

# *Musicality and the human capacity for culture*

Ian Cross

Centre for Music & Science  
Faculty of Music  
University of Cambridge  
West Road  
Cambridge  
CB3 9DP  
UK  
ic108@cam.ac.uk  
<http://www.mus.cam.ac.uk/~cross>

This paper proposes that the human capacity for musicality is integral to the human capacity for culture, and that the key feature of music that motivates its efficacy is its indeterminacy of meaning, or *floating intentionality*. It suggests that, from an evolutionary perspective, a focus on music's commonalities of function (rather than of structure) across cultures provides an appropriate framework for theorising the roles and the operational features of music's indeterminacy of meaning. A three-dimension account of meaning in music is presented in which biologically generic, humanly specific, and culturally enactive dimensions of the experience of music are delineated, with summary examples of the application of the theory to musical usages in different cultures. It is noted that the dimensions outlined in the theory may be operational at different semiotic levels, and it is concluded that music became part of the repertoire of modern human behaviour as an exaptive consequence of processes of progressive altricialisation in the hominin lineage.

Key-words: evolution; meaning; ethology; culture

## *Introduction*

For the humanities, music is a cultural phenomenon, while in the sciences music appears to be rooted in our biologies; the discourses in terms of which each of these domains of human understanding frames music seem so irreconcilable that they appear to be dealing with quite different and entirely separate things. Yet music is inescapably biological and at the same time profoundly cultural. A number of papers and chapters by the present author (Cross, 1999, 2003a, 2003b, 2003c, 2005) have attempted to explore music within scientific, cross-cultural and evolutionary perspectives with the aim of finding ways of understanding music that enable some degree of integration of biological and cultural views.

In these papers the idea is proposed that music is functional in human development and interaction because of its attributes of *embodying, entraining and transposably intentionalising sound and action*, and may have been

similarly functional in human evolution. They suggest that, in conjunction with its embodied status and its co-coordinative potency, music's multiplicity of meanings, its *floating intentionality*, enables it to be efficacious in group and individual contexts and to have been efficacious in processes of human evolution. The present paper will focus on the notion of intentionality or meaning in music in an attempt to clarify some of the mechanisms that may be at work when we engage with music and that may have been significant for human evolution.

## *The human capacity for culture*

Human beings are one single and recently-emerged species, but human cultures are radically diverse and specific. But in Sperber and Hirshfield's words (1999, p. cxv) "Today, with a few undistinguished exceptions, it is generally agreed among cognitive and social scientists that cultural variation is the effect, not of biological variation, but of a

common biological, and more specifically cognitive endowment that, given different historical and ecological conditions, makes this variability possible." While there is no such thing as a generic culture, humans appear to have a generic *capacity for culture*. There are many definitions of culture in the anthropological, ethological and cognitive literatures, but for present purposes one can understand this capacity for culture as being evidenced in *shared ways of understanding the world, of understanding each other as ourselves, and of acting together in and on the world, that are transmissible by non-genetic means*. The capacity for culture defined in these terms appears to be unique to humans. There are certainly aspects of it that we share with some near relatives such as chimpanzees and bonobos, and aspects of it appear common between ourselves and more phylogenetically distant species, but the complete package seems to be unique to humans. Although it is a reasonable assumption that all humans possess this capacity, it does appear that some autistic individuals may not possess some of the components necessary for its expression (Tomasello *et al.*, 2005; Baron-Cohen, 1995), in particular the ability of 'understanding each other as ourselves'.

Tomasello (1999, p325) proposed that the capacity for culture is based on an ability of humans to 'understand others as intentional agents with whom they can align themselves'. In a more recent paper, Tomasello *et al.* (2005) have expanded on this proposal by suggesting that understanding the intentions of others is not enough by itself to account for the aptitude for interaction and joint action that underlies the human capacity for culture. What is also required is a motivation towards and a capacity for 'shared intentionality' which

incorporates not only a degree of understanding of others as intentional but also an understanding of the ways in the intentions of others relate to common goals in terms of hierarchies of possible actions and potential roles. For Tomasello *et al.* (p10) this shared intentionality "refers to collaborative interactions in which participants have a shared goal (shared commitment) and co-ordinated action roles for pursuing that shared goal." It is thus dependent on a degree of mutual responsiveness between those who are interacting, the possession of a shared goal, and the coordination of plans of action and intentions some way down the hierarchy between participants, this last underpinned by a degree of mutual understanding of the role each participant plays in an interaction.

The present paper will propose that music can best be interpreted as a mechanism for motivating and sustaining shared intentionality, in part by constituting a medium that facilitates social flexibility in interaction and in part by underpinning individual capacities for domain-general competence that appear to be requisite for the creative exercise of shared intentionality. In effect, it will be suggested that musicality, a generic capacity for music, is related to the capacity for culture, helping to support and sustain it. In trying to delineate the elements of this generic musicality the focus will not be on the common **structural** features of music across cultures but on **functional** commonalities, as well as on the development of a theory of musical meaning that fits with music construed as both cultural practice and biological endowment.

### *Musicality*

Music takes as many forms as culture. When we examine music across cultures we find a profound variability in the structure of those activities and

phenomena that we would recognise as being musical. Just as there is no such thing as generic culture, it appears that there is no such thing as generic music. Nevertheless, there appear to be no cultures in which something like music does not exist (whether or not something like music is identified as a discrete practice within the terms of any given society). Moreover, in all cultures possession of the capacity to engage with music is typically taken as a given; all members of all human societies are generally expected to be able to engage with music in culturally appropriate ways.

Identification of the features of musicality that are common across cultures is no easy task. Musics are immensely and dynamically variable, and many of the tools most readily to hand, in the form of the western categories and concepts that have been used to explicate western music, are not necessarily extensible beyond our culture; music is not just, as some would have it, structured sound that evokes emotion but that fails to express semantically decomposable propositions. Nevertheless, there are likely to be generic structural features that can be used to characterise music across cultures, deriving from constraints on, e.g., working memory (evidenced, for instance, in the tendency of musics to employ discrete and structurally asymmetric sets of notes), and biases towards particular periodicities in attentional focus and behavioural timing and integration (evidenced in our capacity to keep together in time in the form of entrainment, temporal orientation around an abstracted pulse).

However, the influence of such constraints appears to be culturally contingent to the extent that biases towards particular structural musical usages cannot be predicted across cultures. An instance of this is found

in the concept of *tara* in music of Northern Potosí in Bolivia (see Stobart, 1996), where there appears to be a preference for sounds with inharmonic rather than harmonic spectra (a preference for 'sensory dissonance' over 'sensory consonance') that seems almost orthogonal to the preferred usages in western music, where sounds that exhibit sensory consonance are preferred over those that are sensorily dissonant. In the campesino culture of Northern Potosí, the preferred sound of certain types of wind instrument (such as *pinkillu*, end-blown flutes), is profoundly inharmonic; such sounds are said to possess *tara*. This preference in certain musical contexts for sounds with *tara* appears to be related to acoustical features of the sounds made by rutting llamas, and may be tentatively linked to the ecological and economic significance that this sound has for the lives of the people of Northern Potosí. This preference can thus be related to survival-critical aspects of interactions with animals that are ecologically specific and highly contingent rather than to any generic sensitivities to acoustical features of the musical signal.

### *Functions of musicality*

Given that commonalities at the level of musical **structures** seem to afford rather unstable foundations for an account of generic musicality, one might hope to find a more secure basis by exploring the common **functions** that music subserves across human societies. Does music do similar things, and is it used for similar purposes, across cultures? What does music **do**?

When we explore music in the contexts with which we are most familiar, those prevalent within globalised western society, we find that music is frequently valued for the emotional responses it elicits (see

Juslin & Sloboda, 2001). Perhaps the most common form in which music is encountered for many is as an element in cinema, television or computer game, where music is employed to elicit or to bias emotional response (see Cohen, 2001; Boltz, 2001). It seems to operate most efficiently on our affects when its **global** characteristics are being used to manipulate our emotions: on a simple level, high levels of arousal tend to be elicited by music that is intense and has a broad spectrum (music that is "big and loud"); music tends to elicit positively valenced emotion (facilitate happy states) by means of relatively faster tempi (e.g., *The Blues Brothers*) and negatively valenced emotion (sad states) by slow tempi (e.g., *The English Patient*).

There is now a considerable body of research on music and the emotions which tends to confirm that those global characteristics of music tend to elicit consistent types of motivational or emotional response (see, e.g., Husain *et al.*, 2002). These can be interpreted as being appropriate to the correlates of the global features of sound in the physical world. The notion of a relationship between level of arousal and intensity of sound signal (whether of environmental sound or of music) is unsurprising, as high signal levels will indicate high energy levels of a nearby system, physical or biological, which is likely to be of biological significance to the perceiver and to elicit situation-specific motivational states characterised by high levels of arousal. These consistent types of affective responses to global features of musical sound can thus be thought of as driven by general tendencies to respond affectively to biologically significant features of sound in the physical world. These include intensity but are not limited to that parameter of sound; it's likely that appropriate situation-

specific motivational states will be elicited by other types of acoustical cues.

For example, the film *Jaws* opens visually with an innocuous underwater scene accompanied by an extremely low two note semitonal motif at the bottom register of the double bass, a motif which is repeated several times before suddenly doubling in tempo, increasing in intensity and extending into a three note, chromatic figure spanning a whole tone. The music can be construed as conveying to a listener specific environmental information - there is a large object in the immediate vicinity, it is not visible, and it is approaching (increasing in intensity) and accelerating as it does so (increasing in tempo). The appropriate situation-specific motivational state elicited by the acoustical features of this musical cue is most likely to be fear...

This is probably how music is popularly conceived of in western societies - as a sonic phenomenon of which the function is to elicit emotion, one that can be employed so as to play with our experience of unfolding time, whether personal or dramatic. And we can relate music's power to do this to the apparently unmediated access of aspects of sound to our emotional triggers and switches. Indeed, musical sound has been almost routinely used for many years as a means of consistently inducing altered mood states in experiments exploring the cognitive and neural correlates of anxiety and depression (e.g., Albersnagel, 1988; Koelsch *et al.*, 2006), though no clear rationale has been advanced for its efficacy. But while music is valued and employed for its emotional potency in many other musical cultures, music cannot be conceived of as a purely sonic phenomenon; when we look outside

contemporary western culture, we find music performing a multiplicity of roles, often in the form of dynamic interaction. Music is not simply something that is heard and consumed, it is something that is **done** in interaction with others.

Music in many societies can constitute a temporal framework for interactions, enabling coordination that reinforces a sense of joint action that is open to the participants to interpret almost freely. In this guise music is not imposing a specific meaning on the interaction, only meanings that are grounded in the significances of interaction with others and in the temporal dynamics of such interactions through processes such as entrainment (see Clayton, Sager and Will, 2004). The social functions of music may be multifarious, including simple celebration, or marking of significant life transitions, or liminal or numinous ritual interaction. Music fulfils a huge range of social functions in the form of interactive musical behaviours, and while the advent of technology and the dynamic of western capitalism has led to music coming to be regarded as an aural and consumable commodity, interactive musical behaviours continue to fulfil significant functions even in contemporary western societies in religious and communitarian contexts, in the social lives of adolescents, and most unavoidably in the interactions of caregivers and infants where it has a highly significant role in (co)regulating affect. Music functions as a framework for social and intentional action.

And finally, music can be culturally or personally emblematic in a variety of ways. It can signify membership of a particular community, as do many national anthems, or it can cue memories of salient personal events with which it just happened to co-

occur. An example of music as cultural emblem can be found in the singing of 'You'll never walk alone' by fans of Liverpool football club; there is a relationship between that particular song and that particular city and team that is almost wholly contingent, and indeed it's notable that that particular song has now been co-opted by fans of a number of other European football clubs in the wake of Liverpool's successes. We can term the function of music that connotes place, community, object, event or attribute 'associative', wherein the relationship between signifier and signified here is primarily circumstantial. A return to the earlier example of the *Jaws* theme should help point up what is meant by an associative function of music. In this music the low-frequency motif is joined by a horn call; within western cultures over the last several hundred years, a horn call signifies the activity of hunting. This association between horns and hunting is by no means universal; other cultures may use horns for quite different purposes, as for instance, in the widespread Polynesian use of conch shells in ritual, or in the Central African use of horns in social performance. But for western listeners, the music overlays the acoustical signature of an approaching, accelerating large object with a conventional sign indicating the chase; there are thus two different types of information within the music which both appear to point to the desired motivational state of fear, one ecological and one associative.

To sum up, music has a multiplicity of functions across cultures in group and individual contexts which derive from its affective, social, and emblematic potencies. As the *Jaws* example demonstrates, the features of music that motivate these diverse functions are by no means mutually exclusive; any specific instance of engagement with music is likely to be motivated by

more than just one of these types of feature. While the functions of music appear almost as irreconcilably diverse as do musical structures, it can be suggested that all are rooted, to a greater or lesser extent, in distinct dimensions that underlie our experience of significance or meaning in music.

### *Meaning (and emotion) in music*

One might have expected to find accounts of meaning and emotion in music rooted in consideration of social interaction. This is certainly the case in the ethnomusicological literature, but that literature has tended to steer clear of exploration of the commonalities of music across cultures, leaving the field to musicology and cognitive science. In these fields there has been a tendency to focus on musical structure rather than function in attempts to elucidate meaning in music. As has been noted, such approaches seem unlikely to be able to provide accounts of meaning and emotion in music that have any generality beyond the cultural context from which they are derived, that of contemporary western musical practice.

To allow us to situate an understanding of music in our common biological endowment and also in our cultural variability, it can be suggested that we need to partition out the factors that may motivate emotional responses and attributions of meaning to music in ways that relate more clearly to the generic functions that aspects of music may fulfil for individuals and in social interaction. It should be noted that in making this suggestion it is not the intention to provide an account of the "essence" of musical meaning. Rather, the intention is to delineate a framework within which meaning and emotion in music may be approached analytically in ways that are consonant with biological theory and

commensurable with cultural variability. It should also note that an experientialist perspective is being adopted here which does not differentiate between those foci of meaning or emotion that are "objective" or "subjective". In other words, meaning (and emotion) are being treated here after Jackendoff (1987, p19) as properties 'of...mental states whereby they are related to the world as experienced, whether real or not' [italics in original]. Moreover, meaning and emotion will be approached here as being two sides of the same coin. Both terms are interpretable as referring to motivational and intentional states, aspects of which may be more or less accessible to introspection and available in communication.

It is proposed that we can understand our experience of music as bearing meaning and eliciting emotion in terms of three broad dimensions:

- one which relates to aspects of our experience of the world that are conditioned by our biological heritage and that may have some cross-species generality;
- one which is rooted in the specific types of **human** interaction and interpretations of human interaction that underpin our capacity for cultural interaction and learning;
- and one which derives from the particularities of the cultural contexts in which we develop and come to play a part.

All three dimensions can be considered to be operational in the experience of music, not just in its 'passive reception' (if there exists such a phenomenon, as appears to be the case in the western concert hall) but also in the active use of music, in its production.

The first dimension can be related directly to the scheme developed by Owings & Morton (1998) for the analysis of animal communication. As Seyfarth & Cheney (2003, p158) note, "... there is now growing evidence that, while animal vocalizations may have evolved because they can potentially alter the behaviour of listeners to the signaler's benefit, such communication is - compared with human language - inadvertent, because signalers are unaware of the means by which vocalizations exert their effects". Owings and Morton's approach develops a framework that enables the analysis of these 'inadvertent' communications. In contrast to an 'informational' approach to the analysis of animal communication, in which the focus is on the information that is encapsulated in the signals which an animal emits and receives, they propose that the motivational states of animals may be signalled directly and involuntarily in the structure of the acoustic signals that they produce, referring to these as motivational-structural regularities, a term that will be adopted here.

Owings & Morton propose that these motivational-structural regularities play a role in evolution, in that (1998, p56) "An individual [organism] emits signals to manage the behaviour of others. The social consequences of these signals feed back on the population by influencing the individual's success in contributing to the gene pool of the next generation." For example, an organism in a state of high arousal is likely to produce sounds that have a high intensity and that succeed one another rapidly. Hence rapid sequences of sounds with high intensities will reliably signal the proximity of a - prospectively threatening - highly energised sound source, and evolutionary processes are likely to lead to the differential

survival of those organisms which exhibit appropriate avoidance responses to such signals. These avoidance responses will be mediated, at least in higher organisms, by limbic system activity, biasing the organisms' motivational or emotional states towards avoidance reactions by increasing the level of arousal. The human limbic system proves to be no exception; human responses to music that is loud and that has a rapid event-rate is likely to be mediated by the same processes that motivate responses to loud, fast, sound sequences in other animals (Juslin & Sloboda, 2001).

The **motivational-structural** dimension of musical meaning is thus based on global (and local) characteristics such as tempo, tessitura, timbre, mode of articulation, and intensity. Its effects originate in the correlates of sound in the physical world, produced by environmental objects, organisms and events (the latter two of which may involve generic - not necessarily intentional - aspects of inter-individual interaction), and derive from (partially innate, partially learned) sensitivities to features of the sonic environment. As noted above there is evidence for this in the multiple studies that demonstrate that global features such as tempo relate to stable attributions of emotional arousal and valence, and that such features may be interpreted as relating to features of generic real-world phenomena. These motivational structural factors should be interpreted as playing a role not just in the 'passive sensitivity' of an individual to these sonic correlates of the physical world but also in the capacity of the individual to employ these sonic correlates in attempts to regulate aspects of their environment, including the behaviours of others. In postulating this dimension of meaning in music it may seem that it is,

paradoxically, being suggested that music may exhibit structural universals after all; it must be noted that structure as it is conceived here is concerned not with the structure of sound *qua* sound but with structure that derives from the triadic relationship between physical or organismic events, the sonic correlates of these events, and the prospective generic biological (and evolutionary) consequences of the events.

A similar consideration may hold in respect of aspects of the second dimension of meaning in music; underpinned by the specificities of human interaction, this dimension can be referred to as the **socio-intentional**. The socio-intentional dimension of musical meaning derives from (partially innate, partially learned) sensitivities to features of the structure of interactions with other people that require attributions of intentionality - in Bruner's (1986) terms, 'narrative interpretations' - and is motivated by processes involved in the 'dialogic interchanges' of Tomasello *et al.* (2005). This dimension of meaning is likely to be unique to humans as an intrinsically social and collaborative species, being grounded in the pragmatic processes that frame the communication of information between humans. Such processes will involve inferences concerning imperative, demonstrative, disclosural and dissimulative intent and the expectations that these inferences evoke. Again, it should be noted that this dimension of meaning plays a role not just in working on 'passive' sensitivities but may also be actively employed in seeking to regulate the social environment. The socio-intentional dimension is unproblematically evident in perhaps the vast majority of contexts in which music involves active participation. It is apparent in the real, live interaction that constitutes music in such contexts,

enabling the ascription and the inference of intention and collaborativity. It is perhaps only for contemporary western musical cultures, where the predominant mode of engagement with music constitutes listening to commodified and 'disembodied' recordings, that the operation of the socio-intentional factors are less easily discernible. It could be that in these contexts the 'disembodied' music is experienced as embodying person attributes in its own right, as Watt & Ash (1998) suggest. It seems more likely, however, that music in such contexts is bound up with processes of expectation and anticipation (see, e.g., Huron, 2006) and is experienced in terms of traces of human behaviour, embodying cues as to human action or intention (or to the body-imagistic schemas that may underlie human action and interaction) in ways that have the semantic open-ness to afford the experience of joint action, joint attention and joint intention.

In perception, the socio-intentional dimension is likely to rest on inferences that relate not so much as to *what* unfolds musically as *how* music unfolds, bearing on interpretations that attach to implicitly performative stances that are embodied in the ongoing flow of musical structures. In this respect, the socio-intentional dimension might be relatable to Meyer's (1956, p37) notion of music's *evident* meanings, 'those that are attributed to the antecedent gesture when the consequent becomes a physico-psychic fact and when the relationship between the antecedent and the consequent is perceived'. Nevertheless, while the socio-intentional dimension may be in part bound to the temporal flow of music, its scope is likely to extend to aspects of the global characteristics of music's structure, in this respect overlapping

somewhat with the compass of the motivational-structural dimension.

The particularities of cultural contexts underlie the **associative**, or more appropriately (Tolbert, personal communication), the **culturally-enactive** dimension of musical meaning, deriving from enculturative, formal and personal learning processes. The term culturally-enactive is preferred here because the results of cultural learning and experience are not motivated solely by simple exposure to co-occurrences and hence not reducible simply to the products and processes of associative learning; they are the result of active participation in, and engagement with, the dynamics and specificities of particular cultural contexts and processes, as well as of individual life histories (as in what Davies (1978) describes as the 'darling-they're playing-our-tune' aspect of music's significance). This dimension is rooted in the conventional and institutional use of music and is likely to be dependent in part on the frequency of co-occurrence of music and personal or social situations, in part on the trajectories of individual and social histories, and subject to the contingencies of cultural formation and change.

It should be noted that when both motivational-structural and socio-intentional dimensions are referred to here as 'partly innate', this should not be interpreted as implying that they are 'hard-wired from birth'; infants demonstrate predispositions to interpret information and to interact with others in discrete ways that are particularised in development (see Spelke, 1999) and aspects of both motivational-structural and socio-intentional dimensions are rooted in these predispositions and their developmental trajectories. It should also be noted that the motivational-

structural dimension of meaning and emotion in sound refers to the uses and interpretations of sound and regularities in sound that are shaped by their ecological significances in the evolutionary history of the species. For such a profoundly social species as ourselves, this shaping by ecological significance necessarily overlaps with that which occurs in what is here termed the socio-intentional dimension.

Nevertheless, it may be possible to differentiate the operation of motivational-structural and socio-intentional processes by comparing theories of pragmatic interaction that are grounded in different assumptions concerning the degree of intention involved in communicative acts. The notion of animal communication as regulation of social environment that underlies Owings and Morton's (1998) 'management-assessment' approach appears directly parallel to Sperber & Wilson's (1986) notion of human communication as being 'ostensive-inferential', where the aim of an act of communication is to change a listener's **cognitive** environment (see Cross, 2005). Both approaches are grounded in pragmatics, the difference being that for Owings and Morton an act of communication does not rely on any assumptions as to intentionality either in respect of the 'manager' (signal producer) or 'assessor' (signal perceiver); communication, within Owings and Morton's framework, is almost wholly contingent. For Sperber and Wilson's approach assumptions and ascriptions of intentionality are key. In treating the two approaches as parallel one is postulating that communication is operating within different frameworks of intentionality for most animals and for humans (and perhaps some great apes). However, it would seem appropriate to postulate that human, 'ostensive-inferential', communication can be conceived of as

grounded in the management-assessment processes that can be interpreted as framing acts of animal communication. Indeed, one can interpret Sperber and Wilson's, and Owings and Morton's, schemes as constituting different levels of analysis that possess different degrees of species-specificity. Hence it may be that just as the motivational-structural dimension can be interpreted as rooted in a management-assessment framework, so can the socio-intentional dimension be construed as rooted in an ostensive-inferential framework.

Despite this difference, it seems inevitable that there will be some overlap between aspects of the motivational structural and the socio-intentional dimensions. A similar overlap can be postulated for the socio-intentional and culturally-enactive dimensions, as both are rooted in processes and products of human interaction. However, the three dimensions appear to relate to different underlying types of context in which meaning and affect may arise in respect of music and seem to account well for different aspects of the experience and employment of music across cultures.

There are certain similarities between the framework outlined here and the structure of the framework in terms of which Sloboda and Juslin (2001, pp91-96) analyse the roots of the experience of emotion in music, in which they separate the sources of affect in music into that that are intrinsic to the music and those that are extrinsic. However, the framework outlined here is intended as an attempt to overcome some of the problems that inhere in Sloboda and Juslin's framework by exploring affect and meaning in music in terms of music's functional rather than structural characteristics. Moreover, although developed

entirely independently, this framework appears to bear some similarities to Runciman's (1998) proposal for three types of human behaviour, 'evoked', 'acquired' and 'imposed'. 'Evoked' behaviours are instinctive or reflexive, and their existence may be referred to processes of natural selection; 'acquired' behaviours arise through learning and imitation; and 'imposed' behaviours are bounded by institutional rules and practices. The difference between the scheme outlined here and Runciman's approach appears to be that these different dimensions are not considered here as 'types of behaviour' but as sources of meaning, and it is not intended to reify aspects of them as entities that may be culturally transmitted. In addition, aspects of the three dimensions are prefigured by Lavy (2001) in his treatment of music as sound, utterance, context and narrative in developing a conceptual framework for undertaking experiments on music and emotion. However, the dimensions of meaning in music as laid out here are intended to separate out the properties of music as experienced that bear on both emotion **and** meaning and to ground these within a biologically and culturally viable framework.

The principal benefit of the 'three dimension' account of meaning in music is that it provides an integrated framework within which biological and cultural significance can be explored. However, in itself it will not suffice to enable us order to explore fully the cultural specificities of music, in particular, the ways in which our experience of music as a symbolic behaviour is profoundly mediated by the cultural contexts in and through which we encounter it. We also need to specify mechanisms that will enable us to account for the ways in which music's meanings become the foci of culturally specific transactive

behaviours that can be interpreted as bearing significance in multiple dimensions of meaning simultaneously, or of shifting their affiliation between dimensions as a consequence of interpersonal and institutional dynamics. In effect, having *de*-composed the significative powers of music into the three dimension account, we now need to *re*-compose the sign in music.

Recently, Elizabeth Tolbert and I (Tolbert & Cross, forthcoming) have been exploring the idea that the dimensions of meaning in music may be considered as operating within a (modified) Peircian semiotic system of icon, index and symbol. An icon represents a referent by formal similarity to that referent, an index represents a referent by prior association, hence being dependent on a history of co-occurrence whereas a symbol represents a referent by being embedded in a formal system and has an arbitrary relationship with its referent. These Peircian categories of icon, index and symbol can be considered as levels involved in the experience of meaning in music that operate more or less orthogonally to the three dimensions of meaning outlined above. Hence all three dimensions and all three levels can be regarded as simultaneously operational within the affective and cognitive processes that are engaged in the perception and production of music, both in the experience of music as it unfolds and in the outcomes of that experience. Indeed, it must be stressed that the aspects of music's meaning that are interpretable within the motivational-structural dimension, while appearing to be 'natural', are, by virtue of being expressed or elicited in *musical* contexts, necessarily symbolic.

### *Floating intentionality*

A couple of short examples might make this clearer. To return to the *Jaws*

example, here the motivational-structural dimension is operational in the inferred relationship between low pitch and large size, the culturally-enactive dimension is simultaneously operational in link between the horn call and hunting, perhaps the motivational structural is operational in the implication of increased arousal provided by the tempo increase, but all these dimensions can be thought of as being operational at different levels simultaneously. The low pitched two note motif may derive its potency from the motivational-structural dimension and could be thought of as functioning indexically but at the same time it is not just low-frequency sound; it is a motif performed on musical instruments, an 'artificial' entity. In that sense it is already symbolised and can be interpreted as symbolic, perhaps of human presence in the filmic scene with which we are presented. Similarly, the horn call derives its power from the association of horns with hunting, but it outlines a quite specific figure that inhabits a tonal space that is distinct from that implied by the low two note motif; the rising horn figure increases tension, perhaps acting iconically in respect of aspects of the socio-intentional dimension wherein rising pitch may denote increased muscular tension or perhaps by its activation of a unexpected region of our schematicised and pre-conscious understanding of the tonal pitch relations implicit in the opening motif.

A further example can be found in the Bolivian musical practices referred to earlier. In the particular culture in question, pinkillu, end-blown flutes, are played by men in ensemble. Some, the lower pitched, exhibit *tara*, a broad-band inharmonic sound quality that is said to be related to the sounds made by rutting llamas. Others, the higher pitched, exhibit *q'iwa*, a higher-pitched, and thin sound, explicitly, in

that culture, said to resemble sounds made by both young children and young llamas entreating their mothers for comfort and sustenance. *Tara* seems locatable in the motivational-structural dimension, while *q'iswa* might lie somewhere between that dimension and the socio-intentional. Both seem to be operating at the iconic level, yet they are occurring together in a context of seasonally-determined performances where their use must be regarded as symbolic.

So whether one explores music in a western or non-western context, its meanings appear fluid, slipping easily between dimensions and levels. However, the possibility of a role for motivational-structural factors in the experience of music means that the musical sign may never be *completely* ambiguous; the motivational-structural dimension (and to an extent the socio-intentional) is likely to provide a leash on music's floating intentionality (albeit a highly flexible and extensible one). Nevertheless, even an experience of music in terms solely of the motivational-structural dimension of musical meaning will exhibit a degree of floating intentionality in that it will be motivated by generic sonic attributes of physical-world phenomena and is likely to be susceptible to multiple interpretations, much as the sound of a physical world process generally underspecifies the identity of the process and requires to be triangulated by other sensory modalities in order to resolve ambiguities. Hence meaning in music appears essentially polyvalent, a fact which renders it distinct from language. This is not to say that language cannot be polyvalent - this is precisely what metaphor is - but in the limit language can express unambiguous and semantically decomposable propositions. Its meanings can be specific, with a lack of ambiguity that is quite alien to the

meanings of music. Music has transposable meanings, floating intentionality; music and language inhabit opposite poles on a continuum of specificity of meaning, perhaps overlapping somewhere near the middle, near poetry.

### *Proximate and ultimate functions of music*

So where does this leave music? Is it just a non-functional offshoot of the language faculty, a symptom rather than a cause of the capacity for culture? I would suggest not; the fact that music melds together multiple dimensions and levels of meaning allows it to be efficacious in social and individual contexts in which language is likely to be inefficacious precisely because of its potential for unambiguous interpretation. Music, in its ability to *embody, entrain and transposably intentionalise sound and action* can be interpreted as providing a medium within which participants can interact in ways characteristic of shared intentionality whilst enabling individual interpretations of that shared intentionality to diverge widely without undermining the integrity of the collective musical behaviour and experience. In effect, one musical event never means in only one way at any one time but always in a multiplicity of ways, providing an open conceptual-intentional field for participants. Music can be interpreted generically as a scaffolding for the sharing of intentionality, particularly in respect of its capacities to entrain (which is increasingly being recognised as a significant and potentially species-specific human capacity). If one switches the focus to children interacting musically with each other or with adults it may be that here music is not merely sustaining but helping to form a capacity for sharing intentionality.

Music is able to serve as a medium for interaction with others, in which action goals and aspects of affect can be co-regulated within a temporally regular framework, and in respect of which a heterogeneity of interpretation by individual participants does not threaten the integrity and sustainability of the joint action. In other words, music in generic terms affords a risk-free medium for the exercise and rehearsal of social interaction. For the individual, music combines purposive action with indeterminacy of meaning or ambiguity that may allow disparate concepts or even conceptual realms to be experienced as integrated, perhaps in terms of what Meyer (1956) calls 'connotative complexes'. In interaction, then, music may serve to exercise and perhaps assist in the formation of, social flexibility while for the individual music can be interpreted as constituting a medium for the emergence of metaphorical - domain-general - thinking.

Musicality thus seems integral to the human capacity for culture. It can be interpreted as likely to have been functional in the emergence and consolidation of that capacity, by virtue of its proximate generic functionality at both the level of the group and the individual. In other words, musicality can be interpreted as having played a significant role in the evolutionary processes that resulted in the emergence of modern humans, in facilitating our extraordinary social and cognitive flexibility, and as continuing to play that role in consolidating those flexibilities. It is notable that unambiguous evidence for music appears early in the modern human archaeological record in Europe in the form of the Geissenklosterle pipe, dating from about 36-38 kyr BP (see D'Errico *et al.*, 2003); moreover the prevalence of music in native

American and Australian societies in forms that are not directly relatable to recent historic Eurasian or African musics is a potent indicator that modern humans brought musicality with them out of Africa.

It seems unlikely that a faculty as complex as musicality could have arisen fully-fledged with modern *Homo sapiens*. It is more likely that musicality arose through what Foley (2005) terms a 'mosaic' pattern of evolution, with different components of musicality emerging at different times in the later hominin lines and persisting in response to different selection pressures. These different components include (but are probably not limited to) the evolution of the modern vocal tract (see Morley, 2002), the emergence of fine manual control (including action sequencing and timing), the emergence of the ability to make use of symbolic forms of representation (see Henshilwood & Marean, 2003) and the emergence of the capacity to entrain. This last component of musicality may indeed have been critical in instantiating the capacity for inter-perspectival awareness adduced by Tomasello as fundamental to the emergence of the capacity for culture. Interpersonal entrainment involves the reciprocal use of periodic behaviour to control the timing of each participating individual's own periodic behaviour. Given that some central timekeeping function is involved in activities as basic as locomotion (Molinari *et al.*, 2003), the emergence of an ability to entrain could allow one to 'experience' the world in another's time, hence facilitating the emergence of a degree of inter-perspectival awareness. Nevertheless, on the basis of the archaeological evidence in respect of the varying degrees of social and cognitive flexibility that can be inferred as having differentiated our predecessor (and sibling) species, it

seems likely that it is only with modern humans that musicality emerges as a complete package.

However, the issue of *why* something like musicality might have arisen within the hominin lineage remains unresolved. Elsewhere (Cross, 2003c) I have suggested that a possible answer to this question may be found in the selection pressures that would have accompanied the increases in the duration of the juvenile period (increased *altriciality*) evident in recent hominin species. Joffe (1997) found that the more complex the social organisation of a species of primate, the longer the period of that species' maturation. She concluded that the extension of the juvenile period facilitated the acquisition of the skills required by the need to interact flexibly with conspecifics. This relationship between complexity of social organisation and duration of juvenile period appears to hold across the hominid and hominin lineages. Bogin (1999) has shown that the hominin lineage exhibits a process of progressive altricialisation and stage-differentiation, with our predecessor species exhibiting shorter juvenile periods that are less differentiable into discrete stages of maturation than is the case for modern humans. In highly altricial species such as the later hominins, it is likely that there would have been selection pressures to accommodate to an increased prevalence of juvenile modes of thought and behaviour in the population.

A crucial feature of those juvenile modes of thought and behaviour is play. Imaginative play may involve the construction and regulation of virtual worlds which can be individual or interactive. Even when individual, play tends to be virtually interactive and regulatory (there is nothing quite so authoritarian as a small child with

her imaginary friends). Imaginative play constitutes an almost risk-free medium within which to practice social interaction, and to make and apply metaphor, not least in the animation of the inanimate. It appears to have quite specific and positive impact on both individual and interactive flexibility (see Bekoff & Byers, 1998). Music can be thought of as a way of extending into the adult repertoire of thought and behaviour the benefits of such juvenile exploratory behaviours and of managing their operation, and hence as an adaptive consequence - an exaptation - arising from processes of progressive altricialisation and stage-differentiation in the later hominin lineage.

### *Conclusions*

Musicality appears to be integrally bound to the human capacity for culture, not as symptom but as partial cause. Music allows interacting individuals to engage in goal-oriented behaviours whilst under-specifying goals in ways that permit individuals to interact even while holding to personal interpretations of goals and meanings that may actually be in conflict. It thus provides a potent medium for the formation and consolidation of the capacity for shared intentionality that Tomasello *et al.* (2005) propose as central to the human capacity for culture, as well as having an individual efficacy in enhancing the emergence of domain-general modes of thought. This paper has focused on the ways in which music can be interpreted as fulfilling these functions by virtue of its floating intentionality; one and the same musical event will be bear meaning in multiple dimensions and at multiple levels simultaneously and is hence susceptible to multiple interpretations. The dimensions of meaning in music proposed here are intended as dimensions in terms of which meaning

in music may be analysed. They are operational definitions of aspects of the correlates of the experience of music that seem to have some generalisability and that appear to provide a way of conceiving of and interpreting music both as biological phenomenon and as cultural construct within a single integrated framework.

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