

Music and biocultural evolution

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Introduction

How should we understand music? The ways in which we can answer this question are conditioned by the status that we are willing to grant to music. If music is a universal human behaviour, part of "human nature," then it should be possible to understand music by identifying and applying general principles of the type found within formal and scientific theories. And music has been claimed as "a universal behavior" by Alan Merriam (1964, 227), though Blacking (1995, 224) is more circumspect in stating that "every known human society has what trained musicologists would recognize as 'music'."

But this view is difficult to square with much ethnomusicological, and most recent musicological, scholarship, which would replace music with musics, holding that musics are musics only in their cultural contexts. Musics only make sense as musics if we can resonate with the histories, values, conventions, institutions, and technologies that enfold them; musics can only be approached through culturally situated acts of interpretation. Such interpretive acts, as Bohlman (1999) makes clear, unveil a multiplicity of musical ontologies, some or most of which may be mutually irreconcilable: hence a multiplicity of 'musics'.

In the first view, there is a singular phenomenon called music, which has a knowable relationship to human biology, mind, and behaviour. In the second view, music exists as musics, diverse, multiple, and unknowable within a single unitary framework. But in this second view music seems to have lost much of its materiality, and while the materialities of 'musics' may be heterogeneous and heteronomous, they are irrefutably grounded in human behaviours.

From a materialist perspective, underlying human behaviours are minds, and underlying minds are embodied human brains. Underlying embodied human brains are human biologies, and underlying human biologies are the processes of evolution. Musics as culturally situated, minded human behaviours—musics as material phenomena—thus stand in some to-be-determined relationship to human evolution. Of course it might be the case that the cultural dynamics of music owe little or nothing to the evolutionary processes that underlie our biologies. But this position is only tenable if our biological being can be cleanly dissociated from our cultural lives, and given that our cultural lives are mainly evidenced in material behaviours and their traces, a clean dissociation between culture and biology—or between music and evolution—is unfeasible. To state this is **not** to argue that musics are reducible to—are knowable wholly in terms of—an understanding of evolution, merely that the relation between musics and evolution needs to be explored and specified.

Current theories of evolution are concerned with the ways in which the operation of processes of random variation, natural selection, and differential reproduction within a population leads to changes in the state and makeup of that population. Random variation leads to the emergence of entities with different attributes or capacities; natural selection, operating through ecological pressures, leads to the preferential survival of those types of entities whose capacities are best adapted to immediately prevailing sets of circumstances; and those entities that are best adapted have a better chance of reproducing and passing on their genes than do less-well-adapted entities. It is important to note that the entities referred to above might be genes themselves, organisms, or individual or group behaviours (see, e.g., Boyd &

Richerson, 2010). An evolutionary approach will tend to focus on the attributes that allow a gene, a behaviour, an organism, or a specific intra- or intergroup dynamic to be functional in the processes of evolution, that is, to be adaptive in contributing to the differential success in survival and reproduction of the entities that make up the population.

Hence an evolutionary perspective seems to offer an integrated framework that has explanatory power with respect to individuals' biological components and behaviours, as well as with respect to groups of individuals (and the existence of groups of individuals is a necessary though not sufficient premise for the existence of culture). So evolutionary thinking may provide a means of exploring relationships between human biology, behaviour, and culture. There are, however, very good reasons why anthropologists and psychologists have been wary of applying an evolutionary perspective to human behaviours and culture. The genetic determinism and racist stereotyping that the evolutionary thinking of the first half of the twentieth century appeared to sanction led to some of the worst barbarities in recorded history.

But contemporary evolutionary thinking offers comfort neither to genetic determinists nor to racists. Evolution is currently seen as impacting on human mind and behaviour not by shaping or determining complex behaviours directly, but by providing general constraints on how minds interact, and develop so as to be able and motivated to interact, with their physical and social environments. And modern genetics has shown that two gorillas five miles apart in a central African rain forest are likely to differ more in their genetic makeup than are a Basque inhabitant of San Sebastian and an Aboriginal Australian from the Northern Territories. Despite recent evidence for a limited amount of gene flow between archaic humans and modern humans (Reich et al, 2010; Green et al, 2010), we are one single species—*Homo sapiens*—recently emerged from Africa. However, our biological homogeneity stands in extreme contrast to our cultural diversity; for a species whose members are, biologically speaking, all much the same, we have developed a superabundance of different ways of living—an enormous plurality of cultures.

Bearing this prodigious cultural diversity in mind, are there reasons to expect that musics, as culturally situated human behaviours, have anything other than a contingent relationship to evolutionary processes? In the first place, a hint of a more than contingent relationship can be found in music's ancient provenance as a human behaviour. The earliest unambiguously musical artefacts identified to date are bone and mammoth-tusk ivory pipes dated to around 40,000 BP found at Hohle Fels in southern Germany, uncovered in contexts that associate them with modern *Homo sapiens* (Conard et al, 2009). The pipes predates almost all known visual art, and in any case a capacity for musicality (most likely vocal) would predate the construction of a sophisticated musical artefact such as a pipe, probably by a considerable period. Archaeology thus suggests that human musicality is ancient; the fact that music appears about as early as possible in the traces of *Homo sapiens* in Europe, together with the fact that musicality is an attribute of both the peoples of the pre-Hispanic Americas and of the Aboriginal peoples of precolonial Australia, provides good grounds for believing that music accompanied modern humans out of Africa.

And not only is music ancient, but musicality may be universal for all members of the human species; it has been claimed that "musical ability [is] a general characteristic of the human species rather than a rare talent" (Blacking 1995, 236). Of course, there are societies within which the term music does not seem to offer a good fit to

any discretely identifiable set of cultural practices. But this does not seem to connote an absence of activities that might be interpretable as "musical." This lack of fit might arise because such "musical" behaviours are so embedded in broader categories of cultural practice as to be inextricable from them (as is the case in many African societies); or it may arise because "music" is a proscribed activity (as under the Taliban regime in Afghanistan). Even in this latter case, behaviours interpretable as "musical" may be manifested in contexts such as devotional song, though unacknowledged as music by the participants (Baily, 2005).

Music is thus humanly ancient and ubiquitous, making it a good candidate to be considered as an evolutionarily adaptive behaviour. But both music's ancient provenance and universality are more suggestive than conclusive. It may be that musics are contingently human. Perhaps they are human behaviours that are not adaptive (in the evolutionary sense), which have arisen simply because humans have evolved other capacities that music can parasitically exploit, or they might be behaviours that have specifiable and determinate functions but that have neither played a role in, nor been impacted upon by, processes of human evolution.

Music as a generic human capacity

In order to evaluate the relationship between music and the processes of evolution we have to start by ascertaining whether or not music is a generic capacity of the human species; is there a sense in which we can claim that all humans are musical? A positive answer to this question will require that we are able to identify phenomena across all human societies—and across all typical members of those societies—that we can categorise as "music"; only then will we be in a position to determine whether or not this generic "music" has any specifiable function that has the potential to be considered as adaptive.

As we have seen, ethnomusicologists generally agree that all known societies have music, or perhaps more accurately, musics. However, the question of what precisely counts as "music" poses a significant problem; the diversity of cultural practices that ethnomusicologists have characterised as "music" seems to present no essential diagnostic features that would allow "music" to be identified unambiguously.

Nevertheless, a pragmatic solution to the problem can be found in the ethnomusicologist Klaus Wachsmann's (1971, 384) suggestion that what ethnomusicologists and others tend to identify as "music" in cultures other than their own are simply the phenomena that sufficiently "...resemble the phenomena which I am in the habit of calling music in my home ground".

While this may not seem to get us very far, we can at least start by suggesting that "musics" in cultures other than our own will tend to share some objective properties with the music with which we are familiar, typically employing complex patterns of sound that may be articulated in any or all of the dimensions of pitch, rhythm, timbre and intensity, typically by the voice. Most musics tend to "sound like" music, their sonic surfaces and structural organisations tending to exhibit similar features. These shared features can be understood as rooted in generic constraints on human perceptual, cognitive and motoric capacities (see Stevens & Byron, 2009). A less evident shared property relates to the tendency of musics to exhibit temporally cyclical event-structures organised around an underlying, regular pulse. This not only allows the foci of listeners' attention to be modulated according to the music's

underlying pulse (Jones & Boltz, 1989) in presentational contexts, but also enables performers engaged in musical interactions (both formally-trained specialists and enculturated individuals) to co-ordinate their musical behaviours in time—to *entrain* with each other (Clayton, Sager & Will, 2005). Aside from commonalities of structure, engagement with music across cultures tends to be associated with changes in the affective states of participants; universally, engagement with music tends to elicit emotion (see Juslin & Sloboda, 2010; Fritz et al, 2009) and music is conceived of as emotionally expressive (see, e.g., Feld, 1984).

Music also tends to be experienced as powerfully meaningful, but the meanings that are experienced embody the paradox of being somehow immediate and "natural" (e.g., Feld, 1981, 28), yet at the same time indeterminate or ambiguous (e.g., Qureshi, 1987)—what I have described elsewhere (Cross, 1999) as "floating intentionality". As Alan Merriam (1964, 32-3) noted, across cultures—and even from a perspective rooted in one particular society—music is more than just sound; it is also manifested as concept and as behaviour. The concepts that underpin music may take quite different forms in different cultures, as might the practices that embody or that give rise to those concepts; hence, although the acoustical manifestations of music in two different cultures may appear quite similar to a Western listener, their conceptual and behavioural contexts may render them quite distinct as musics. For example, music may be conceived of or enacted not just for entertainment or for its aesthetic value, but may be embedded in, and be instrumental in respect of, other domains of social action. It may be presentational, or it may appear as a participatory, communicative medium entailing active contributions from all culture members (e.g., Turino, 2008) that involve both sound and movement; it may be an integral component of coping with social change (Cross & Woodruff, 2009) or may be central to the maintenance of aspects of the social order (Marett, 2005).

Despite the immense range of contexts in which musics manifest themselves in different societies, and the wide range of cultural functions that they appear to fulfil, music is part of the cultural repertoire of every known society, and there is a general presumption that all culture-members will be able to respond to it and engage with it. Blacking's claim that "musical ability [is] a general characteristic of the human species", can be glossed by suggesting that each culture typically expects its members to be able to engage with music in culturally-appropriate ways, irrespective of whether the primary mode of engagement with music in a particular society is presentational, differentiating between those who perform and those whose capacity to engage with music is limited to listening and appreciation, or participatory, imputing to each culture-member the capacity actively to contribute to collective musical behaviour. In general, while the participatory mode is prevalent in pre-industrial or traditional societies (see Turino, 1999), in contemporary western societies the presentational mode predominates, privileging acts of listening; however, the participatory mode, involving collaborative music-making by non-specialists, remains widespread in present-day urban societies, as shown in the work of Finnegan (1989) and others.

Prospectively adaptive attributes of music

Across cultures, then, music appears to have several clearly identifiable attributes; it is complexly structured, affectively significant, attentionally entraining, and

immediately—yet indeterminately—meaningful. If we restrict our view of music to the "folk-theoretic" (Walton, 2007) terms in which it is typically conceptualised within Western societies—as an autonomous aural commodity that has hedonic (and perhaps aesthetic) value—then our identification of these generic attributes of music may be interesting but seem to offer little in the way of help in understanding the nature of any relationships between music and evolutionary theory. From this perspective music seems to have complexity but to lack purpose, incongruous features that have led evolutionary theorists such as Steven Pinker to dismiss music as a trivial pursuit—a "technology", in his terms. For Pinker (1997), its complexity is parasitic on our capacity for language, while our use of it to move our emotions is on a par with our use of recreational drugs to simulate the pleasure engendered by the release of endorphins. He suggests that our faculty for music simply exploits capacities such as language, auditory scene analysis, motor control, etc., that can be postulated to have become universal components of the human behavioural repertoire through evolutionary processes because of their incontestable adaptive value. Pinker's view still holds sway in much of the scientific literature that has addressed music and evolution (see, e.g., Balter, 2004). However, as should be evident, such a view is only tenable if almost all the world's musics other than those of the last one hundred and fifty years of technologised Western societies are excluded from consideration, and if we completely disregard the fact that music is experienced as meaningful.

If we think of music as primarily interactive and communicative, as fused with other domains of human thought and behaviour rather than constituting an autonomous domain in its own right, then its complexity, its immediacy and indeterminacy of meaning, together with its tendency to occur in contexts of entrainment, endow it with considerable powers. Its cyclic periodic structures afford individuals interacting through music the experience that their behaviours are coordinated with other participants, endowing musical interaction with the impression that each participant is somehow sharing each other's time and laying the ground for the emergence of a sense of mutual affiliation. Its floating intentionality allows each participant to hold to their own interpretations of the meaning of the collective musical act without ever having to make those interpretations explicit for each other. At the same time, music's immediacy of meaning—its *apparent* honesty—legitimises the sense that what each participant feels and understands is also felt and understood by the others.

In these respects, music appears quite different from language as a communicative medium. For most linguists and psycholinguists, the key feature of language is its capacity to represent and communicate complex propositions about states of affairs in the world. As Pinker & Jackendoff (2005, 219) put it, "...language is a mapping between sounds and meanings..."; the principal task of language is to enable information that can have semantic specificity—that can unambiguously denote things such as objects, agents, attitudes or events—to be exchanged between speakers and listeners. Music, considered as a communicative system, cannot do this; it cannot be employed to communicate complex yet unambiguous propositions about states of affairs in the world, indeed, it cannot even communicate simple propositions. But at least some of the time language, or more properly, speech, does *not* convey complex semantic information.

For example, on meeting someone in passing with whom one is casually acquainted one might say "How are you?", expecting a formulaic "Fine, thanks—and you?" response, the interaction reaching an anticipated close with one's own response of "Oh, fine". This linguistic interaction is not concerned with exchanging information but with establishing or re-establishing a social relationship—it is phatic (Coupland & Coupland, 1992). In such phatic contexts, where language is being used *relationally* rather than *transactionally*, it is fulfilling a function that seems more like that which I have postulated for music; it is acting, albeit transiently, as an affiliative and non-conflictual means of interaction. However, that function could be suppressed in the instance outlined above were one's initial enquiry to be interpreted as a genuine desire to elicit information rather than as a ritualised act of social facilitation. Language's capacity to be interpreted as unambiguously referential underwrites a potential for conflict between participants' interpretations of a shared discursive act. Music, in the view presented here, constitutes a more efficacious medium for sustained non-conflictual, affiliative social interaction precisely because of music's lack of capacity to be interpreted as unequivocally conveying a specific meaning. Nevertheless, there appears to be a significant overlap between the capacities of music and speech, and it can be suggested that "music" and "language" constitute culture-specific categories of communicative interaction that are distinguishable by being at opposite poles of the capacity for unambiguous reference (Cross, 2005).

That music has potency in the social domain is a consistent theme of the ethnomusicological literature, summed up in Bruno Nettl's proposal that one of the fundamental functions of music is "...to support the integrity of individual social groups" (Nettl, 2005, 253). The ideas outlined here put a particular gloss on Nettl's proposal, suggesting that music's socially facilitative effects depend on the attributes identified above as common across cultures and implying that music, as a communicative medium, is likely to have a significant role in minimising within-group conflict or, to put it another way, in collaboratively establishing a degree of social equilibrium. Indeed, as McLeod (1974, 113) notes, across a wide range of societies music is particularly associated with "...the public presentation of social uncertainty" and elsewhere (Cross, 2009), I've proposed that music, as a generic human capacity, can best be interpreted as a communicative medium that is optimal for the management of situations of social uncertainty.

Music and evolution

This proposal provides a baseline for understanding music as having a generic role across human societies, and may also offer a way of understanding how musicality—the capacity for music—comes to be instated in the human genome. Music is self-evidently functional in the social domain, facilitating social interaction and sustaining the integrity of social relationships. Such relationships are intensely important for humans; we are an intensely social species, and we are extremely flexible in the ways in which we manifest that sociality in comparison with other species, including most of our close evolutionary precursors (Foley & Gamble, 2009). Indeed, humans exhibit a range of cultural variability (and of flexibility in accommodating to new cultural environments) that is of a different order from all other species. Boyd and Richerson (2009) propose that the course of human evolution is marked by an increasing capacity for social interaction driven by adaptive enhancement of the ability to learn from others, leading to the emergence

of intra-group (cultural) and inter-group (inter-cultural) selection pressures that drove the evolution of cooperative, prosocial behaviours.

Tomasello et al. (2005) have suggested that it is the possession of a *capacity for culture* is a generic feature of modern humans, marking us as fundamentally different from other species. The capacity for culture is manifested in our ability to "share intentionality" with others; we are able to interact with others in ways that indicate that we can infer and share their feelings, attentional foci, intentions, and goals. We are able to do this because we have highly developed (and largely pre-conscious) powers of attributing "mindedness" to others, on the basis of their (largely pre-conscious) behaviours (Frith, 2008); gaze direction, facial and brachiomanual (hand and arm) gestures, degree of spatial and temporal alignment of others' actions with our own, all provide cues that we can use in making inferences about the feelings, mental states and attitudes of those with whom we are interacting. This "mind-reading" ability, generally termed "Theory of Mind" (Leslie, 1987), is evident from infancy, though its developmental trajectory through childhood to maturity is complex and susceptible to a degree of cultural influence (Liu et al, 2008).

Music plays on and exploits these cues (particularly temporal alignment of action and sound) in providing a framework for affiliative—prosocial—interaction. We can suggest that "something like music" is likely to have played a role in enabling our ancestors to get on with each other: to form, maintain and re-form stable yet flexible groups or cultures. In effect, in an evolutionary scenario in which the capacity to create and maintain social relationships is as important for survival as are any overt attributes of the individual (such as strength, speed, perceptual acuity, etc.), music's powers of stimulating and consolidating the appearance of social accord would have had considerable adaptive value in the overall repertoire of human behaviours. Over the course of human evolution music could have served as a means of managing intra- and inter-group interactions, helping to nurture the human facility for complex sociality that underpins the capacity for culture. As I have suggested elsewhere (Cross, 2003), it may have emerged as a mode of communicative interaction as a mechanism for regulating, and co-opting into the adult repertoire of thought and behaviour, juvenile exploratory patterns of thought and behaviour, under the selection pressure of the increasing altriciality (extension in duration of the juvenile phase relative to total lifespan) that is evident across our ancestor species in the hominin lineage (Bogin, 1999).

As I've suggested above, music and language overlap considerably in the functions that they can fulfil as communicative media (and, indeed, in the structures and forms that they use to effect their ends); the distinction drawn between "music" and "language" in present-day Western cultures may reflect historic and contemporary cultural practices rather than any clean or intrinsic distinction between the two domains. Hence I would suggest that rather than music preceding language in human evolution (as Mithen, 2005, suggests, following Darwin's suggestion of 1871: see Darwin, 2004), or indeed language preceding music (after Spencer, 1858), music and language are best conceived of as having co-evolved as components of a generalised human communicative toolkit. It is possible that they manifested themselves in ways that might be dimly discernible from the perspective of the present day with *Homo heidelbergensis* (the immediate predecessors of both ourselves, *Homo sapiens*, and our sibling species, *Homo neanderthalensis*) some half a million years ago; but it seems more likely that only with the emergence of

Homo sapiens some 200,000 years ago did music and language assume forms with which we contemporary humans could fully resonate. According to this interpretation, more archaic humans (such as *Homo ergaster*) are likely to have had to make do with communicative capacities that fully integrated phatic and (limited) referential functionality.

In the end we can speculate almost endlessly about whether music has been evolutionarily adaptive, non-adaptive, an exaptation (an accidental but evolutionarily beneficial consequence of the evolution of other capacities), or merely a technology (as Pinker proposes). The evidence will always be likely to remain susceptible to multiple and contested interpretations, as is clear from the theories summarised in Cross (2007). However, it seems to me that the evidence most strongly supports the view that music *could* have been unequivocally adaptive; it is certainly socially efficacious in present day societies, and given music's universality and ubiquity across all societies including traditional cultures there is every reason to suppose that that social efficacy is an ancient characteristic. In the light of music's early appearance in our archaeological record, all this lends weight to the idea that the capacity music is an adaptive characteristic of the human species.

Nevertheless, the fact that we can account for certain generic aspects of music within an evolutionary frame does not provide an account of music *per se*, nor does it provide a warrant for science in general, or evolutionary theory in particular, to claim intellectual hegemony over the exploration of music. What has been outlined here is a generic account of music that reflects commonalities across cultures and that is concordant with an evolutionary understanding of the human faculty of musicality; but it cannot capture or reflect any single or particular cultural manifestation of music, and all music is inescapably culturally-situated. For that, we must turn to ideas, methods and disciplines represented elsewhere in this volume. That said, a generic account of music as a human capacity may provide those concerned with music in contemporary society with some moral, or even political, capital. If it is the case that the ideas outlined in this chapter have some validity—if it is the case that there is no other mechanism or vehicle that can perform for humans what music can perform as *a communicative medium*—then at the least we have a basis for claiming that to remain human we require the right to be able to be musical.

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