

Chapter 9

**EVOLUTIONARY MODELS OF MUSIC:
FROM SEXUAL SELECTION TO
GROUP SELECTION**

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ABSTRACT

Ever since the publication of Darwin's *Descent of Man* in 1871, the survival value of music for the individual has been placed into question. Darwin's solution to this problem was to argue that music evolved by sexual selection as a courtship device to increase reproductive success. He envisioned music as functioning analogously to the courtship songs and advertisement calls of many animal species, most of which are performed exclusively by males during a breeding season. However Darwin's thinking predated the comparative study of world music-cultures, which developed only in the late 19th century. The 20th century anthropological study of music has been overwhelmingly group-functional in its thinking. Music is almost exclusively described in terms of its manifold roles in supporting group function—with regard to both within-group cooperation and between-group competitiveness. In this essay, I criticize the sexual selection model of music and attempt to channel the group-functional thinking of the ethnomusicology literature into a group selection model. Music is a powerful device for promoting group identity, cognition, coordination and catharsis, and it has a host of design features that reflect its strong role in supporting cooperation and synchronization at the group level, features

such as the capacity for pitch blending and the use of isometric rhythms. I argue that music and group rituals co-evolved during human evolution such that ritual developed as an information system and music its reinforcement system. Music is a type of social "reward" system, analogous to the neuromodulatory systems of the brain. This view accounts for music's universal association to ritual activities as well as its psychologically rewarding properties.

1. INTRODUCTION: EVOLUTIONARY MUSICOLOGY MEETS SOCIO-MUSICOLOGY

Dmitri Shostakovich composed his Seventh Symphony, the "Leningrad" Symphony (Op. 60), in 1941 at the beginning of the Nazi siege of Leningrad in a kind of outburst of patriotic spirit. The Symphony quickly became an important international symbol of the resistance of the Russian people to the Nazi threat. Personal accounts from the period tribute this symphony with giving both the citizens and soldiers of Leningrad the moral strength necessary to resist the siege. So important was the Symphony to the morale of the people that those front-line soldiers who were also trained musicians were transported from the battlefield to the concert hall to perform the Symphony on live radio at the height of the siege on August 13, 1942 (Wilson, 1994). Shostakovich's next symphony, the Eighth Symphony (Op. 65), was composed two-and-a-half years later, after the 872-day siege of Leningrad had lifted, not as a work of patriotism but as a work of suffering and mourning for both the people of Leningrad and for the nearly 20 million Russians who were to die by the war's end. The work is, through and through, an expression of despair and horror. Interestingly, the Eighth Symphony was condemned at the 1948 meeting of the Communist Party Central Committee for its overly catastrophic vision of the war and for Shostakovich's general use of "formalistic distortions" (Schwarz, 1986).

Although I've chosen examples of European classical music to make a point, this brief description of the history of two of Shostakovich's middle symphonies tells us something about the general features of music throughout the world. Music is a cultural communication device, and musical performance is often directed and transmitted to the entire social group. Music deals with group strivings, actions, memories, attitudes, and emotions. Group-wide transmission of music has the effect of unifying people spiritually and of coordinating their behavior towards common ends. Music has social meaning, and this meaning comes from both the context of a performance and from the contents or referents of a musical work.

These referents needn't be immediate events, but can allude to past and future events. Thus, music can serve an historiographic function, in terms of the transmission of group history and the marking of important events in the life of the group. Music is as representational as it is directly emotive. And although neither of the Shostakovich symphonies mentioned above makes use of words, music is one of the major vehicles for the transmission of texts (oral and written) and their underlying philosophies and prescriptions, especially in the case of ritual/religious texts. Consequently, verbal song is a universal feature of human cultures.

1.1. Evolutionary Musicology

This chapter is but one of many articles and books which have in recent years attempted to provide an evolutionary perspective on human cultural behavior. In doing so, it brings us face to face with several intellectual traditions in this area, everything from sociobiology (E. O. Wilson, 1975) and evolutionary psychology (Barkow, Cosmides, & Tooby, 1992) to Darwinian anthropology (Boyd & Richerson, 1985; Durham, 1991) and gene-culture co-evolutionary theory (Cavalli-Sforza & Feldman, 1981; Lumsden & Wilson, 1981). Moreover, it brings us in contact with historical theories of music origin, and most especially with the theory of sexual selection, which, since Darwin (1871), has viewed human music in relation to the courtship function served by singing in several animal species.

For a long time I believed that we had only two available reference-frames in thinking about the origins of music: a "singing-animal" model and a "chimpanzee-society" model, where the first makes reference to the role of singing in animal species quite distant from humans and the second looks to species much closer but which lack behaviors that strongly resemble singing or music. One could say that the first model is based on evolutionary analogy and the second on (presumed) homology. Given their reciprocal weaknesses (phylogenetic distance vs. absence of function), the singing-animal and chimpanzee-society models provide complementary ways of thinking about music origins. Be that as it may, is it proper to view human musical capacity as some sort of chimera between the creative vocalization capacities of birds and the social intelligence and group structure of chimpanzees? How much insight do we ultimately gain from such animal models?

I now believe that there has to be a third way of thinking about this issue, one that places humans at both the starting point and end point. This is not to say that there is not invaluable information to be gleaned from studying animal behavior but rather that at some point studying analogous behaviors in genetically-distant species and all-but-absent precursors in

genetically-close species shifts from being a source of enlightenment to being a type of excess baggage that cannot be gotten rid of. At some point we must consider human behavior on its own terms to understand what it is that evolutionary hypotheses need to explain. The point of this argument is not to brush aside the question of precursors of musical capacity but to emphasize that any understanding of the route from bird singing to human singing requires not merely a comparative analysis of auditory and vocal capacities (and the analogies or disanalogies therein) but an acknowledgment of the *horizontal* relationships that exist between musical capacity and other human capacities related to it (Brown, Merker, & Wallin, 2000). If we skirt these relationships, we will miss much that is important about music. Human social behavior, group structure, and cognitive architecture are different from those of other species, and music reflects and reinforces this in important ways. It is here where sociomusicology provides important constraints on models in evolutionary musicology, and where the question of music evolution and that of human evolution in general become intertwined. If music-making is an important component of human social behavior, then it becomes increasingly difficult to separate music from all the rest that we think of as human. This point has particular relevance to the evolution of language (Brown, 2000) and ritual behavior (see below).

There is thus a great need before embarking on evolutionary analyses to understand what music is, how it is implemented at the social level, and how it is instantiated at the neurocognitive level. If not, simple-minded evolutionary scenarios based on presumed adaptive function will be little more than bandwagon effects in the contemporary milieu of imposing Darwinian explanations on anything and everything. It is interesting to note that neural and cognitive evidence suggests that music might be an excellent candidate for a cognitive module (Peretz & Morais, 1993).¹ Music displays the kind of neural and cognitive autonomy that evolutionary psychologists are constantly searching for. Howard Gardner (1983, 1993) has described music as being one of seven types of "intelligence" that characterize human cognition. Therefore, if music could be convincingly shown to be adaptive by evolutionary criteria, it would serve as an excellent model of not only a cognitive module but a cognitive adaptation as well (Miller, 2000).

¹ For all the attention that has been accorded art objects in the study of human evolution, the issue of cognitive autonomy has been all but ignored. Art is simply viewed as a marker for other capacities (mainly language) and not for art itself. In contrast, the case for music as a cognitive module is much stronger despite the absence of musical artefacts prior to the upper Paleolithic. So here we have another interesting trade-off of weaknesses in human evolutionary studies: one function with many artefacts but little neural specificity (the graphic and plastic arts) and another with few artefacts but much evidence for neural specificity and cognitive autonomy (music).

What is music for? It seems clear that no monofunctional explanation of music-making is adequate to account for music's manifold roles in human societies. Consider this short list of musical functions: play, work, courtship, dance, pacifying infants, storytelling, ceremonies, festivals, religious rituals, battle, foraging, communication, propaganda, personal symbol, ethnic and group identity, salesmanship, sleep, meditation, healing, trance, communication with animals, and many others (discussed in Kaemmer, 1993 and Gregory, 1997). However, to people raised in Western society, music seems to be little more than a form of entertainment, something that makes life better but which one can live without. No one ever died from lack of music. In addition, extreme musicality can be counterproductive for individual welfare, as demonstrated by the lives of suffering and destitution of many of the great composers and musicians of the European classical tradition (Mozart, Schubert, Beethoven, and Chopin, to name just a few). Many of them lived unhappy lives plagued by poverty, physical disease, and mental illness. So how could music be adaptive?

Not surprisingly then, the survival value of music has been repeatedly questioned by thinkers both inside and outside of musicology (Darwin, 1871; Granit, 1977; Roederer, 1984; Sloboda, 1985; Jackendoff, 1993; Pinker, 1997). Evolutionists have proposed two solutions to the conundrum of the apparent adaptive-inutility of music. The first one is that music evolved as an elaborate courtship display, similar to several forms of animal song, and therefore that music evolved by sexual selection. The second one is that music's adaptive value lies not at the level of the individual but instead at the level of the group, and that music evolved by group selection. Whether one chooses to think of music in terms of sexual selection or group selection depends, in large part, on whether one views music principally as a competitive or cooperative activity within groups. But, as I will argue below, music is both of these things, and these two perspectives serve as complementary rather than opposing explanations for the evolution of music. Music has features of both a sexually-selected and group-selected trait, and the value in choosing one perspective over the other depends on whether one places the conceptual lens on the individual or the group, in other words, whether one looks at fitness consequences at the within-group level or the between-group level (Dugatkin & Reeve, 1994; Sober & Wilson, 1998).

I will review the arguments for both of these selectionist accounts of music below. But before we rush blindly into a consideration of Darwinian fitness consequences, let us first allow ourselves a broad and cultural view of music, rather than a narrow and selectionist one. Let us consider the full span of possibilities before limiting ourselves to monolithic and simplistic mechanisms that invariably reduce musical diversity to the level of developmental noise.

1.2. Sociomusicology

The quintessential question in the field of sociomusicology is the following: What is the relationship between musical structure and social structure? Such a question has its counterpart in behavioral ecology where study of the “design features” of communication signals in animals is a prime area of concern. In communication, as in morphology, form reflects function, and this is no less true of music than it is of vervet monkey alarm calls, gibbon great calls, and reed warbler territorial songs. An understanding of the relationship between musical structure and social structure requires first and foremost a consideration of how music is employed at the social level. In the most general sense, music acts as an *emotive enhancer* of cultural objects other than itself. It acts to give emotive salience to those things with which it is associated, and it is used for this purpose in a widespread manner in cultures small and large. Music never really stands alone; it is always about other things, always a component of other activities and other meanings. As sociomusicologists have been quick to point out, even where explicit attempts are made to divorce music from its contents and contexts, it is always an embodiment of the social, and much has been made of the fact that seemingly innocuous devices such as intervals, scales and rhythms can be codes for gender, power struggles, moral virtues, universal truths, and the like (reviewed in Martin, 1995).

How is this enhancer role for music manifested at the social level? The most prominent and universal context for the use of music is in so-called ritual situations, that context which is most remote from Western listeners but which is at the very core of social life in tribal cultures. Music operates principally at the level of the social group, rather than at that of the individual or dyad, and functions as a powerful manipulator of mass behavior. Music operates in the context of group rituals to make them emotionally and behaviorally salient for participants. In addition, music's association to language makes the underlying contents of the ritual more meaningful, sacred, and memorable. Thus, music doesn't merely accompany the ritual, it is about the ritual. The result of music's emotive enhancement and semiotic tagging is to allow the members of a social group to enter into a type of contract which is not only musico-linguistic but audiovisual and audiokinetic as well, and it is this collective contract that permits the many functions of music mentioned above. For this to occur, it is not important that all members of the group perform together. A pop concert involving a single musician and 20,000 spectators is best seen in terms of the emotional synchrony (and often kinetic synchrony) that characterizes the experience. To the extent that this is so, we see an important contrast to the typical social arrangement of speech. Speech tends to act at the dyadic level to influence behavior inter-individually, and its grammar is designed to express

behavioral relationships between individuals (i.e., who did what to whom). Music invariably acts at the group level to influence mass behavior and, as I will describe later on in the chapter, it has several design features that make it ideally suited to do exactly this.

The operative metaphor here is not “display,” the one that ethologists are so fond of attaching to song, but “communication.” Music is a group-level communication system whose sound-devices and meanings are socially structured and socially exploited. Music's involvement in group rituals makes it an ideal device for coordinating behavior, reinforcing norms, transmitting history, and synchronizing emotions in ways that lead to collective and cooperative action. As Alan Lomax (1980) has written: “A musical performance is an enactment in public of a synchronic plan which shapes the interaction of culture members in the everyday survival activities that constitute the culture. Musical performances (...) reinforce the strategic models by means of which and in terms of which cultures endure” (p. 57). The real question, though, is how music does this. What is the relationship between the sound properties of music in a given culture and “the strategic models by means of which and in terms of which cultures endure”?

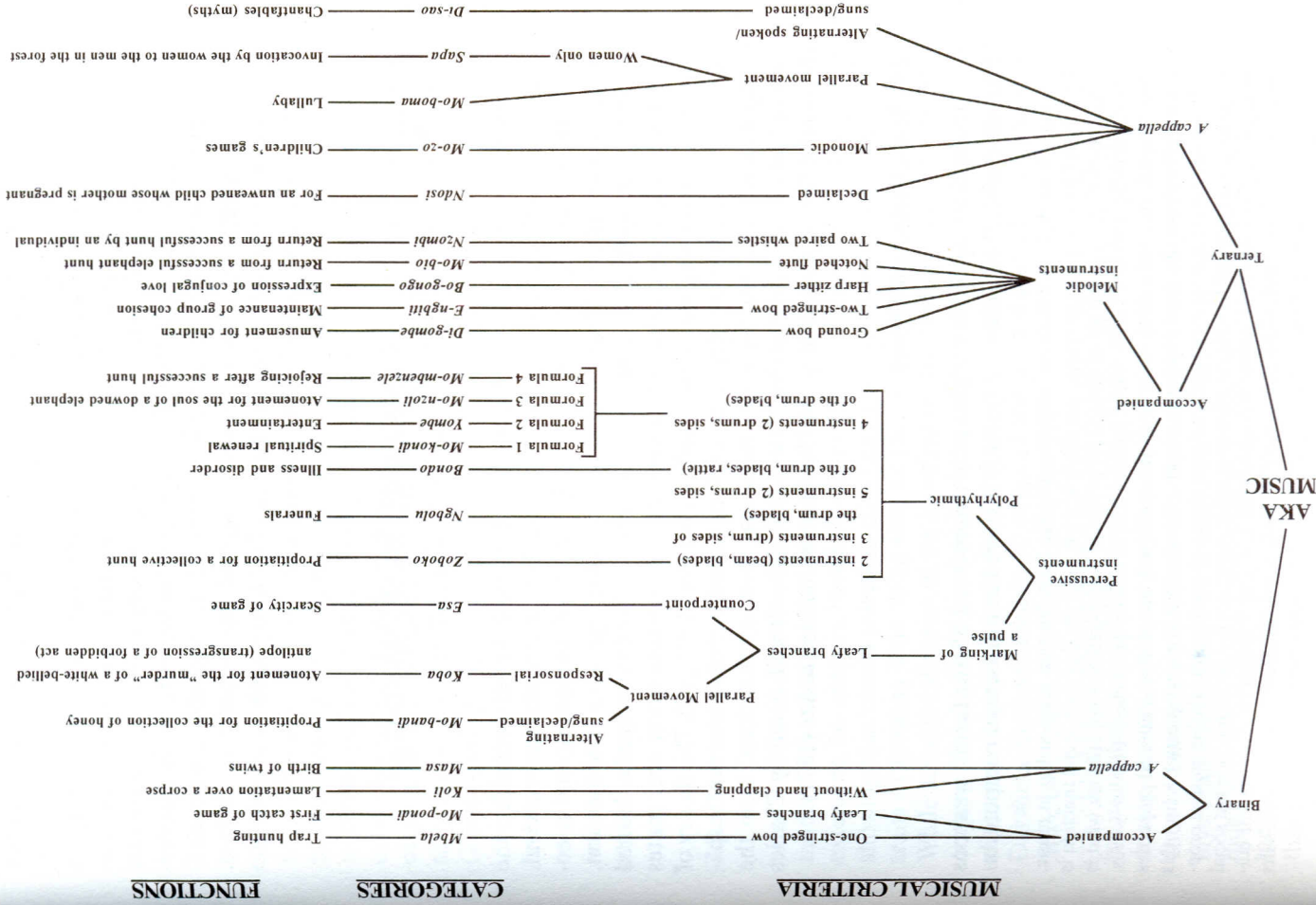
This is clearly a complex question, and we can only provide a glimpse of the answer here. A study by Arom and Khalfa (1998) of the musical forms and associated social functions of the Aka Pygmies of central Africa gives us some idea as to how such an analysis might proceed. Arom began studying the music culture of this population in the 1960's and devised a systematic analysis of its music (Arom, 1991). As shown in Figure 1, Arom and Khalfa identify about two dozen musical categories (forms) in this culture, which “in the current state of our knowledge represents the complete system of categories of Aka music” (p. 13, my translation). Although it is premature to conclude that this profile is representative of all hunter-gatherer music cultures, Arom's is the most comprehensive analysis to date, and so we should view it as an adequate model of such a culture until further studies lead us to believe otherwise.

Arom and Khalfa (1998) describe three interesting features of Aka music culture. First, musical forms occur as discrete categories, and the complete repertoire of Aka music can be seen as the sum of these categories. Second, each category is strictly linked to a particular social function and thus performance context. No musical form is performed outside of its appropriate context, and each context strictly demands performance of a given musical form. This is what ethnomusicologists refer to as “functionality”, and is known to apply to virtually all tribal cultures. Third, each category has a distinguishable set of musical parameters and performance arrangements that characterize it. As Arom and Khalfa describe it, each musical form is distinguishable from any other by at least one musical property, be it at the level of rhythm, scale, instrument type, performance

ensemble, and so on (Figure 1). These musical parameters and arrangements are instantly recognizable to all members of the group, thus making each category of musical form distinguishable on a purely acoustic basis. Putting this together, we see that each social category is related to musical structure in a distinct fashion: "Each category is indissociably linked to a function or determinate social circumstance, which is attested to by the fact that the name it has in the vernacular language is, without exception, the same as the function in question. But, and this is the crucial fact, each of these categories is *musically determined*: there is no category which is not distinguished from all the others by at least one musical property" (p. 15, my translation, emphasis in original). What this analysis highlights is that at the level of hunter-gatherer populations, musical structure is strictly and determinately related to social function in a manner which is consensually recognized.

What can we conclude from the discussion of this section? If the functionality that Arom and Khalifa describe implies that a particular social context requires the performance of one music and not another, then we can safely conclude that performance of the appropriate music is essential for performing the social activity to begin with. In hunter-gatherer populations like the Aka Pygmies, music is an essential component of literally all social activities, and it does not require a great stretch of the imagination to believe that the same must have been true of our hominid ancestors. Music reinforces "the strategic models by means of which and in terms of which cultures endure." How music does this can be understood at several different levels. At the affective and motivational levels, music is a type of emotive enhancer, and to the extent that music is experienced in a group fashion during ritual events, this enhancement promotes the synchronization of group emotion, motivation, and action. But it is wrong to see music as a purely limbic or hedonic function, as it is always an embodiment of the social: its forms and structures reflect underlying social relationships and structures. In hunter-gatherer societies, musical form is strictly linked to

Figure 1. The Musical Forms of the Aka Pygmies. This table provides a complete description of the musical repertoire of a hunter-gatherer culture—the Aka Pygmies—as outlined by Arom and Khalifa (1998). The column labeled "categories" provides the name of each musical form in the vernacular language of the Aka people. This name corresponds exactly to the social activity accompanied by each musical form, as shown in the far left column labeled "functions". The rest of the table shows how each form is musically distinguishable from all others by at least one musical criterion, resulting in a correspondence map between musical structure and social function. This figure is a direct translation from the French by the author and is printed with the permission of Simha Arom and the *Revue de Musicologie*.



social function, and therefore music plays a critical role in defining just what those social functions are.²

The following sections of this chapter will analyze the two major types of selectionist scenarios that have been proposed to account for the existence of human music. From the above discussion, it should be clear that music is not merely a vocalization system or a display behavior but a communicative and semiotic device of great richness and flexibility, whose functions, meanings, and uses are socially derived and socially controlled. Selectionist scenarios that ignore this can only be expected to provide the most incomplete account of the origins of music.

2. SEXUAL SELECTION AND MUSIC: MUSIC-MAKING AS A COURTSHIP DISPLAY

Sexual selection is a mechanism of natural selection that considers the consequences of a trait for mating success rather than individual survival. Traits that are sexually selected work in the service of competition and selection for mates, even though they may have no other type of survival function, and may even work against survival. Sexual selection of a trait can be defined as “differences in reproductive success caused by competition over mates and related to expression of that trait” (Andersson, 1994, p. 7). The theory of sexual selection was developed to explain sexually dimorphic traits, especially exaggerated (usually male) traits that seem dysfunctional from the standpoint of individual survival. It was first elaborated in detail by Charles Darwin in *The Descent of Man, and Selection in Relation to Sex* (1871).

2.1. Sexual Selection Theory

Sexually selected traits generally assume one of two forms: weapons and ornaments. The former are mainly involved in intrasexual competition

² Two questions that are critical for understanding the form-function relationship in music, but which I have no room to discuss, are the following: 1) Given that each social function is associated with a particular set of musical properties in hunter-gatherer populations, what is the relationship between a given social function and its musical properties? In other words, assuming that this relationship is not an arbitrary one, why are particular musical properties associated with certain social functions and not with others? 2) The next question is how this relationship occurs at a cross-cultural level. Are there universal trends relating musical properties to social function? In addition, how does music reflect not just social function but social structure and its underlying personal relationships and power hierarchies in different cultures? Lomax (1968) has performed a global analysis of this issue, and some of his results are presented in later sections of this chapter.

(usually inter-male conflict), and consist of such things as horns and sharp teeth. The latter, by contrast, are involved in intersexual advertisement, and consist of exaggerated secondary sexual traits such as bright plumage or elaborate courtship displays. Because weapons are often explainable in terms of natural selection due to their utility for individual survival, the task for sexual selection theory is to explain physical and behavioral ornaments. Two sexual-selection mechanisms have been invoked to explain the evolution of ornaments: runaway processes and indicator mechanisms (Andersson, 1994). The first involves a positive feedback cycle between a male's ability to develop a secondary sexual trait and a female's preference for an even more exaggerated form of it. The second considers ornaments as signals of health, fitness, and good genes, and assumes that such traits evolve because they are favored by females who use them in selecting males of good quality. As these features are often disadvantageous to survival, they are said to be “handicaps” which serve as honest signals of fitness (Zahavi, 1975).

Much of the sexual selection literature focuses on male displays and female recipients, where such displays are produced by either single males or groups of competing males (i.e., leks). However, in some species the female is the dominant one in courtship and territorial matters, and thus sexual selection in these cases applies to female traits and male recipients.

2.2. Darwin (1871)

Darwin brilliantly laid down the foundations for virtually all the modern-day concepts of sexual selection. But he was also interested in extending his analysis, based almost exclusively on animals, to humans by showing that sexual selection could explain courtship behavior and other traits in humans. One thing that he mentioned in this regard was music. While scientific theories of music origin in the West date back to the 18th century (Thomas, 1995), and while there are no doubt countless tribal myths about the origins of music, the first biological theory of music origins was Darwin's, as expounded in 10 pages of the second part of *The Descent of Man, and Selection in Relation to Sex* (1871).

Like many others after him, Darwin questioned the utility of music for individual survival: “As neither the enjoyment nor the capacity of producing musical notes are faculties of the least direct use to man in reference to his ordinary habits in life, they must be ranked amongst the most mysterious with which he is endowed” (p. 335). And so he proposed that music evolved by sexual selection as a form of courtship behavior akin to the vocal courtship displays of insects, frogs, and birds. Darwin pointed out that many of these vocalizations were performed exclusively by the male

of the species, and tended to be expressed primarily during the breeding season. His basic hypothesis was that music too evolved as a means of "charming the opposite sex." However, Darwin was much less clear about who was doing the charming: "We have hardly any means of judging whether the habit of singing was first acquired by the male or female progenitors of mankind" (p. 337). Of course, sexual selection could in theory accommodate either possibility.

In reality, despite his strong ground in talking about the courtship role of song in many animal species, Darwin ultimately made a very weak case for sexual selection in music, as he openly acknowledged that little to nothing was known about courtship calls in mammals, the exception being the gibbon, whose complex song Darwin mistakenly took for a seasonal courtship call (see below). While he states in a footnote that "musical notes and rhythm were first acquired by the male or female progenitors of mankind for the sake of charming the opposite sex" (p. 336n), he bases this hypothesis on little more than the analogous singing behavior of other animals rather than on any kind of direct ethnographic evidence that music is indeed involved in human courtship. In other words, Darwin relied exclusively on evolutionary analogy in making his case for sexual selection in music.

Darwin's theory of music, while far from being the centerpiece of his sexual selection theory, was the first attempt to explain music's aesthetic properties in adaptive terms. It was the first biological explanation for why music should be creative and elaborate and attention-grabbing and emotionally affecting and physically challenging. Unfortunately, Darwin's analysis of music did not stimulate any type of response or following in either biology or musicology until quite recently.

2.3. Miller (2000)

Geoffrey Miller (2000) presented the first detailed sexual selection account of music since Darwin. In addition to providing a strong and clear statement of the sexual selection perspective as applied to music, Miller plotted out with utmost clarity the adaptationist program for music. In this regard Miller's essay is required reading not only for those interested in the evolutionary psychology of music but for anyone interested in the evolution of human cultural behavior generally. Unlike Darwin, Miller makes a strong case for sexual selection in human music and does so with the tools of both modern sexual selection theory and evolutionary psychology. I will take the liberty of summarizing Miller's essay in the form of four principal arguments.

1. *Music is costly but provides no individual survival benefits.* Like Darwin before him, Miller points out the general conundrum of the survival value of music. Music can be seen to involve several types of individual costs in terms of time, energy, motor skills, training, cognitive abilities, and so on. Miller points out that music and dance rituals in tribal cultures can last not only through the night but for several days. This requires not only a great investment in time but severe physical endurance as well. Like Darwin before him, Miller argues that the individual fitness costs involved in music-making are made up by the reproductive benefits that accrue to men who sing and dance for prospective mates. "Music is a complex adaptation, and it has costs, but no identifiable survival benefits. Therefore, it is most likely to have evolved due to its reproductive benefits" (p. 337).

2. *Most complex acoustic signals in nature are used in courtship.* *Music is analogous to them.* Like Darwin, Miller points out that music-making, as an acoustic behavior, is analogous to many forms of courtship call and song in animal species: "Bird song and human music do not share a common phylogenetic origin, but they may very well share a common adaptive function" (p. 355). But he makes this claim much broader: "Given that almost all complex acoustic signals produced by other species are courtship displays, [then] this courtship hypothesis for human music is not only better supported by music's design features, but should be considered the evolutionary null hypothesis" (p. 329).

3. *Music and dance function as both aesthetic displays and fitness indicators in the service of human mate choice.* Up to this point, Miller's account closely follows Darwin's. But then Miller develops a detailed hypothesis of how music-making could satisfy the criteria of a sexual selection model. He argues that music and dance function as both fitness indicators and aesthetic displays. With regard to the former, we can imagine music and dance serving as indicators of aerobic fitness, physical endurance, and motor coordination, as well as cognitive indicators of learning, memory, auditory function, linguistic skill, creativity, and the like. At the level of aesthetic display, one could point to the aesthetic appeal of the singing voice, the elaborateness of improvisational music and dance forms, and the myriad opportunities that dancing affords to show off the form and function of the human body. Although Miller does not cite any ethnographic evidence for the direct use of music in human courtship, he gives a list of criteria for testing an evolutionary

psychological hypothesis that music is in fact a device for impressing and stimulating the opposite sex for courtship purposes.

4. *Musical behavior throughout the life span is consistent with a sexual selection hypothesis.* Finally, Miller argues that the ontogenetic pattern of human musical expression is consistent with the expression of any sexually selected behavioral trait. He argues that music is preferentially performed by men of reproductive age and that an individual's musical activity declines after this time. "Over the life span, public music production rockets upward after puberty, reaches its peak in young adulthood during the period of most intense courtship, and declines gradually with age and parenting demands" (p. 337).

In sum, Miller revives Darwin's 1871 hypothesis that music evolved for courtship purposes but brings it into the modern age. Whereas Darwin was noncommittal about which sex was charming the other, Miller explicitly states that human music has the form of most courtship vocalizations in other animals where it is the male who does the singing. Music is not only an aesthetic display but a good indicator of male quality. Miller argues that this courtship hypothesis is supported by ontogenetic data and by evolutionary psychological considerations about the effects of music on the two sexes.

2.4. Problems with the Sexual Selection Argument

I see many problems with a sexual selection account of music. For one thing, it sees music as a purely competitive activity in which men compete with one another for the affections of women. It allows little room for music as a cooperative activity within groups. In addition, both Darwin and Miller make weak social cases for music. Music is little more than a bird display, and it is difficult to reconcile this with the major sociological issues that are raised in current theorizing about uses and control of music (Martin, 1995; Brown & Volgsten, in preparation). I shall present a critique of the sexual selection hypothesis of music in the same form as it was presented above.

1. *Music is costly but provides no individual survival benefits.* I will defer this issue to the next section of the chapter, and merely mention here that if music-making were a group-selected cooperative display, this would account for many of the same elaborative and seemingly-functionless features of music that sexual selectionists highlight in their arguments. In fact, it would probably explain quite a bit more about the actual acoustic features and performance properties of music.

2. *Most complex acoustic signals in nature are used in courtship. Music is analogous to them.* If, like Darwin and Miller, we employ an approach based on evolutionary analogy, then we see that not only are all complex acoustic signals in animals *not* involved in courtship, but that *the most complex signals are not used primarily in courtship.* Unlike the highly monotonous and repetitive courtship signals of cicadas, frogs, and many species of birds, the most acoustically-complex vocalization signals in nature come from the monogamous singing species, such as gibbons and several species of tropical birds, who sing elaborate duets. As in music, increases in the size of the performance ensemble can greatly increase the acoustic complexity of the signal.

As mentioned above, Darwin based part of his reasoning for sexual selection in mammals on the singing of the gibbons, and he incorrectly attributed a seasonal courtship function to it. By all contemporary accounts, gibbon duetting functions in the maintenance of year-round territories and the strengthening of pair bonds in already-formed monogamous couples (reviewed in Geissmann, 2000). There is little to no evidence that unpaired males sing to attract females (Mitani, 1988). The same is true of several species of monogamous birds that live in the tropics which, like gibbons, use duetting to defend year-round territories (Farabaugh, 1982).

There are several features of duetting that bear an important resemblance to human music which cannot be accounted for by a courtship hypothesis of music. 1) Certain features of music, such as responsorial, antiphonal, polyphonic and homophonic singing, are only conceivable when discussing coordinated, multi-singer performance and not solo singing or even singing in flocks. Multi-singer coordination greatly increases the potential complexity of acoustic signals. It permits what in the human sphere is called "multi-part music." 2) Biologically, both sexes are singers. In addition, both sexes make more or less equivalent contributions to the song, in contrast to the asymmetry of male singers and female recipients found in courtship songs and advertisement calls. In the case of gibbons, it is usually the female that makes the more dominant and more elaborate contribution to the song with the male (of many species) singing both an introduction and a coda to her "great call" sequence (Haimoff, 1984). Thus, while the male and female contributions to the gibbon duet are sexually dimorphic, the capacity to sing is not. In the case of humans, lack of asymmetry is even more extreme, as women are just as capable as men of performing musically. Music is not a sexually dimorphic trait in humans. 3) Duetting

is cooperative and coordinated, rather than competitive or disjoint. Gibbon couples place a high premium on maintaining tight coordination, and will terminate and restart a duet if the appropriate level of coordination is not achieved (Haimoff, 1984). Duetting is not a contest but a display of cooperative strength. 4) Duetting is involved in defending year-round territories (Leighton, 1986), just as in many human tribes and bands. Daily duetting is a highly ritualized "keep out" signal accompanied by exaggerated physical displays. Whereas the males of many bird species terminate singing behavior after finding a mate (e.g., Catchpole, 1973), monogamous species such as gibbons sing all year round and throughout their lifetimes in defense of year-round territories. 5) Duetting, like human music, is thought to play a significant role not only in defending territories but in maintaining social bonds. Such a function is not restricted to duet singing among monogamous species but is found quite prominently in the social calls of many primate species (Ujhelyi, 2000). While such calls do not have the acoustic complexity or coordination of the duets of the monogamous species, they foster group identity and social bonding in a manner similar to them and to music (Geissmann, 2000). It is important to point out that none of the known primate calls in thought to be directly involved in courtship. Primates do not seem to exploit vocalization for courtship purposes, but instead rely on visual, olfactory and kinetic cues. Courtship calls are rare to nonexistent in hominoids, whereas territorial calls are ancestral to the entire group of species. Therefore, territorial calls, rather than courtship calls, are far and away the most likely hominoid precursor for human music (Geissmann, 2000).

Perhaps the biggest disanalogy between humans and the duetting species with regard to singing is that humans are a highly social, group-living species that live in tight-knit, cooperative groups, and that their musical expression tends to occur at the group level (rather than at the couple or family levels), involving groupwide integration of sound and movement. The important lesson that emerges from this study of evolutionary analogy is that form reflects function: just as solo singing is important for attracting mates and defending individual territories, and duetting is important for a maintaining a couple's territory and solidifying the pair bond, then group singing among humans most likely functions in the maintenance of group territories and the strengthening of group identity and cohesion.

In sum, many complex animal vocalizations have evolved that bear no direct relationship to courtship. Part of their complexity

comes about simply by the use of multi-part performance, as in music. Importantly, musical capacity is not a sexually dimorphic trait and this greatly weakens claims that music evolved by sexual selection as a device for men to court women. It is most likely that human singing evolved as a group territorial and cohesion device analogous to singing in duetting species and social calling in many primate species.

3. *Music and dance function as both aesthetic displays and fitness indicators in the service of human mate choice.* The potential of music and dance to function as aesthetic displays and fitness indicators is, to my mind, both the strongest and weakest part of the sexual selection argument for music. On the one hand, it seems quite convincing that the sensory, motor, cognitive, and energetic skills involved in music-making could be excellent indicators of fitness, both male and female. In addition, things like vocal quality, creativity, and style of movement could be quite useful as aesthetic displays in situations that involve music and dance performance. However, at the same time, I see a critical problem with this reasoning, one which Miller indirectly acknowledges: "Sexual selection through mate choice is almost unfairly powerful as an evolutionary explanation for things like music that seem impressive and attractive to us, but that seem useless for survival under ancestral conditions. The reason is that any feature one is even capable of noticing about somebody else (including the most subtle details of their musical genius) could have been sexually selected by our ancestors" (Miller, 2000, p. 355). To my mind, there is something worrisome in this reasoning because it is so all-encompassing. Any feature one is capable of noticing about somebody is a feature that could have been sexually selected. This kind of argument just sucks all the specificity out of music because, at some level, *any* behavior could be reduced to these terms. The display role emphasized by sexual selectionists is so obvious and unavoidable as to be irrefutable. Some form of display, voluntary or involuntary, occurs in all public behavior. A display hypothesis explains little about music's melodic and rhythmic systems.

Another way in which a sexual display hypothesis of music becomes highly problematic is that it has a strong tendency to conflate music and dance. There is a fine line to be drawn here. On the one hand we want to emphasize the important historical roots and contemporary links between music and dance, but on the other hand, we need to emphasize that music and dance are very different systems, based on different organizing principles, although they have important connections at the levels of rhythm and phrasing.

It is much easier to see dance as a type of display, but at the same time it is much easier to see it as an extension of generalized motor capacities. Dance satisfies few of the criteria of specificity that we would expect of a behavioral adaptation. Music, in contrast, has many features of cognitive autonomy and specificity. If the goal of this exercise is to explain the evolution of music *qua* music, then we have to start thinking about music itself and not conflate it with dance or dance music. The more deeply we look at music—its syntax, its neural basis, its sociocultural functions and uses—the more inconceivable it is that music can be reduced to “any feature one is capable of noticing about somebody”.

Regarding dance itself, we must bear in mind that dance—whether performed solo or in groups—serves a multitude of functions pertaining to ritual re-enactment and social coordination that have no direct relationship to mate choice. In *Keeping Together in Time* (1995), William McNeill recounts, from a broad historical perspective, the importance of the interpersonal synchrony evoked by dance and drill for all types of group functions, from religious rites, to military training, to social bonding. Anthropological analyses of dance (Hanna, 1979; Zemp, 1999) focus as much on gestural representation and social symbolism as on gross movement; dance, like any expressive gesture system, conveys meanings and emotions. As Judith Hanna (1979, pp. 4–5) has written: “Dance is *communicative* behavior—a ‘text in motion’—or ‘body language’ (. . .) Movements in dance become standardized and patterned symbols, and members of a society may understand that these symbols are intended to represent experiences in the external and psychic world (. . .) Dance is a conceptual natural language with intrinsic and extrinsic meanings, a system of physical movements and interrelated rules guiding performance in different social situations” (emphasis in original). Several theories of the origin of language propose that gesture preceded vocalization as a device for conveying symbolic meaning (Corballis, 1991; Armstrong, Stokoe, & Wilcox, 1995). We should be skeptical of theories of the origin of dance that do anything less than account for its important roles in gestural symbolism and interpersonal coordination.

In sum, sexual display is but one area where music-making—often in combination with dance—has found an important role in human cultures. However, it is difficult to see courtship as the *raison d'être* of music. Once music evolved, it was cooptable in the form of sexual displays, even highly competitive ones, but I doubt

that this was the initial driving force for the evolution of music’s melodic and rhythmic systems. There are much better explanations for music’s design features, as will be described below.

4. *Musical behavior throughout the life span is consistent with a sexual selection hypothesis.* This is the point that is most dependent upon human empirical evidence. Miller doesn’t present any except as it pertains to recording stars in Western culture. There are two major problems here, one ontogenetic and one ethnographic. The ontogenetic point is clear. The theory of sexual selection was developed by Darwin to explain sexually-dimorphic traits in animal species, arguing that such traits evolved to serve a role in mate selection either directly or indirectly. But, as pointed out above, music is not a sexually dimorphic trait in humans; with the exception of the differing frequency ranges of the voice, both sexes have the equivalent capacity to make music. This in itself should be seen as a critical flaw in the sexual selection theory of music, especially in light of Miller’s strong claim that musical production is the principal domain of men. In this regard, territorial singing by gibbons couples provides a vastly superior model of human musicality than does courtship singing in birds and other species.

This leads to the second major problem with the sexual selection perspective: the absence of any direct role of music in human courtship. If music’s courtship function is really something more than a nonspecific feature one is capable of noticing about somebody, then it should have a clear and defined role in human courtship rituals, and not merely an indirect one that is secondary to the process of group assembly. Neither Darwin nor Miller gives empirical evidence for this kind of primary role of music-making in human courtship. Despite the images of romantic love scenes from the American musicals of the 1940’s, men simply do not sing to women in a dyadic fashion during courtship rituals as, for example, some birds do. One of the most frequently perpetuated myths about the musics of tribal cultures is that romantic love songs form a substantial component of their repertoires. Nothing could be further from the truth. Romantic love songs are prominent features only of large cultures. Look again at the musical categories described for the Aka Pygmies by Arom and Khalifa (Figure 1). Only one of two dozen musical categories is about conjugal love, and most of the rest are about the business of collective survival. So the context is imagined to shift to the level of the group where courtship displays assume the role of indicators and aesthetic displays. But then two major problems of interpretation emerge. First,

the group activity at hand usually has a *completely different* underlying function than courtship itself. We are not talking about teen discotheques here; we are talking about the important business of group survival. The contexts surrounding the two dozen musical forms of Aka culture are not simply empty social vehicles for sexual display. Instead, they are critical group functions that form the basis for the stated purpose of the musical activity being engaged in. And as Arom and Khalifa point out, the name for a given musical form in the Aka language is always identical with its social function. Second, human courtship has many other routes for expression, and musical performance is not a major one of them in any culture. Most of human courtship is based on dyadic, face-to-face interactions—rarely, if ever, involving musical performance—rather than on group displays. Music's role in courtship is, at best, indirect. Courtship and marriage are certainly matters of collective importance, and so we shouldn't be surprised that music plays a role in these functions. However, ethnographic evidence argues strongly against the idea that music evolved to serve a direct and primary role in human courtship.

Miller's empirical argument rests on his appeal to the fact that most jazz, rock, and classical recording artists of the last 30 years were men of peak reproductive age. I think that it is safe to say that even if extreme musical talent were genetically heritable (and there is still no evidence to date that it is; see Howe, Davidson, & Sloboda, 1998), all great musicians and composers of all time would have made a negligible contribution to the human gene pool. Clearly what we want to explain is not some extreme talent but a general human capacity. People at any extreme in human behavior are maladapted, and one only has to glance at the life stories of the great European classical composers to know that this is so, not to mention a large number of the people from Miller's list of recording stars. Furthermore, a sex bias at the level of popular music is too easily confounded with cultural factors related to sexual constraints. Such a bias applies perfectly well to book writing, poetry, painting, sculpting, film making, and in fact most important professions in large-scale cultures. It is very difficult to weed out what is a male-specific, sexually-selected genetic capacity from what is generalized male hegemony in most domains of culture. I believe that we must take as our null hypothesis the biological equivalence of the two sexes with regard to musical capacity until convincing functional evidence suggests otherwise.

In summary, while music can certainly be used in courtship contexts, there is little evidence that it plays any direct role in this function. The most

one can say about sexual selection is that music has some potential to serve indirectly as a type of fitness indicator or aesthetic display. This is a far cry from the directness of the social arrangement of courtship singing and advertisement calling in birds, frogs, and cicadas. In its current form, the sexual selection hypothesis lacks specificity about music's design features. Finally, musical capacity is not a sexually dimorphic trait in humans, and in accordance with this, there is little evidence that it is directly involved in courtship. Thus, with regard to the evolution of music, it is most likely that sexual selection has functioned as a form of *indirect selection* operating secondarily to some other more direct selection mechanism. This indirect role is well accounted for by a description of music as some feature that one is capable of noticing about somebody else.

3. GROUP SELECTION AND MUSIC: MUSIC-MAKING AS A COOPERATIVE ACTIVITY

"If there are (...) adaptations of obvious group benefit which cannot be explained on the basis of genic selection, it must be conceded that group selection has been operative and important."

G. S. Williams, *Adaptation and Natural Selection* (1966)

Music does indeed have important features that can be illuminated by a sexual selection perspective, most especially its potential to be used as an aesthetic display and fitness indicator. However, I do believe that this is a highly incomplete view, and I think any musicologist unconcerned by the constraints of evolutionary reasoning would immediately come to the same conclusion. What is missing from such a view? So much: music as a group-wide activity; music as a cooperative activity; music as a social communication system; music as a semiotic system; music as a reflector and reinforcer of social structure; music as a socially-valued, socially-exploited, and socially-controlled device. However, Miller (2000) warns us that any group-functionalist account of music-making puts us in the "embarrassing position" of invoking group selection. He provides us with the important caveat that we should not conflate activities that are done *in* groups with activities that are done *for* groups. Strong evidence for group participation is not a sufficient basis for making a case for a group adaptation, as group participation alone does not imply any fitness consequences for the group or its members. Thus, as Miller correctly points out, the onus on a group selection account of music is to demonstrate that music is in fact done *for* groups.

3.1. Background to a Group Selection Model for Music

Before venturing in that direction, it will be necessary to say a few words about multilevel selection and group-level adaptations. This issue is

complicated and multifaceted, and only the most general description of it can be provided here. I believe that music is an excellent test-case for models of group selection in human evolutionary studies, one that could be used to analyze other types of behaviors, especially those that fit into the category of group-ritual behaviors. However, as I will argue at the end of this chapter, the group selection and sexual selection viewpoints will ultimately have to be integrated with one another in order to provide a balanced view of music evolution. This section will present the background to a group-selection model for music, which itself is presented in the following section.

3.1.1. *Multilevel Selection Is a Fact of Biology*

Group selection is a form of natural selection that involves the differential reproduction of groups, and is classified within the context of multilevel selection. Multilevel selection theory is predicated on the idea that natural selection can act at multiple levels in the biological hierarchy, and thus that adaptations can occur at any of these levels. What this implies is that "vehicles" for natural selection can be found at any level in the biological hierarchy, from genes to communities (Wilson & Sober, 1994). Multilevel selection is a fact of biology; it is simply beyond dispute at this point. The evidence for it ranges from genic selection (Dawkins, 1976), to cell-line selection (Buss, 1987), to individual selection (Williams, 1966), to group selection (Wade, 1978; Sober & Wilson, 1998) and beyond. Multilevel selection has been invoked repeatedly in explaining the origins of biological organization, everything from self-replicating molecules to complex animal societies (Buss, 1987; Maynard Smith & Szathmáry, 1995). The evolution of higher-level biological organization is explained in terms a transition process in which lower-level units coalesce into higher-order structures through a process involving the suppression of individual-level competition and the emergence of cooperative interactions (Maynard Smith & Szathmáry, 1995; Michod, 1997). The fact that the same type of coalescing process occurs at the molecular level, cellular level, tissue level, and organism level is strong support for multilevel selection, and provides a more general and universal perspective on how natural selection operates. It also provides us with the insight that all biological structures are, in reality, a balancing act between the competition and cooperation of their component parts (e.g., cells in tissues).

While multilevel selection is part of the working tool kit of those interested in the evolution of biological organization, the notion that natural selection can act at the level of the group, a possibility inherent in any multilevel perspective, has been fiercely rejected by the establishment in evolutionary biology since the 1960's (Williams, 1966). I will not recount here a history that has been told many times now (Wilson & Sober, 1994;

Dugatkin & Reeve, 1994; Sober & Wilson, 1998) except to point out that the wrath has been unwarranted. An old school of group selection from the 1960's, one devoid of mathematical foundations (Wynne-Edwards, 1962), was replaced by a new school of group selection in the 1970's that was based on the quantitative principles of natural selection. The latter took the form of "trait-group" models, as developed by David Sloan Wilson (1975, 1980; see also Price, 1970, 1972; Hamilton, 1975). One important feature of such models is that they partition the variance of fitness into within-group and between-group components. When there is no group component to fitness, these models reduce to classical models of individual selection. However, when there are group effects, such models are capable of detecting them. The best-described group effect in the evolutionary literature is the one involving family members, an effect known as kin selection (Hamilton, 1963, 1964; Maynard Smith, 1964). A controversy has been raging since the 1970's as to whether the fitness function of kin selection should be described as a group component to a compound fitness function (as per trait-group models) or as an extended component of individual fitness (as per kin selection models). However, several theoreticians have now conceded that "the mathematics of the gene-, individual-, kin- and new group-selection approaches are equivalent (. . .) Individual and trait-group selection are not alternative evolutionary mechanisms; rather they are alternative pictures of the same underlying mechanism" (Dugatkin & Reeve, 1994, p. 108).

While it may be true that individual- and group-selection models provide alternative pictures of the same mechanism, it is decidedly not the case that the two pictures provide the same information. The best reason I can think of for getting involved in this vociferous levels-of-selection debate is that hierarchical approaches to natural selection provide a hands-down advantage over nonhierarchical approaches in that they allow one to distinguish causal factors *at the level at which they act* (Dugatkin & Reeve, 1994). In the same way that one doesn't analyze selfish genes (i.e., selfish DNA) and intragenomic conflict in terms of individual selection, then there are many phenomena that are only explainable as group-level effects. One can probably stretch the concept of individual fitness *ad infinitum* to accommodate any group-level effect, but in many cases this will only deprive one of powerful insights into the causal structure of the phenomenon in question. Natural selection is an intrinsically hierarchical process.

3.1.2. *Groupishness Is a Missing Concept in Evolutionary Psychology*

Much of the discussion of group selection in the evolutionary literature has focused monolithically on the question of altruism (Sober & Wilson, 1998), in other words on behaviors that are individually costly but beneficial to others. However, I would like to suggest that the central issue

of group selection, especially for human evolutionary studies, is not altruism but a concept that I will call *groupishness*, which refers to a suite of traits that favor the formation of coalitions, promote cooperative behaviors toward group members, and create the potential for hostility towards those outside the group. Altruism is but one component of this suite. Groupishness is similar in several important respects to the "syndrome of ethnocentrism" described by LeVine and Campbell (1972). Group selection theories have been naively criticized as feel-good theories of selfless cooperation, but the concept of groupishness highlights the fact that any such feelings are completely ambivalent, that the positive and negative go hand in hand in a truly binary fashion. A large social psychological literature supports the idea that while positive feelings and cooperative behaviors are extended towards members within the group, negative feelings and hostile behaviors are shown towards those outside of the group (see below). To see group selection exclusively in terms of ingroup cohesion ignores an essential facet of human psychology that goes together with cohesion. However, to see it exclusively in terms of warfare and forced extinction is to miss the important point that cooperation allows groups to function as adaptive entities even in the absence of direct inter-group conflict. As Christopher Boehm (1997) has pointed out, many of the most important selection pressures that affect the survival of human groups are environmental, factors such as climate, predators, parasites, and the like. Therefore, traits that make groups better functioning are very often poised to make them outsurvive groups that function poorly without there ever being direct conflict between them.

Groupishness is one of the most important concepts missing from the evolutionary psychology approach to human behavior (Barkow, Cosmides, & Tooby, 1992). It is not simply about the human tendency to spontaneously form coalitions and alliances but about a complex set of emotions, attitudes, and motivations that support the human inclination to live in groups and form life-long attachments to people, qualities that make human societies possible. Groupishness has been ignored in large measure because of a deferral on the part of evolutionary psychologists to the theories of kin selection and reciprocal altruism (Cosmides & Tooby, 1992; Tooby & Cosmides, 1996) and their reduction of human cooperative behavior to the level of the dyad and family. Unfortunately, this ignores much about how humans behave as groups. As Boehm (1997) has argued, "with nothing more than kin selection and reciprocal altruism theories to work with, the selection basis of human degrees of altruism and cooperation is often difficult to explain" (p. S100). Such theories must be stretched to irrational limits in order to explain the types of collective behaviors that underlie not only rituals but many types of group behavior seen in human societies, things such as demonstrations, strikes, and riots, not to mention stereotyping and scapegoating (Hogg & Abrams, 1988; Hogg, 1992). There is a great need to develop a theory of *group-wide* cooperation (Boyd & Richerson, 1990),

and this is something that can only emerge from a group functionalist perspective of human behavior, for it is only group functionalism that allows us to conceptualize human cooperative behavior as groupish rather than merely nepotistic or reciprocalist (Boehm, 1997; Sober & Wilson, 1998).

The study of groupishness involves a cognitive and behavioral approach to two related aspects of human behavior: first, the tendency to form groups and to use groups as vehicles for individual survival; and second, a number of binarily-opposed emotive and motivational states that lead to positive behaviors toward members of the ingroup and negative behaviors toward individuals outside the group. Such oppositions take the form of empathy/antipathy, trust/mistrust, tolerance/blame, attraction/fear, attachment/distancing, identity/disidentity, and cooperativeness/destructiveness. At the social psychological level, this is manifested in the form of a universal propensity for what Donald Brown (1997) has called "coalitional thinking," a type of categorical thinking about "human kinds." Coalitional thinking nicely demonstrates the double-edged component of the group mind: group minds not only promote more efficient problem-solving strategies for group survival but also fuel competitive, ethnocentric ideas about group uniqueness and superiority. Hirschfeld (1996) has reviewed the developmental psychological literature showing that the kind of categorical awareness that goes into coalitional thinking about human kinds (including racial thinking) is acquired very early on in psychological development, and Rabbie (1992) has summarized a large literature on so-called minimal-group studies that demonstrate the remarkable inclination of people to see intergroup relations in "we/they" terms, even when the groups in question are highly short-lived and completely fictitious. What these studies demonstrate is the human propensity to polarize, and to spontaneously associate positive evaluations with one's own group and negative evaluations with all others (Hogg & Abrams, 1988; Hogg, 1992).

In thinking about groupishness from an evolutionary standpoint, it is essential to explain its two major components: first, the tendency to form groups, and second, the suite of binarily-opposed emotional and motivational responses that reinforce it. The evolution of the capacity to form stable social groups, like any coalescence event in biology, comes about only through a reduction in competition between component units and a corresponding increase in cooperation between them. As several theorists have pointed out, human social behavior is characterized by a variety of mechanisms that are efficient at both reducing behavioral variation within groups and increasing such variation between groups (Boyd & Richerson, 1985, 1990, 1992; Knauft, 1991; Wilson & Sober, 1994; Frank, 1995; Boehm, 1996, 1997; Wilson & Dugatkin, 1997; Sober & Wilson, 1998). These include such factors as conformist traditions that homogenize behavior within groups (Boyd & Richerson, 1985, 1990), egalitarian ethics that level status differences between group members (Boehm, 1997), and social identity factors

that support group formation and bias individual behavior along the lines of group norms (Hogg & Abrams, 1988). Conformity, egalitarianism, and social identity are but three of a multitude of social processes that empower group selection as a force in human evolution. They do so by homogenizing groups internally thereby intensifying intergroup differences.

However what is typically missing from discussions of social control mechanisms in human populations is the more fundamental issue of group formation. I believe that social identity will turn out to be the most salient factor in understanding human coalescence and the emotive and motivational factors that reinforce it. Social identity is yet another critical psychological concept which has evaded the attention of evolutionary psychologists, this despite the fact that a century's worth of psychological experimentation and theorizing point to the central importance of social identity for human behavior. As early as the 1940's, the social psychologist Kurt Lewin pointed out that what defined a group was not merely similarity among individuals but instead a dynamic interdependence among them, and that the most important aspect of this relationship was interdependence of *fate* (Lewin, 1948). Many years later, Wilson and Sober (1994) reintroduced ideas along these lines in an evolutionary model of human behavior which had at its core the fitness consequences of shared fate for the evolution of group-level adaptations. However, what is more important than shared fate alone is *perceived* shared fate, and it is here where the concept of social identity (or what Lewin called "group belongingness") emerges as perhaps the most essential idea in the psychology of group behavior. The notion of social identity implies a collective acknowledgment of shared fate, and the recognition that coalescence and cooperation are necessary strategies for individual survival.

There is a large literature on the psychology of group behavior which demonstrates that social identity is perhaps the key factor influencing both intragroup and intergroup behavior, including the fundamental motivation to form groups (reviewed in Hogg & Abrams, 1988, and Hogg, 1992; discussed in Abrams & Hogg, 1999). Thus, the establishment of social identity might be the primary event that promotes both group formation³ and the duality of ingroup-positive and outgroup-negative feelings that reinforce it. Shared fate is certainly an important ingredient in this formula, but group formation requires, in addition, an implicit awareness about human

³ In passing, it is interesting to note that the notion of "identity" or "determination" is actively employed in the study of embryonic development in relation to the differentiation of cell types during tissue formation (Gilbert, 1997). This analogy can be applied to coalescence processes of any kind, and suggests that identity is a necessary precondition for coalescence. Cell sorting during tissue development follows the prior establishment of cell identity. Most likely, a similar process of identity establishment (self-identification in this case) is required for the formation of human groups.

categories and the importance of the group for individual need satisfaction and survival. Suffice it to add that social identity also has an enormous impact on the dynamics of social controls within groups, including such things as the conformist transmission described by Boyd and Richerson (1985).

To summarize this section, I have argued that multilevel selection allows us to understand the causal structure of biological phenomena in a way that than gene-centered or individual-centered explanations cannot. One component of multilevel selection is group selection. Group selection is probably a strong force in human evolution, and may be responsible for the complex trait I have called groupishness, with its coalition formation and suite of emotive and motivational traits that promote ingroup preferences and outgroup hostility. One offshoot of this syndrome is a type of group-wide cooperation and coordination that characterizes much human behavior in small-scale cultures, including the kind that makes up music and dance rituals. With this background, I can now move on to discuss a group selection model for music. Based on the above discussion, it should not be surprising to find out that music exploits our most groupish tendencies, both the positive and the negative.

3.2. Music as a Group-Level Adaptation

In this section, I will make a detailed argument that music is a group-level adaptation that evolved by group selection to increase the relative fitness of groups. I pointed out previously that sexual selection theory viewed music-making exclusively in terms of competition within groups, and completely ignored the cooperative nature and cooperative consequences of music. I concluded by saying that sexual selection functioned principally as an indirect selection mechanism secondary to a more direct form of selection. I believe that this latter mechanism is group selection, and that music's potential to be used as an aesthetic display and fitness indicator is secondary to its more general role in group function.

The following is a summary of my argument. The human capacity to make music is a group-level adaptation that evolved, in large part, by group selection. What this implies is the that the group, more so than the individual, is the appropriate level of analysis in thinking about the fitness consequences of music. Music's fitness advantages come about from its ability to promote group-wide cooperation, coordination, cohesion and catharsis, and this operates to increase both the absolute and relative fitness of groups. It functions to promote both group welfare and group warfare. The fitness benefits of music-making at the group level far outweigh the costs of individual participation in musical activities; music is, on balance, a low-cost system for the individual. There is little conflict between within-group and

between-group fitness consequences, and little motivational conflict between self-interest and musical participation. Music has a host of design features that strongly reflect its role in group function, the most prominent ones being pitch blending and isometric rhythms. Finally, music functions as a type of neural "reward" system, serving to emotively reinforce cooperative behavior during group ritual activities. Music evolved as ritual's reward system.

3.2.1. *Music's Fitness Consequences Involve Increases in Both Absolute and Relative Group Fitness*

What kind of framework can provide a reasonable basis for thinking about the fitness consequences of music from the group selection perspective? I will discuss music's role in reinforcing four generalized aspects of group function: group identity, cognition, coordination, and catharsis. Music will satisfy the criteria of being a group-level adaptation to the extent that it reinforces these general factors in the course activities critical to group survival. So long as we accept the argument that factors that promote either intragroup welfare or intergroup warfare contribute to the same final outcome in terms of relative group fitness, then there will be no need in making separate arguments for these two kinds of roles for music. Human groupiness is a two-sided psychological suite; ingroup cooperation and outgroup hostility are strongly linked to one another. To the extent that music can promote one, it can promote the other, and to the extent that it can promote either, it can increase the relative fitness of groups. It is not difficult to imagine the types of fitness-promoting effects that enhancers of group identity, cognition, coordination, and catharsis can have in terms of survival. We can choose to place the focus on ingroup-positive things like foraging efficiency, food sharing, cooperative group norms, altruism, social self-identification, and interpersonal bonding, or on outgroup-negative things like ethnocentrism, competitive edge, contests, warfare, genocide, and ethnic cleansing. Focusing on one should not obscure the fact that the other sits just around the corner. Music is a powerful force in human cultural behavior exactly because it is so effective at reinforcing both sides of the syndrome of human groupiness.

Therefore, I see no need to link the functions of music to specific behaviors, such as foraging or courtship. Music is a generalized emotive and semiotic enhancer which is powerful at influencing mass behavior. This effect often occurs in the context of group rituals, but in large-scale cultures music finds an astonishing variety of uses in the audiovisual media (i.e., film and television) and the sound environment (e.g., stores, restaurants, airports, doctors' offices). This power of music to act as an enhancer of anything with which it is associated leads to problems regarding the

morally-questionable uses of music, such as nationalist propaganda music (quite widespread in the Communist world) and many forms of hate music. The power of music to foster group identity and collective resolve has been only too well recognized by dictators in the 20th century, and this has led to the frequent banning of ethnic-minority musics as a mechanism of social control. In thinking about music from a sociological point of view, we must keep this balance between use and control in mind at all times.

As with my discussion of the work of Arom and Khalifa above (Figure 1), I will describe how music's role at promoting group identity, cognition, coordination and catharsis manifests itself in form of *functional song types*. I believe that this is the only way that an evolutionary model of music will ever be able to have the sociomusicological sophistication necessary to bridge the gap between musical structure and social function, which is really the ultimate goal of the evolutionary approach to music.

1. *Group identity.* As described earlier, social identity is one of the most important determinants of human behavior. Given the intense groupishness of the human species, group identity markers are extremely important for self-identity. They are highly valued, personalized, and defended. Music is perhaps the most salient auditory feature of a culture, which is why it is universally acknowledged as being one of the most important cultural-identity markers, essential for signifying ethnicity, national identity, social class, and gender. As Stokes (1994) has written: "music is socially meaningful not entirely but largely because it provides means by which people recognise identities and places, and the boundaries which separate them" (p. 5). For example, from puberty Australian Aboriginal males start to the learn "lineage songs" about the totems and musical formulas that distinguish their culture from that of neighboring clans (Ellis, 1985). Political repression of such symbolic markers is a very effective means of suppressing group identity, such as occurred with the suppression of Aboriginal culture by the Australian government, or through the banning of all "national" musics by the nazis in the occupied territories during the Second World War, including disbandment of all the national orchestras in Poland and Czechoslovakia (Levi, 1994). In addition, people who are exiled from their homelands "sing the songs of home" (Nettl, 1983) as an important means of retaining their ethnic identity in a foreign and often hostile land, the occurrence of which has given rise to a rich repertoire of syncretic musical styles, such as all the African-American musical forms. Where historical migrations lead to a mixing of disparate cultures, music is perhaps the best means of reflecting the underlying mix of cultural identities, a

prime example being the Afro-Spanish phenomenon of Salsa music in Cuba (Negus, 1995). National composers, long dead, become national heroes, such as occurred in the case of Chopin in Poland (Mach, 1994), even though Chopin spent the better part of his active years as a composer living in France. While there, Chopin was able to retain his own sense of Polish identity by invoking typical Polish dance forms in his music, such as the mazurek and polonaise. At the regional level, this group-identification function occurs in the form of local musical dialects. As with linguistic dialects, these small but perceptible differences in musical performance style are ready indicators of what separates "our style" from "theirs," where "theirs" is invariably inferior to "ours." At the level of song types, this group-identity element is demonstrated in the form of national anthems, lineage songs, patriotic songs, songs of valor, songs of exile, songs of solidarity, and all songs that recount the characteristics or history of a culture, or the individual's identification with the community. It is also demonstrated at the local level in all the dialects that characterize group-specific musical variation in a region.

2. *Group cognition.* Human ritual activity can be thought of in a general sense as a form of group-level cognition. It is a type of collective thinking and decision making that reflects the operation of a group mind. It is here where we see music's essential role not only as a shared channel for communication but also as a major means of ritually marking key events in the life of the group. Music is an important mechanism for the transmission of group history and the planning for group action. This assumes a universal manifestation in the ritual chanting of sacred texts and prayers, the content of which invariably deals with matters of collective importance. It is probably no accident that ritual texts such as the Torah and Qur'an are never spoken but always chanted, as music is a major means of conveying a feeling of sacredness or specialness in human activities (Dissanayake, 1988). Another aspect of this role is music's involvement in group problem solving, as presented in the form of such things as healing music, rain dances, sun dances, and shamanistic rites. But, perhaps most importantly, music's role at promoting group-level cognition is found in an abundant fashion in the historical songs (e.g., lineage songs, group epics), life-cycle songs (e.g., wedding songs, funeral musics), calendrical songs (holiday songs and seasonal songs), and narrative songs that fill the world's song repertoires. Music is one of the major means by which group ideas of all kinds are presented, maintained, and transmitted in a collective fashion for the purposes of recounting

history, preserving tradition, and planning for the future. We rarely use singing to convey information to individuals, but we very often use it to convey information to the group, especially in a ritual context. With regard to fitness consequences, music's effect on group cognition can be seen not only in promoting collective communication within the group but in defining and justifying group actions in relation to common purpose, historical tradition, and a shared sense of destiny.

3. *Group coordination.* Music is perhaps the ideal device for promoting coordination and cooperation at the group level, and the fitness consequences of such a function are far-reaching. This is mediated through both the rhythmic entrainment that occurs in metric music and through the pitch blending that occurs in group-wide vocal and instrumental performance, thereby promoting group participation, synchronization and "harmonization". Music's potential to promote coordinated action during work, a prominent feature of African cultures, was first highlighted in evolutionary models as early as 1896 by Karl B ucher. It is this coordinating function of music that allows us, perhaps more than any other human activity, to see human groups as organisms in a functional sense. But music's ability to coordinate people is not only used for action itself. Musical rituals are most often performed in *preparation* for group actions, such as hunting expeditions, foraging bouts, and battles, in which case symbolic re-enactment, in the form of theatre, story telling, dance, mime, and play, acts as an essential component of the ritual. Coordinated group activity in preparatory rituals serves an important goal in creating a sense of unity and shared involvement in the outcome of the group action at hand. The coordinating property of music is emphasized in such song types as work songs, rowing songs, and marching songs, but also in such preparatory forms as hunting songs, foraging songs, harvest songs, patriotic songs, and battle calls. Finally, we should not forget that even outside of ritual contexts, music's coordinating activity is found in a ubiquitous fashion in all the world's dance musics. There is no dance without music.
4. *Group catharsis.* Many of the things discussed above involve states of high emotion, as they are so closely associated with the issues of survival. In addition, interpersonal conflicts arise which threaten to destroy the stability of the group. It is telling to consider that music and dance are among the very few cultural mechanisms available for channeling group emotional expression, functioning as vehicles for generalized catharsis and conflict resolution, but most

importantly, as bonding mechanisms that generate spiritual solidarity and cooperation through shared, temporally-synchronized experience. These mechanisms are effective at both dissipating negative feelings and at crystallizing positive ones. And as mentioned above, they can be just as effective at exalting "us" as in dehumanizing "them." While language is certainly used to express emotion, music is the principal means by which emotion is expressed at the group level. In this category, we find play songs, protest songs, songs of oppression, lamentations, songs of mourning, celebrational songs, love songs, drinking songs, all songs expressing political sentiment, and most universally of all, all types of devotional religious songs that express love, fear and/or respect for a deity or ruler.

In sum, music's functions and advantages at the group level are so universal, dominant, and numerous that it is difficult to imagine a scenario for the origins of music that ignores them. Seeing music's fitness consequences in terms of the four broad categories of group identity, cognition, coordination, and catharsis allows us to see both the generality of music's effects at the level of function and the specificity of its effects for the level of the group. Music is a group-level adaptation that acts in a very general fashion in the life of the group. A group selection model of music does not necessitate that fitness-increases at the group level occur at great cost to the individual but only that a group can function as an organism, such that the shared fate of its components makes collective survival of the whole the best route for survival of its parts (Wilson & Sober, 1994). And in fact, music may be one of the few mechanisms that allows a group to act as an organism, not only in a metaphorical sense but in an actual sense.

3.2.2. *Music Has Groupish Design Features at the Performance and Cognitive Levels*

It was mentioned earlier that in music, as in all forms of animal communication, form reflects function, and that music has several design features that reflect a significant role in group function. I made this statement in the context of a critique of the sexual selection theory of music evolution. Yet to many people, this critique is counterintuitive because their own experience of music is based exclusively on the commercial music-culture of the West, with its sexy superstars and ever-present love songs. However, if the goal of this analysis is the think about music in evolutionary terms, then we must look to the musics of small-scale cultures, and most especially to hunter-gatherer societies. Only then can we decipher which features of commercial music are "ancestral" and which are "derived" (Brown, in preparation). Many Western notions of music are simply irrelevant to an

ancestral view of music (although the converse is not true). In fact, I think it is safe to say that the pop music culture that forms the basis of most Western people's image of music is the single most "derived" form of music (i.e., most diverged from the ancestral state) in the world today, hardly the basis for an evolutionary model of music.

It is therefore dangerous to use large cultures as a starting point in constructing models of the ancestral state of music, and this is because of some important sociomusicological correlations between musical structure and social structure and what they reveal to us about the cultural evolutionary processes that lead to the emergence of derived forms from the presumed ancestral state. As cultures expand in size and become stratified, many functional properties, including musical performance style, change in a dramatic way. At a fundamental level, a shift in social focus from the group to the individual occurs, as symbolized by the status of the ruling class of the culture. Musical strata evolve in a corresponding fashion through a progressive process whereby new strata are added onto pre-existing ones. The core stratum, ritual music, is present in some form in every culture. It is accompanied by a stratum of non-ritual music, something we can refer to as folk music. The next layer in the progression is the formation of classical music, which is the private music of the ruling class and aristocracy in a hierarchical society. This development is accompanied by a simultaneous expansion of folk music as an opposition not only to ritual music but to classical music as well. The last layer, which is added onto ritual, folk and classical musics, is commercial or popular music, which is a stratum found only in the technologically-advanced societies of the 20th century.

Between the extremes of hunter-gatherer cultures and large-scale industrialized societies, we see many intermediate levels of group size and social stratification. Such medium-sized cultures differ among themselves with respect to the emphasis they place on the group or the individual, as reflected in cooperative and competitive musical practices in their characteristic performance styles (Lomax, 1968). These two emphases can become segregated into different musical strata. For example, in any culture, ritual music will always retain the status as the most groupish and group-functional stratum of a large-scale culture, even when there are other strata, such as pop music, which explicitly glorify the individual. Likewise, these contrasting emphases can co-exist within the same musical forms through a combination of cooperative and competitive elements. By doing so, mixed forms are created, which contribute to the amazing diversity of musical forms and practices throughout the world. This notion of "mixed" musical forms is a reference to the opposition not only of cooperation and competition but of group selection and sexual selection. As music moves from the cooperative to the competitive, it also moves from the groupish to the sexual. It is no accident that Western pop music, the most derived form of

music in the world, is not merely soloist but sexual. And it is sexual not merely as a nonspecific fitness indicator and aesthetic display but as an unabashedly explicit message about conjugal love.

The major point here is that the opposition between group selection and sexual selection, with their respective emphases on group cooperation and individual competition, provides us with an important way of thinking about the ancestral state of music as well as the processes by which derived forms evolve. If we use large cultures as our starting point, with their many strata and mixed musical forms, we have great difficulties in determining which features of music reflect ancestral functions. However, when we examine small-scale cultures, in which *ritual music is the major stratum of the music culture*, we see that the structural properties, contexts, contents, and performance practices of music are overwhelmingly groupish and cooperative rather than individualist and competitive (see below). In such cultures, sexual display is secondary to the process of group assembly, not a primary motivation for musical expression.

The following list of ten points illustrates performance and cognitive features of music that strongly reflect the group nature of human music making. Briefly, music is a group-wide activity that encompasses people of all ages and both sexes. The principal contexts for music-making are activities of importance for collective survival; song texts and accompanying group behaviors reflect and reinforce this. The musical repertoires of small-scale cultures are organized into categories of discrete song types that reflect their associated social activities. Music-making both demands and produces cooperative teamwork on an unprecedented scale, serving to coordinate behavior both in preparation for group action and during it. Finally, the two defining features of music as a cognitive system, pitch blend and metric rhythms, are clear design features of music—completely absent in speech—that reflect music's origins as a group-selected trait. These points are now elaborated in detail.

1. *Group size.* As Lomax (1968) has detailed, musical performance style co-varies strikingly with group size (and thus with many structural parameters that covary with group size, such as subsistence style, power hierarchies, and sexual constraints). Perhaps the most important finding of his work is the demonstration that in small-scale cultures, performance style is overwhelmingly groupish, whereas only in larger-scale cultures, where there is a large degree of social stratification and hierarchy of authority, do we begin to see soloist styles emerging as major musical-performance arrangements. Lomax has shown that widespread use of solo singing is restricted to that style region which he calls

the "Old High Culture," comprised of the old civilizations of Asia (i.e., China, India, Southeast Asia, and the Arab world), where solo singing evolved as a device for the entertainment and glorification of the ruling class. This contrasts strongly with sexual selection scenarios suggesting that solo singing evolved from music's origin as a courtship device, as reflected in the oft-heard myth that "the first human song was a love song." It wasn't. Of this we can be reasonably certain. Soloist musical forms have arisen, for the most part, as reinforcers of self-promoting rulers, often at the expense of musicians who themselves retain a very low status in that society (for example, in northern India and all Islamic societies today).

2. *Functionality.* Functionality refers to the context-specific performance of functional song types, whereby particular songs are performed only in their appropriate contexts, and where the performers of these songs tend to be those people who engage in the activity being sanctified through song. It was described earlier with regard to the musical forms of the Aka Pygmies (Arom & Khalfa, 1998). Such is the case in cultures where music is a ritual preparation for action. Thus, among Central African Pygmies, women sing food-gathering songs, and do so in advance of or during food gathering expeditions but never at other times. Jews chant prayers before all meals (and sing such chants only then), reciting a prayer specific for the type of food being consumed. All people chant these prayers as all people eat. In shamanistic cultures, only the shaman (usually a man) is permitted to perform those ritual chants that induce a state of trance, thus expediting his psychic transport to other worlds. Again, such chanting is only allowed during appropriate ritual situations and not at other times. Thus, at the performance level, functionality maintains context-specific and/or role-specific performance arrangements, which often reflect a cultural division of labor.

3. *Both sexes.* The human singing arrangement is significantly different from that of all other animal species in that it frequently involves both sexes and all members of a social group. Group singing (called "chorusing") has been described in certain species of birds, but it shows none of the coordination of human singing. It tends to be nothing more than random simultaneity (Brown, Farabaugh, & Veltman, 1988; Catchpole & Slater, 1995). Whereas singing in humans often involves the whole group, the universal phenomenon of functionality implies that there are times when

only woman sing or only men sing, again, as small coordinated groups. This caveat implies that the role played by women in musical rituals may not be the same as, or even symmetric with, the role played by men. Such sex-specificity of functional song types is rather common among small-scale cultures. However, sex-specificity should not be equated with sexual display function (although it may certainly make good use of this), as functionality at the song level generally reflects gender differentiation at the task level, where music-making functions as a group coordination device in preparation for or during such tasks. The human singing arrangement, whether differentiated by sex or not, is unique among all singing animals, and clearly reflects the group structure of the human species.

4. *All ages.* The issue of age specificity in music is a complicated one. I don't believe that there is currently enough ethnographic data to provide any generalizations regarding this point. Clearly, group size and functionality considerations are critical here. The smaller the culture, the more groupish is the overall performance style (Lomax, 1968). In classless cultures like hunter-gatherer societies, there is simply *no distinction* between musicians and nonmusicians, and this means that there are no age restrictions when it comes to singing; everyone sings if they can. Children start to sing as soon as they are able to, as an important part of their socialization process. The oldest members of the group continue singing as long as they are physically able to do so. Louis Sarano recounts his experiences with the Babanzélé Pygmies: "Whenever those precocious four-year-old boys are drumming away on a battery of plastic jerrycans and tin bowls, you can be sure to find equally precocious four-year-old girls singing nearby. From what they attempt, it's clear they already know the ground rules for improvisation, they just don't have the technical ability yet to execute it properly. By the time they are teenagers they have the technical ability, and the genius, to sing music that sends shivers down the spine. At middle age, their music has the power to heal damaged souls. Certain older women may gain local renown as talented mime artists who dance out the stories in sung fables called *gano*; others become master storytellers, telling long stories alive with voices of a dozen characters and interspersed with songs" (Sarano, 1995, p. 18). Clearly, in such cultures, and in virtually all others, there are no general age restrictions as to who can sing. However, the real question is who *does* do the singing? At the level of the hunter-gatherer cultures, the answer seems to be that there are divisions of labor that characterize the work

group, as reflected in the functionality of song types (Arom & Khalifa, 1998), and that every member of the group who is capable of performing either the singing or the working does so, regardless of age. Cultures that deviate from this pattern, such as most large-scale cultures, are characterized by social stratification and sexual restraints on many levels, including the development of several differentiated musical strata. These things have a large effect on considerations of who sings and when. In such cultures, the distinction between musicians and nonmusicians becomes intensified to the point that musicians represent a minority specialization, often times restricted to family lineage (many societies) or outgroup status (e.g., the Gypsies of Central Europe and the Jews of the Islamic countries). In the largest cultures, where the commercialization of cultural objects abounds, there is a strong preference for young, attractive musicians in the stratum of commercial music. But this is a characteristic feature of commercial culture in general, and applies as much to film, television, dance, and fashion as to music. The overriding question here of whether there is an overall trend towards musicians being of peak reproductive age is, I believe, an open one, and unquestionably one which ethnomusicology should explore more closely.

5. *Group exclusivity.* To the extent that music is used as a group-identification marker, musical performance will be restricted to members of a particular social group. An obvious example of this is the fact that in Western societies, religious ceremonies tend to be restricted to practitioners of a given faith. Examples that might have more of a bearing on genealogical relatedness can be found in the Andean region of Peru, where one finds large populations of "mestizos," who are people of mixed native and Spanish origins. During many mestizo festivals, the nearby Quechuan community, comprised of indigenous rather than mestizo populations, is officially excluded from taking part in these festivals (Turino, 1997). Likewise, exclusion of the ex-slaves from white Protestant churches in post-Reconstruction America led to the formation of black churches of the Baptist, Methodist and Pentecostal varieties, each with their own unique musical traditions (Oliver, 1986). Group participation intensifies not only group cohesion but also group exclusivity, again, reflecting the double-edged nature of the group mind.

6. *Collectivist context.* This topic was covered in a general fashion above in the discussion of music as a group-level adaptation, in which music's roles for group identity, coordination, cognition,

and catharsis were outlined, as exemplified by the principal song types corresponding to each category. The context for musical performance in tribal cultures is as different as can be from the bird song arrangement, such that music tends to be restricted to occasions in which groups of people assemble for the purpose of performing some activity. That activity may be music alone, or it may be one of a large number of activities that deal with the business of group living and collective survival. Suffice it to add that courtship, reproduction, and the maintenance of group size are among the many functions important to collective survival.

7. *Collectivist contents.* Collectivist contents would seem to be implied from the notion of collectivist contexts. To the extent that music is associated with ritual contexts, it also tends to be associated with ritual contents, reinforcing the myths and normative behaviors of a culture. Thus the major emphases of ritual music are on honoring and obeying deities, respecting ancestors, performing socially positive behaviors, extolling virtues, recounting the origins of the group, transmitting group epics and myths, preparing for collective action, and so on (Merriam, 1964). Songs of conjugal love are either completely absent or are rare in small-scale cultures, thus arguing strongly against sexual selection scenarios of music origins (Sachs, 1948; Lomax, 1968; Arom & Khalifa, 1998). However, the comparative contents of the world's musical repertoires is very much an empirically analyzable body of data. One of the few people to look at song texts in a cross-cultural fashion was Alan Lomax as part of his Cantometrics project in the 1960's. Although he analyzed musical performance style in 233 cultures, his comparative analysis of folk-song texts was only a pilot study of 17 songs from six contrastive cultures. The purpose of this study was to generate a "concept profile" which would serve as a scale for analyzing song texts in general. In this very small sample, Lomax found that the four leading concept categories among the 17 songs were (in decreasing order of importance): time (words of being and condition, as well as words related to action upon the environment); the universe (the sky, the earth and the elements); communication (speech, music and dance); and social positive (all concepts related to good, right, beautiful, healthy, powerful and supportive at the social level, while minimizing any sort of conflict) (Lomax, 1968, p. 287). Obviously, not too much can be made of this small analysis, and no more comprehensive study has been undertaken since. However, it is telling to note that the concept-categories of "communication" and "social positive" were highest in the smallest cultures,

and lowest in the largest ones, once again arguing for important group-size effects on music at many levels. Much work is needed in this area.

8. *Pitch blend.* Space limitations prevent me from presenting a general analysis of musical phrase structure, but it is clear that the human musical system is by its very nature a system of pitch blending and patterning,⁴ one that encourages group participation. Music is a two-dimensional system comprised of horizontal "sequence" and vertical "blend." Speech, by contrast, has only the horizontal dimension of sequence, and is used principally for dyadic communication rather than for group-wide expression. Speech proceeds obligatorily by an "alternation of parts," whereas music is highly effective at promoting "simultaneity of different parts" through its intrinsic capacity for pitch blending. Music's vertical dimension must be seen as a design feature promoting group performance and interpersonal "harmonization." Yet, not all forms of vertical patterning foster good blend. In fact there are at least nine different forms of polyphony in world musics (Zemp, 1996). However, in small-scale cultures, where groupish musical performance predominates, well-blended performance style is most common, and is highly valued for its symbolic feeling of unity. Good blend is best demonstrated in the polyphonic traditions of sub-Saharan Africa and the homophonic traditions of the Pacific Islands. In such cultures, individual showiness is discouraged, and good blend is culturally valued. Oddly enough, several forms of poor blend, such as Arabic heterophony, are probably no easier to achieve at the performance level than is good blend. Be that as it may, the major point is that the human musical system is one which is inherently designed for interpersonal simultaneity and group-wide participation, in a way that is inconceivable for conversation.

9. *Teamwork and coordination in performance.* Related to the issue of blend is the idea that musical performance requires a great deal of active teamwork. This is well documented in the very elaborate

⁴ I have intentionally used the terms pitch blending and pitch patterning instead of harmony and polyphony in this chapter as the latter two terms have very specific meanings in musicology. Western-style harmonizing, called homophony, is found only in Oceania, Europe and the former colonies of the European powers. It is anything but the prototype of pitch blending in world musics. Be that as it may, thanks to the advent of commercial music and, more recently, to international pop music (so-called "World Music"), homophony has developed into a kind of infectious meme that seems poised at obliterating all other forms of pitch blending in the world. See Abraham and von Hornbostel (1905) for an almost amusing account of how homophony was imposed by a musicologist in a place it just never belonged.

choral singing and group dancing styles of the world. A wonderfully complex musical device that reflects this point is African “hocket,” a system of total interdependence. In hocket, each member of the performance ensemble sings (or plays) one note or a small motif, such that coherent melodies can only be generated through the precise and ongoing alignment of these multiple parts. Such a technique is very common in Pygmy singing as well as in Haitian vodou music. The general technique of which hocket is a part is referred to as “interlock.” Interlock is the general performance technique found in all sub-Saharan African musical styles (Arom, 1991), but is also used throughout the world in such disparate performance groups as Javanese *gamelan* orchestras and Andean panpipe ensembles. In such interlocked traditions, standing out above the crowd is officially discouraged. The ensemble should sound as one. Thus, musical performance in such traditions is about working together to create a common sound. This sound quickly becomes identifiable as a “our” sound, which then becomes an important group-identity marker.

10. *Meter*. As Eric Clarke (1989) has pointed out, and as is apparent from watching the evening news, there is hardly a political rally in which people do not chant slogans a metric fashion. While speech never uses meter in a dyadic context, it uses it extensively in a collective context. Metric speech is the major means by which a group speaks in a collective fashion. Space limitations again prevent me from presenting a detailed thesis about the evolution of meter, however the simplest hypothesis is that the human capacity for metric time-keeping, which is a hallmark of human music, evolved as a group synchronization device during music- and dance-related rituals. This thesis places human time-keeping capacity firmly within a group-selectionist perspective, especially one that sees music as co-evolving with ritual. Yet not all music is metric. In fact, what a comparative view of world music suggests is that meter is used as a group coordination and synchronization device *when such coordination is needed or desired*. When it is not, musical forms will be in a freer, non-isometric rhythm. Therefore, soloist forms, especially those involving improvisation (like the *alap* of the Northern Indian raga, the *taksim* of the Ottoman Fasil suite, the *buka* of a Javanese gending, or a Qur’an or Torah cantillation) tend to be in a free rhythm, whereas ensemble pieces from these same cultures tend to be in an isometric or heterometric rhythm. Thus, musical meter functions as a coordination device in multi-part music or dance music, and seems to be

present only when such interpersonal entrainment is desired or needed. It is a device for coordinating vocalists with one another, instrumentalists with one another, instrumentalists with vocalists, and dancers with musicians. Again, when there is not a constraint to perform in a coordinated fashion, musicians throughout the world will often perform music in an unmeasured rhythm, especially, as has already been mentioned, where good improvisational skills are particularly valued in a culture. If we look at the predominant rhythm types of the different cultures of the world (Lomax, 1968), we see that freer rhythms are used in the soloist-oriented, improvisational forms of the large cultures, but that isometric or heterometric rhythms are the predominant rhythm types in the smaller, tribal cultures, where group-wide singing and dancing are the norm. Metric music and the human-specific capacity for rhythmic entrainment might be the strongest case for arguing that music evolved as a group cohesion and coordination device by group selection. Add to this the above argument that the capacity for pitch blending is inherent in the musical system and is well exploited in the musics of small-scale cultures, and we can say that music-making is the quintessential group coordination mechanism.

These last three points conform with evolutionary psychologists’ preoccupation with “design features” for complex cognitive capacities (Tooby & Cosmides, 1992) by arguing that music is by its very nature a device which not only permits but promotes group participation and synchronization. This is reflected principally in music’s capacity for pitch blending and rhythmic entrainment, which has led me to argue that the evolution of the neural modules mediating these functions occurred by group selection. However, I reiterate that music is a multifunctional object and that this short list has attempted to highlight the collectivist and groupish aspects of music-making, which are widespread.

There are many examples of musical forms or styles that are soloist, competitive, self-promoting, dyadic, poorly-blended, age-restricted, sex-restricted, asynchronous, monophonic, and so on. To the extent that sexual selection accounts of music-making highlight these features of performance style, they are complementary, not contrary, to the group selection account presented in this section. However, as I mentioned above, sexual selection scenarios tend to eliminate the specificity of music by reducing musical behavior to the level of nonspecific sexual display. What sexual selection models need to do is move beyond the display metaphor, and elucidate the extent to which sex and courtship have become specified in musical behavior and music itself, as reflected in the contexts and contents of music

making, in the features of global performance style, and in the formal and structural properties of music itself. In the end, if the evolutionary approach to music is to have any benefit at all for musicology it will be in directing future ethnomusicological research towards developing and testing hypotheses that can distinguish the effects of different selection mechanisms on musical behavior.

In closing this discussion of the group selection model of music, I want to make one last point. To the extent that music evolved by group selection, this must have been based on genetic variation more so than cultural variation, although the latter may explain many important features of music at the social level. The reason for this is that there is ample evidence demonstrating neural and cognitive specificity for music (Peretz & Morais, 1993; Marin & Perry, 1999), thereby suggesting that music is a genetically-mediated capacity shared by all human beings and not merely a culture-specific behavioral strategy or a culturally-selected meme. Music is a prime example not only of a universal human behavioral but a modular function as well. Music is a self-contained grammatical system akin to language (Brown, 2000). Music is not just an art form but one of our fundamental ways of thinking (Gardner, 1983, 1993). The brains of musicians show several structural and functional differences from those of non-musicians (Sergent, 1993; Schlaug et al., 1995a, b; Zatorre et al., 1998). Musical consciousness exists in parallel to verbal consciousness (Brown, 1999). Universal properties of musics throughout the world can be described and classified (Brown, submitted a). In many ways, music is an ideal example of a cognitive adaptation of the type that evolutionary psychologists are seeking (Tooby & Cosmides, 1992; Miller, 2000), although it may be the first one described so far which is not explainable by individual selection mechanisms.

Music evolved in the context of collective rituals by group selection to make groups better survival machines, both against environmental pressures and against competing groups. Ultimately, this capacity for music came to characterize our species as a whole, and the ancestral state of music was born. As cultures diverged and expanded, musical behavior and music itself changed in significant ways. Different types of music-cultures evolved, devising new musical systems and novel uses for music. In this way, the elements that comprise the music-culture became complex memes, and the norms and roles that characterize musical behavior became important components of the survival strategies of each culture. However, to the extent that music is both a cultural universal and a modular neurocognitive function, we must entertain models based on genetic variation (in addition to those based on cultural variation), despite the constraints that such models impose.

4. MUSIC AS RITUAL'S REWARD SYSTEM

For many, music's evolutionary mystery is Darwin's paradox: that music requires such an investment of time and energy yet provides so little benefit for individual survival. But for me, the fundamental paradox of music is both deeper and more modern: that music has all the hallmark features of a complex and autonomous neurocognitive module, yet it has no autonomy at the cultural level (Brown, submitted b). Music is always about something else, about other activities and other meanings. But this point will certainly seem perplexing to people raised in Western culture, because the notion of a "concert" is such a prominent feature of our own music culture. However, it is essential to realize that concerts are a very recent human invention. In many cultures of the world, and most especially in tribal cultures, music is not performed for its own sake; there are no concerts and there is no passive listening to music in the privacy of one's bedroom. Music is inextricably associated with other activities, and most universally with group ritual activities. In addition, music is strongly associated with language, where it serves as a vehicle for the transmission of history, norms, and scriptures; music is an important device for making words sacred and memorable.

So here we have a true neural module, a cognitive adaptation, one of our seven intelligences, a self-contained grammatical system. Music has so much autonomy at the neurocognitive level yet so little at the social level. That, to me, is the evolutionary mystery of music. How can we resolve this paradox and move towards an evolutionary theory of music?

I believe that the only way around this is to say that music and ritual *co-evolved* in some very important sense during human evolution, and that in order to understand the role of music in ritual we must understand the role of ritual in human life. Ritual serves many important functions in the life of a group, including event marking, time marking, transmission of group history and identity, planning and decision making, preparation for action, social bonding, and conflict resolution. It is a means of sanctifying, marking, and making special (Dissanayake, 1988, 1992). Ritual represents the cooperative and groupish domain of culture. It is what happens when people put their group identity before their individual identity.

Merlin Donald (1991, pp. 175-176) has provided a fascinating and provocative account of the evolution of human cognition and culture. In discussing ritual, he writes: "Ritual, and its derivatives in theatre, differs from most other forms of mimetic representation in that it is a collective act in which individuals play different roles. A well-documented, widespread example from human Paleolithic cultures is the acting out of conquest, often without use of any words. A mimetic representation of the

enemy if accompanied by chanting, drumming, and communal mimetic dance. The essence of the mimetic act in this case is not in the action of a single individual but in the orchestration of several actors. Such representations are coordinated social efforts, dependent upon the actors', and the audience's, sharing a global cognitive model of society."

However music's role in ritual is not limited to wordless re-enactment plays but includes words, texts, and philosophies. Perhaps its most prominent role is in reinforcing the shared meanings and collective narratives of a culture, in other words, its myths. For Donald, "every aspect of life is permeated by myth (. . .) The myth is the prototypal, fundamental, integrative mind tool. It tries to integrate a variety of events in a temporal and causal framework. It is inherently a modeling device, whose *primary* level of representation is thematic. The pre-eminence of myth in early human society is testimony that humans were using language for a totally new kind of integrative thought" (pp. 214–215, emphasis in original). Music's role in myth occurs in the form of both the "chanting, drumming, and communal mimetic dance" alluded to above by Donald and in the direct association of music to a "totally new kind of integrative thought" through the singing of narrative texts, texts that describe the origins, history, personality, deities, norms, and virtues of a culture.

Donald offers little role for music in human cultural evolution beyond being an adjunct to wordless mimetic rituals. I would like to supplement Donald's "mimetic" account by describing a general role for music in ritual's development, thereby making this account co-evolutionary. An analogy to brain function would be useful. Many neural systems serve a purely informational function for the organism, encoding stimulus properties, controlling motor outputs, or mediating declarative memories. Other systems, called "modulatory" systems, are involved not so much in transmitting sensory and motor information as in conveying a sense of the *value* of an object or behavior for survival (Edelman, 1989). Such systems are reinforcement systems that attach rewards and punishments onto objects, thereby influencing the motivation to either move towards or withdraw from an object. If we extend this metaphor to the level of the social group, then we see that ritual is a type of informational system involved in encoding features of the physical and social environment, planning for action, transmitting history, and maintaining a sense of identity. In contrast, music is a type of *modulatory* system acting at the group level to convey the reinforcement value of these activities (or the information contained therein) for survival. Music evolved as ritual's reward system, a social neuromodulatory system. This view is supported not only by music's ubiquitous association to ritual activity in all human cultures but by the pleasurable and rewarding emotions universally associated with musical behavior and music perception. Music is not just an enhancer but a reward. It makes ritual

behavior motivationally salient for the individual. My basic hypothesis, therefore, is that *music and ritual co-evolved during human evolution, where ritual served as an informational system and music its reinforcement system.*

This view of music should make us reconsider the evolution of ritual from a biomusicological point of view. If there is a module for ritual behavior in the human brain, it is most likely the one for music. This is the only characterized module whose focus is on the collective side of survival, on what Lomax (1980) has called "the strategic models by means of which and in terms of which cultures endure." Was music the emotional justification for bringing people together, to have them feel a sense of unity, to have them sanctify that which is shared, to have them rebel all that is foreign? In the end, music's salience is the salience of exactly those activities that Darwinists glorify. Music can be about foraging, but foraging is not about anything other than simple survival. We don't need ritual to remind us that we are hungry; we do need it to remind us that collective foraging is our best route to individual survival. Music simply convinces us that this has to be so.

5. CONCLUSION

Music has a wide range of functions. It is used for everything from assembling cattle to assembling soldiers, from playing games to initiating battles, from hunting animals to blessing food, from glorifying gods to condemning foreigners, from expressing romantic love to declaring political resentment, from exalting an individual's uniqueness to defining a group's identity, from uniting a city during a siege to commemorating its victims many years later, from celebrating life's pleasures to reinforcing one's duties, from cherishing fraternal ties to bemoaning sexual inadequacy, from transmitting creation myths to presaging group destiny, from remembering why one is alive to remembering those who have died. Yet, while music has this wonderful diversity of uses, the overriding theme seems to be centered at the level of the group, especially in terms of group identity, cognition, coordination, and catharsis. The notion that music-making affords opportunities for sexual display takes advantage of the very fact that music is a group behavior, one which brings all members of the courtship game into close contact. But courtship is simply one more domain in which music has found an important role in human cultures. There is an abundant number of contexts in which courtship and sex serve no role at all in musical rituals, and in which any display role afforded by music-making is an indirect consequence of the group activity at hand. So courtship should be viewed as one important context and function for music-making, not its *raison d'être*.

A cross-cultural view of musical performance style strongly supports the role of music in group function. Music has adaptive design features that reflect this role, such as its use of pitch blending and isometric rhythms. I have proposed a group selection model for the evolution of human musical capacity, one which openly acknowledges the highly double-edged character of human nature: music is just as useful for bringing out our killer instincts as it is for inspiring our most high-minded and ecstatic sentiments.

In discussing music's adaptive function, two evolutionary paradoxes came up. First there was Darwin's paradox about the high cost but minimal survival benefit of music for the individual. Then there was my own evolutionary psychological paradox which says that while music has all the requisite features of an autonomous neurocognitive module, it acts in a completely non-autonomous manner at the social level. My solution to both paradoxes led to a common view of music as a group-cooperative device that evolved with the emergence of group rituals during human evolution. Music's role in ritual is both general and specific. It is general in the sense that music functions as a generalized reinforcer of all types of ritual activities and symbols. However, its role is specific in the sense that music evolved as a reward system rather than a punishment system at the group level. It makes individual investment in group rituals a cultural imperative. Music is a group-level modulatory system, ritual's reward system.

I have argued that music is a group-level adaptation because of its ability to promote collective survival. But as we all know, much has been done throughout history in the name of collective survival. Dmitri Shostakovich, whose Seventh Symphony was mentioned at the opening of this chapter, was vehemently attacked by the Stalinist regime during the 1930's and 40's exactly because his modernist music was considered to be a threat to collective survival. He became the most renowned victim of artistic repression in Stalinist Russia. He squelched his creative tendencies as the most brilliant composer of his generation to become something of the obedient composer-of-state of the Soviets, and even then did not evade devastating public censure on two occasions. Much the same kind of manipulation of composers and musicians occurred, but on a much more insidious scale, in Nazi Germany, where the "degenerate music" of the atonalists, Jews and Blacks was outright banned, and where music was used as a propaganda device in a manner that still inspires modern-day manipulators of music. Music is a prostitute. It is used for whatever purposes people have in mind. It can promote hate as much as tolerance, division as much as unity, idleness as much as action. All these things emerge from a view of music acting not as a display behavior in a fixed context but as a flexible semiotic enhancer and emotive manipulator that operates within complex and often irrational systems of cultural meaning. Such things that can only be appreciated from a group-functional perspective. In the end, multilevel

selection provides a much broader and richer view of music than individual selection.

Whether music evolved to woo the hearts of women or to promote the survival of social groups, there is no question that it has been one of the most important forces shaping cultural behavior during human evolution and in all contemporary societies. The time has come for those interested in the evolution of human culture to realize that music offers a veritable treasure trove of insight into how we act, how we think, and how we feel . . . both individually and collectively.

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