MUSIC AND EVOLUTION: THE NATURE OF THE EVIDENCE

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ABSTRACT

In recent years the relation of music to human evolution has begun to be explored from many different perspectives. In large part, these explorations are motivated by the sense that an evolutionary perspective may be the best way to integrate an understanding of music as a biological phenomenon with an understanding of music as a component of culture. This paper is intended to identify the nature and the sources of the evidence in which explorations of the relations between music and evolution must be rooted in order adequately to address the concerns of musicology, anthropology, archaeology and cognitive science. The principal sources of evidence fall into six categories: functional, phylogenetic, developmental, physiological, ethnographic and archaeological. The first, functional, deals with the social and individual roles of 'music' across cultures, and provides the fundamental delimitation of what can legitimately be construed as 'musical'. The second, phylogenetic, is required to assess the degree of homology between human musical behaviours and 'musical' competences in other species. The third, developmental, provides indications as to the genetic component of sets of behaviours, while the fourth, physiological, sets the boundaries for the possession and exercise of 'musical' capacities and behaviours. The fifth, ethnographic, examines the roles and possible forms and artefacts of music in current lifeways and environments that are similar to ancient lifeways and environments, while the sixth, archaeological, is concerned with the 'hard' evidence of ancient artefacts and their find contexts. The evolutionary perspective on music needs to be examined and its evidentiary bases need to be made explicit in order to elucidate the relation of culture to biology and situate music within that relation as well as, critically, to delimit the implications of an evolutionary view.

1. INTRODUCTION

Music is a cultural phenomenon, but it has a material existence in the sounds that comprise it and in the actions that give rise to or are evoked by those sounds. And that materiality is inextricably conditioned by our biologies and neurophysiologies. From certain perspectives this creates a conflict; music appears to be either a cultural construct, a discursive category, free to vary in all its aspects according to the vagaries of cultural forces or even not to exist, or music is a product of our material being, grounded in the dynamics of our biologies. However, over the last decade the theory of evolution has become an increasingly tenable conceptual framework within which to undertake an integrated exploration of things natural and cultural, and music has begun to be addressed from an evolutionary perspective. This paper is intended to identify the nature and the sources of the evidence in which explorations of the relations between music and evolution must be rooted in order adequately to address the concerns of musicology, anthropology, archaeology and cognitive science. The principal sources of evidence fall into six categories: functional, phylogenetic, developmental, physiological, ethnographic and archaeological. Each will be considered in turn.

2.1 Functional evidence

At the outset it must be made clear that there are many 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 with 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 so as to be inextricable from them (as is the case in some African or Andean societies); or it may arise because 'music' is a proscribed activity (as in the case of the late 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. At a first approximation, all these 'musical' behaviours seem to share certain commonalities: 'music' involves not just patterned sound, but also overt action; 'musicality' is a property of communities rather than of individuals; and music is mutable in its specific significances or meanings.

It may be objected that listening to music scarcely involves action; however, the notion that *the* predominant mode of engagement with music lies in the listening experience appears to apply only in certain (largely, western) cultural contexts. In any case, although participation in western art-music as a mature listener may appear *not* to involve action, the *acquisition* of that capacity to participate as a listener

almost invariably does. Similarly, a distinction is often made between 'musical' and 'non-musical' individuals, seeming to suggest that 'musicality' constitutes a property of individuals. However, the designation of an individual as 'musical' is always mediated by social or even institutional influences and interests; and again, the distinction between musical (active, knowing) and non-musical (passive, non-competent) individuals seems to be severely culture-specific, in that within most cultures performers and audiences are co-joint participants, with 'music' entraining action through interaction. Finally, 'music' is always embedded in social process, deriving significance from its context of performance and endowing that context with meaning in turn; 'music's' meanings are inextricably linked to social and individual experience and interpretation. However, those meanings are rarely if ever unambiguous, may differ from participant to participant and may even be multiple for a single participant. From these considerations one can derive an operational definition of music's functions and hence a fundamental delimitation of what can legitimately be construed as 'musical' across cultures and times: *'music embodies, entrains and transposably intentionalises time in sound and action*'.

2.2. Phylogenetic evidence

Viewed in this way, music appears to be solely a human phenomenon. No other species appears to engage in behaviours that display all the qualities of 'music' as delineated above. Different behaviours that have been held to be musical - such as bird-song, gibbon song or even whale song - seem more similar in their functions to human speech than to music; they are typically tied to specific situations and functions, so that, e.g., much bird song serves strictly territorial or mate selection functions (the latter seems to be the function of much the humpback whale repertoire), while gibbon song appears to be employed to strengthen pair-bond cohesion.

The principal means of assessing whether or not the sound-producing behaviours of other species are related to human musicality rests in an examination of the inter-species relations outlined by evolutionary cladistics, and depends on whether or not elements of traits for musicality appear to arise in a particular species *and persist* across all those species whose lineages intervene between and converge on modern humans (see Cross, 2001). Only in this way can one assess whether a behaviour that has been claimed as a precursor of music and human music share some genetic basis (in which case they would be homologous) or are contingently similar, having no demonstrable genetic connection (in which case they would be analogous).

To give an example, birds' singing capacities have often been claimed to be similar to human musicality (see Marler, in Wallin et al. 2000). But, evolutionarily speaking, lying between humans and birds are every other mammalian species, only the most minute proportion of which display types of behaviour that share features of song or music. Bird song and human music are at best analogous behaviours and are not homologous.

One might look for homologous behaviours closer to home, amongst species that are evolutionarily close to humans. But it is clear that even here there is little evidence for the genetic transmission of a capacity for musicality. Most primates other than humans do use sound for functions such as alarm calls, within-group interaction, signalling of food sources, or inter-group intimidation (see Ujhelyi, and also Geissman in Wallin et al. 2000), but these sounds tend to be referential in nature, bearing a speech-like function. Nevertheless, it is possible that precursors of human musicality might be found in those primate vocalisations that are components of, or adjuncts to, behaviours that subserve a social function (such as expressing or assenting to dominance relations, indicating the 'play' status of a behaviour otherwise interpretable as aggressive, etc.); here, reference is less determinate than in, for instance, predator alarm calls and may be closely linked with expression of (transposable) affective state in ways that have similarities with human musicality. However, even if no homologies can be convincingly demonstrated between the behaviours of other species and human music-making, evidence of a sensitivity by non-human species *to* music (as, e.g., in Toukhsati & Rickard, 2001) can indicate the extent to which phylogenetically general attribute of neural systems may condition and constrain human musical behaviours.

2.3. Developmental evidence

While the phylogenetic evidence would suggest that musicality is not shared with other species, evidence from developmental studies would suggest that from birth, humans display many capacities that are parts of mature musicality, seeming to support Blacking's (1995, p236) claim that 'musical ability [is] a general characteristic of the human species rather than a rare talent'. Over the last two decades compelling evidence has emerged for a genetic component to crucial aspects of the ways in which the neonate and infant mind experiences and construes the world, and it has been suggested that an innate capacity for 'musical' perceptions constitutes one such aspect (Gelman & Brenneman, 1994). To these predispositions for musical perception can be added predispositions for overt musical behaviours, as evidenced particularly in the kinaesthetic musicality of infant care-giver interactions (M. Papousek, 1996). At present research on early musicality is itself at an early stage; there is a paucity of information from non-western societies that rather limits the generalisability of findings to date, but what little evidence there is would seem to support the premise that human musicality is present from birth and that the foundations of musicality are not culturally constructed.

Of course, infant predispositions to display musicality must be differentiated from the factors that underlie the exercise of musicality by the mature members of a culture, but while the latter cannot be reduced to the former they are undoubtedly sustained and shaped by them. From an evolutionary perspective the absence of musicality amongst our closest

surviving relatives, the great apes, and its presence in humans suggests that it arose either with our hominid ancestors or with ourselves; the complex suite of characteristics that comprises our musicality has been interpreted as evidence for the latter possibility (Cross, 1999 and in Peretz & Zatorre, 2001), though others have proposed an earlier provenance (Brown, in Wallin et al., 2000; Morley, in press).

2.4. Physiological evidence

One possible source of evidence for such an early provenance is the emergence of a physiology that could sustain a capacity for musicality, and in exploring this capacity it is necessary to focus on vocal and percussive methods of music production. To have the physiological and neurological *capacity* to produce and process melody and/or rhythm is not necessarily to make use of it in that particular way, but this approach allows a time to be identified before which musical behaviours could not have been undertaken.

This evidence consists principally of information from the fossil record of hominids regarding the evolution of the neurology and physiology identified as associable with musical ability, evidence from neuroscience for distinct areas of the brain relating to musical ability and their relation to those controlling speech, including ontological studies of these abilities in children, and investigation of the inter-relatedness of the physiology and neurology used in the production and processing of sound.

Fossil evidence for the development of vocal physiology consists of several major features, for example the larynx and basicranial flexion (e.g. Lieberman, 1989), the hyoid bone and mandible (Arensberg *et al*, 1990), the hyperglossal canal in the jaw (Kay, Cartmill & Balow, 1998) and the structure of the inner ear (e.g. Spoor *et al*, 1994). The development of these features can be tracked with surprising accuracy through the fossil record, and as well as merely showing the development of these physiological capacities, inherent within this is the implication that the properties they bestowed upon the species in which they manifested were evolutionarily selectively advantageous.

The development of neurology and inter-relationships between features and functions of areas of the brain can be plotted both ontologically and phylogenetically through neuropsychological research, neural pathologies and developmental studies (e.g. Peretz & Zatorre, 2001); in tandem with the fossil evidence for apparent growth in particular areas of the brain (e.g. Falk, 1992), this provides important clues as to the roots and links between the various physical and neurological perceptual and productive capacities within humans that form the basis for musicality.

2.5. Ethnographic evidence

While physiological evidence suggests earliest incidences of the capacities for musical behaviour, it does not provide any model for the nature of what those behaviours might have been; ethnographic evidence can be called upon to provide just such models. Contrary, and complementary, to the aim of illustrating the diversity of musical behaviours, is the aim of identifying shared features of musical behaviours across traditional cultures whose lifeways approximate in certain characteristics to those of our ancestors, for example, Plains Indians (Nettl, 1992), African Pygmies (Kisliuk, 1991), Yupik and Inuit Eskimos (Johnston, 1989) and Australian Aborigines (Myers, 1999). Given the diversity of habitats and the temporal and spatial separation of the peoples whose musical traditions it is possible to investigate, and that they are united only in their humanity and, in the case of hunter-gatherers, their subsistence strategy, similarities in their musical behaviours could suggest information about the roots of these behaviours. Close parallels between the groups would imply either convergent development of these behaviours or a shared cultural heritage. The former (convergence) would suggest that there are important evolutionary driving forces towards those common behaviours, either as a consequence of subsistence method or of human biology, these being the principal common factors between the groups. The latter situation (shared heritage) would indicate a very ancient tradition of musical behaviour, as the groups considered are probably separated by at least 60,000 years.

A further aim of the investigation of ethnographic sources of evidence is to examine the nature and the uses of instruments, such as are used, how they are manufactured, and what resources are made use of in their construction. Are the resources used subject to complex modification to produce sound-making devices or are they used in their natural state? Are the instruments melodic, percussive or both? The answers to these questions could have important implications as regards the potential capability of prehistoric and pre-modern humans to have undertaken similar behaviours.

As a consequence of these analyses it should be possible to identify a diversity of types of instrumentation, including some which may have been available to be used by early humans, but which have been lost to the archaeological record. Through looking at the uses of music within societies which hunt and gather, it may also be possible to identify potential selective benefits to be had from the use of music within such a social organisation.

2.6. Archaeological evidence

To date, the oldest undisputed archaeological evidence for musical instruments dates to between 35 and 40,000 years ago, and is found in Europe (e.g. Scothern, 1992; Lawson, Scarre, Cross and Hills, 1998). The relevance of this evidence as a source of information about the development of musical behaviours is self-evident, but its principal value lies in its status as a clear manifestation of *fully realised* musical behaviours. The instruments that are manufactured at this time are not sub-standard early experiments but are clearly accomplished and carefully manufactured pieces with specific functions in mind. Not only does this suggest that musicality by this point played a developed role in human groups, but it also implies that musical behaviour did not emerge suddenly

at that point, as has often been asserted in the past, but instead had a considerable period of development leading up to this time.

In addition, what we can hope to gain from this source of evidence is a picture of the nature, role and practice of music at this time when we see the first unequivocal evidence for its use in anatomically modern human societies. For example, many of the examples of these items are found in aggregation sites, areas of consistent levels of high activity by large groups over the course of sometimes many thousands of years (e.g. Scothern, 1992; Lawson, Scarre, Cross and Hills, 1998). Evidence such as this regarding the context and location of musical artefacts could provide fundamental clues to the nature of the practice of music at this early time, including conclusions regarding the type of social situation and physical environment in which such artefacts might have been used, and the raw materials and methods used for the production of these objects.

3. CONCLUSION

Of course, all the foregoing presupposes that research on the cognitive foundations of musicality continues to explore the manifold forms and significances of musical experience in all its pan-cultural manifestations. But the argument of this paper is that a multi-disciplinary approach to investigating the origins of musicality will allow a diversity of contrasting yet complementary sources of evidence to be brought to bear on the issue of understanding musicality, each (ideally) exponentially increasing the value of the conclusions independently to be drawn from any of the others. Fundamental to this is the realisation that an evolutionary perspective on the development of cognitive and physiological musical capacities is not one-dimensional. An evolutionary perspective does not seek to reduce music to genetics but rather to ramify and provide an integrative framework for our understandings of music as a cultural and biological phenomenon.

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