfolds in time and the nature of its global structural characteristics are likely to shape our affective experience of music. Leonard B. Meyer, in a seminal text, proposed that our experience of the ongoing flow of music takes the form of a continual process of expectation formation, and that interruption or delay of the realization of these expectations activates our limbic systems and results in the experience of affect.[22] This plausible hypothesis has attracted much attention but has

[19] Antonio Damasio, *Descartes' Error: Emotion, Reason and the Human Brain* (London, 1995).
[20] Jaak Panksepp and Günther Bernatzky, 'Emotional Sounds and the Brain: The Neuro-Affective Foundations of Musical Appreciation', *Behavioural Processes*, 60 (2002), 133–55.
[21] *Music and Emotion: Theory and Research*, ed. Patrik Juslin and John A. Sloboda (Oxford, 2001).
[22] Leonard B. Meyer, *Emotion and Meaning in Music* (London, 1956).

proven to be surprisingly difficult to test, with very few studies offering any degree of empirical support.[23]

Quite independently of the articulate flow of musical events, our affective systems also appear to be activated by our experience of global structural characteristics of music. Experiments indicate, not unexpectedly, that music that is fast, loud, broad in tessitura and bright in timbre is likely to elicit high levels of arousal and to be experienced as positively valenced; music that is low, soft, narrow in tessitura and dark in timbre will evoke lower levels of arousal and is likely to be experienced as negatively valenced.[24] The interaction between these two aspects of our experience of music is likely to lead to the elicitation of complex and compound affective states, which will in turn shape the meanings that we abstract in the processes of listening. Indeed, the nature of the affective states that music elicits is likely to impact on the effectiveness with which we can bring our processes of schematicization to bear in the listening experience. Although our affective capacities, like our schematicization abilities, are based on processes that are common to all animal species, it appears likely that, just as is the case with our schematicization capacities, the range and diversity of our affective experiences exceed those of other species, probably by virtue of the biological significance of managing the unique complexity of social relations in the human species.[25]

These active processes of schematicization and of affect elicitation and interpretation are integral components of any musical listening experience; listening to music involves continual, largely preconscious, acts of inference and interpretation – continual performance – that is covert both on the part of, and from the perspective of, the listener. But there are yet more processes involved in musical listening that are even more grounded in action.

Perhaps underpinning all active musical listening are processes of entrainment, processes that are certainly common across all world music cultures[26] but which are, it seems, possibly species-specific.[27] Musical listening typically involves the entrainment of our attention to an inferred, more or less regular and periodic, pulse that may or may not be directly signalled by the presence of events in the sonic surface of the music.[28]

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[23] John A. Sloboda, 'Musical Structure and Emotional Response: Some Empirical Findings', *Psychology of Music,* 19 (1991), 110–20; David Huron, *Sweet Anticipation: Music and the Psychology of Expectation* (Cambridge, MA, 2006).

[24] Gabriela Husain, William Forde Thompson and E. Glenn Schellenberg, 'Effects of Musical Tempo and Mode on Arousal, Mood, and Spatial Abilities', *Music Perception*, 20/2 (2002), 151–71; Patrick Gomez and Brigitta Danuser, 'Relationships between Musical Structure and Psychophysiological Measures of Emotion', *Emotion*, 7/2 (2007), 377–87.

[25] Robert A. Foley, *Humans before Humanity* (Oxford, 1995).

[26] Martin Clayton, Rebecca Sager and Udo Will, 'In Time with the Music: The Concept of Entrainment and its Significance for Ethnomusicology', *ESEM Counterpoint*, 1 (2005), 1–45.

[27] Bjorn Merker, 'Synchronous Chorusing and Human Origins', *The Origins of Music*, ed. Nils Wallin, Bjorn Merker and Steven Brown (Cambridge, MA, 2000), 315–28; John Bispham, 'Rhythm in Music: What is it? Who has it? and Why?' *Music Perception*, 24/2 (2006), 125–34.

[28] Bruno H. Repp, 'Musical Synchronization', *Music, Motor Control, and the Brain*, ed. Eckart Altenmuller, Mario Wiesendanger and Jurg Kesserling (Oxford, 2006), 55–76; Mari Riess Jones and Marilyn Boltz, 'Dynamic Attending and Responses to Time', *Psychological Review*, 96/3 (1989), 459–91; Carolyn Drake and Daisy Bertrand, 'The Quest for Universals in Temporal Processing in Music', *The Biological Foundations of Music*, ed. Robert J. Zatorre and Isabelle Peretz, Annals of the New York Academy of Sciences, 930 (New York, 2001), 17–27.

This process has been demonstrated experimentally in a wide range of music listening situations, across a number of different cultural contexts.[29] In effect, as we listen we engage in yet more processes of hypothesis generation and testing that are aimed at abstracting a predictable temporal scaffolding for our attentive engagement with the music. This temporal scaffolding serves to allow us to reduce the amount of attentional effort that we need to devote to tracking the ongoing flow of events in the music; having abstracted a more or less regular pulse allows us to predict when future events in the music are likely to occur without having constantly to monitor what we are listening to. Hence we can use the abstracted pulse to modulate the load on our attentional resources that is imposed by engagement with the music; we increase our attentional focus at timepoints predicted by our abstracted pulse, decreasing it between these timepoints. Typically, we go further than simply abstracting regular pulses and organizing our hearing of structure in the music around these; we distinguish between the structural importance of pulses, typically (in respect of Western common-practice period music) according more significance to pulses separated by two or three intervening pulses. These intervening pulses are experienced as structurally subordinate to each fourth or fifth pulse, and underpin our experience of metrical structure.

There are temporal limits on the pulses that we can abstract: abstracted pulses need to be more than about 300 milliseconds, yet less than 1.5 to 2 seconds, apart, and we strongly prefer abstract pulses that occur with an interpulse interval of around 600–800 milliseconds.[30] These absolute time constraints suggest that our capacities for pulse entrainment are grounded in control mechanisms in body movement and in general limits on event integration in perception. Indeed, our entrainment capacities are most evident in action, in our ability to tap along with a beat without conscious effort within the temporal window between 300 milliseconds and 2 seconds. This capacity has largely been explored by requiring people to tap along with a regular metronomic pulse.[31] However, recent research conducted in Cambridge exploring human temporal interaction by requiring two people to tap along with each other suggests that we are biased towards entraining with 'pulse producers' that demonstrate a predisposition to entrain to us, evidenced in mutual processes of continual adjustment of phase and period of action and attention that are as likely to be preconscious as conscious.[32]

In other words, one of the most fundamental processes involved in musical listening, that of pulse abstraction and dynamic attentional modulation, is not only an active process internal to the listener, but appears to be grounded in expectations of interaction with others who are capable of entraining to pulse streams in the human range. Musical listening is not only active, it appears to have its roots in processes central to human *interaction*.

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[29] Carolyn Drake and J. Ben El Heni, 'Synchronizing with Music: Intercultural Differences', *The Neurosciences and Music*, ed. Giuliano Avanzini *et al.*, Annals of the New York Academy of Sciences, 999 (2003), 429–37.

[30] Justin London, *Hearing in Time: Psychological Aspects of Musical Metre* (Oxford, 2004).

[31] Bruno H. Repp, 'Sensorimotor Synchronization: A Review of the Tapping Literature', *Psychonomic Bulletin and Review*, 12/6 (2005), 969–92.

[32] Tommi Himberg, 'Co-operative Tapping and Collective Time-Keeping: Differences of Timing Accuracy in Duet Performance with Human or Computer Partner', *Proceedings of the Ninth International Conference on Music Perception and Cognition*, ed. Mario Baroni, Anna Rita Addessi, Roberto Caterina and Marco Costa (Bologna, 2006), 377.

Listening as neurally active

The notion of musical listening as active and interactive has recently received strong support from a new science, the neuroscience of music. Over the last 30 years an exponentially increasing amount of neuroscientific research has been devoted to music, and a torrent of experimental papers is now appearing in this area.[33] One recent article explored commonalities across a large number of studies of music listening and found, somewhat surprisingly, that one of the areas of the brain that was consistently activated in listening is the Supplementary Motor Area, part of the brain that is known to be concerned with planning motor behaviour.[34] As participants in all the studies surveyed had been required only to listen without making or preparing any overt motor response, this suggests that musical listening might be best conceived as involved in a perception–action cycle rather than in a one-way flow of musical information from the musical producer to the listener.

A recent study sheds more light on this possibility.[35] It found that when listening to 'pleasant', as opposed to 'distorted', music, one of the brain areas found to be strongly activated was the Rolandic operculum, a part of the brain that is implicated in planning *vocal* behaviour, specifically, laryngeal and tongue movement. Again, participants in the experiments (none of whom had had formal musical training) were not being asked to respond in any overt manner to the music to which they were listening. The results of this study suggest that a more or less reflexive and involuntary response to music to which one is listening is to participate by at least initiating, though not necessarily carrying through, vocal behaviours. In other words, it is as though the automatic and appropriate response to active listening engagement with music is to prepare to participate however one can – to prepare to sing.

Listening as covert participation in communication

This point leads to the final perspective I shall address here in respect of musical listening as covert performance: consideration of listening as one aspect of engagement in *music as a human communicative system*. It is easy to think of listening as *the* paradigmatic mode of engagement with music; after all, it has been the dominant mode in everyday encounters with music in Western cultures for quite some time, and is privileged in conceptions of music in a number of other cultures. But from broader cross-cultural perspectives – and, indeed, from evolutionary perspectives – music appears to be overtly active and interactive.[36] It is notable in many contemporary hunter-gatherer and subsistence-farming societies that musicality, a capacity to engage in musical behaviours, is expected of all, just as is language;[37] indeed, it can be the case that what one might recognize from a Western perspective as 'musical behaviours' are difficult to differentiate cleanly from other cultural activities in such societies. In those societies, and indeed in our own society, as ethnomusicologists and music sociologists have shown, musical participation, even in the form of musical listening, can fulfil

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[33] *The Cognitive Neuroscience of Music*, ed. Robert Zatorre and Isabelle Peretz (Oxford, 2003).

[34] Petr Janata and Scott T. Grafton, 'Swinging in the Brain: Shared Neural Substrates for Behaviors Related to Sequencing and Music', *Nature Neuroscience*, 6/7 (2003), 682–7.

[35] Stefan Koelsch, Thomas Fritz, D. Yves von Cramon, Karstein Müller and Angela D. Friederici, 'Investigating Emotion with Music: An fMRI Study', *Human Brain Mapping*, 27/3 (2006), 239–50.

[36] Ian Cross, 'Music and Cognitive Evolution', *The Oxford Handbook of Evolutionary Psychology*, ed. Robin I. M. Dunbar and Louise Barrett (Oxford, 2007), 649–67.

[37] Jerome Lewis, 'As Well as Words: Congo Pygmy Hunting, Mimicry, and Play', *The Cradle of Language*, ed. Rudie Botha and Chris Knight (Oxford, 2008), 381–413.

functions that are unique to music and that appear to have effects that extend beyond music, particularly into the domain of management of social relations. Music appears to constitute a communicative system that is optimally suited to managing the uncertainties of social interaction,[38] and I have proposed that the feature of music that actualizes its social potential is its semantic indeterminacy or *floating intentionality*; music is socially efficacious because, to use Diderot's words, 'every listener understands music according to the present state of his soul', yet differences in individual understandings do not significantly compromise the integrity of a collective musical act.

From an evolutionary perspective it is difficult to make sense of music solely as something that is listened to for its hedonic value other than as an accidental byproduct of the emergence of more significant faculties such as that for language. Processes involved in listening to music would then be viewed as parasitic on those that are embedded within the language faculty, and the issue of music, from an evolutionary or biological perspective, would be neatly resolved and easily explicable: music is a simple, happy – but ultimately dispensable – side-effect of the complexity of human thought and behaviour.[39] But if music is viewed as a human communicative system with powers and functions commensurable with, but parallel to, those of language, functions that are evidenced in the management of complex social relations, the issue of musical listening is less easily explained away. Musical listening has to be viewed as an aspect of the expression of human musicality that is shaped and valued for cultural and social ends and that may have profound consequences for other domains of human life and society.[40]

In this paper I have suggested that musical listening can be interpreted as containing residues of action and interaction, in our predispositions in entrainment, our active inferences and affective adaptation that lie at the core of even 'passive' Western listening. If one thinks of listening as a mode of active engagement in musical behaviour (with music construed in the broad sense suggested above), then even physically inert but intent listening, even to recorded music, might best be thought of as covert *interaction* with the traces of human behaviour that are evidenced in the sonic surface of the music. When that interaction is taken back into the world of cultural representations in symbolic form, then, of course, we return full circle, and the processes of that active engagement can re-enter the musical discourse in critical and creative forms – which is where I am happy to hand the problem of musical listening back over to the worlds of historical and critical musicology.

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[38] Ian Cross, 'The Evolutionary Nature of Musical Meaning', *Musicae scientiae*, Special Issue: *Music and Evolution* (2009), 143–59.
[39] Steven Pinker, *How the Mind Works* (London, 1997).
[40] Ian Cross, 'Music and Social Being', *Musicology Australia*, 28 (2006), 114–26.