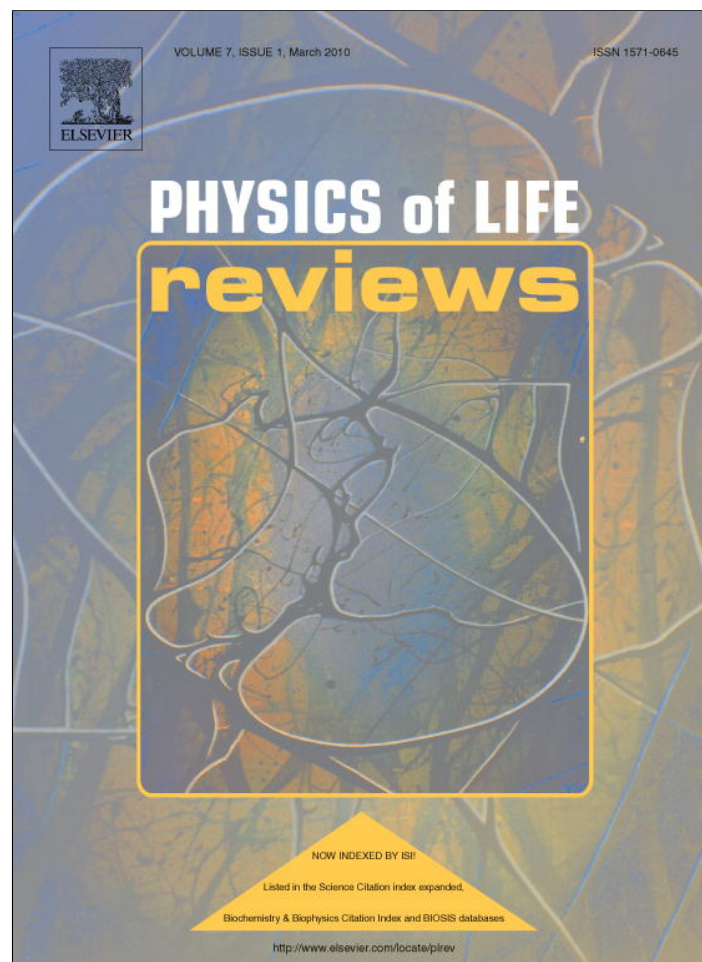


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Comment

The emotional origins of music [☆]Laurel Trainor ^{*}*Department of Psychology, Neuroscience & Behaviour, McMaster University, Hamilton, ON, Canada L8S 4K1*

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Producing and perceiving music are mysterious universal human behaviours in that they appear to have no obvious survival value, but can nonetheless evoke profound social and emotional experiences [13]. A number of theories have been proposed as to why music might have evolved, the most convincing of which suggests that emotions induced by music are felt in common by members of a group, and that this shared experience leads to the social cohesion necessary for group cooperation [3,5,6]. Indeed music is universally present at all important societal events, including religious ceremonies, political rallies, weddings, funerals, sporting events, and military attacks. In all cases, the music acts to induce a common emotion and a common purpose in a group of individuals, and the resulting cooperation likely increases the probability of survival for the group as a whole.

Perlovsky [10] presents a wide-ranging and bold hypothesis that music is actually a causal force in the emergence of consciousness and human culture; that somehow when conscious semantic linguistic thought processes become too differentiated or contradictory in the presence of fast cultural changes, musical emotions can reconcile these contradictions in consciousness; and that music is therefore necessary for language and consciousness to function.

As with many broad theories, it is of course extremely difficult to gather unequivocal evidence to support its validity. Perlovsky describes how different cultures have placed different values on the physical and emotional content of music. However, the causal direction remains unclear. The musical styles that are valued at any particular time may simply reflect aspects of broader cultural ideas rather than contributing directly to conscious thought. And if music is necessary for integrated linguistic thought, it is difficult to explain how 4% of the population has been estimated to be amusic [9], yet these people seem to function normally in language, thought, and non-musical emotion. Perhaps even if emotion is needed as a counterbalance to logical thought, it need not be musical in origin.

It is clear that music is a non-linguistic system that can induce powerful emotions, but the difficult questions are how and why music elicits emotion. Despite the fact that music is typically not about events in the world, emotional reactions to music appear to be physiologically similar to emotions elicited by real-world events [16]. Indeed, musical emotions appear to rely on general emotional mechanisms that evolved much earlier. For example, isolated pitch and timbre can elicit emotions similarly across many species [8]. Aggression, for instance, is conveyed by low, loud sounds (the animal is attempting to appear large and powerful) and submission by high, quiet sounds. Human infants also appear to understand this in that they prefer higher-pitched over lower-pitch singing [17].

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Musical expectations also provide a powerful mechanism for eliciting musical emotions. As pointed out by musicologist Leonard Meyer [7], highly emotional points in music are typically associated with low-probability events. Huron [4] argues that this is part of a general survival mechanism whereby animals are constantly trying to predict the immediate future so as to anticipate danger, and whereby prediction failures result in intensified emotional responses. Music appears to use the same ancient mechanism, such that an unexpected note, chord, or transition automatically elicits an emotional response. Indeed the brain's response to unexpected musical events has been measured with EEG and shown to be similar to that elicited by unexpected events in non-musical stimuli [15,18].

Music has another feature that makes it a particularly powerful social stimulus. This is that people can move in time to, or entrain to, different tempos. Neural similarities in rhythmic auditory and motor circuits are present in species as primitive as crickets, where the male of the species executes leg movements to make sounds and the female must perceive the rhythmic sounds made by the leg movements in order to locate the male conspecific [1]. Indeed, in both human infants [2,11] and human adults [12,14] movement (either on every second or every third beat of an auditory pattern) can influence whether an ambiguous auditory rhythm is perceived as a march or as a waltz. The connection between motor and auditory systems enables people to play music in synchrony with each other, a crucial feature for the social power of experiencing music together.

We can conclude that music induces powerful emotions that are shared socially, and that the mechanisms involved in inducing musical emotions evolved from ancient adaptations that were not specific to music. This probably explains why music has been and continues to be so central to human culture. And why music has the power to instigate riots, as during the premier performance of Stravinsky's *Rite of Spring*, and to promote social justice, as when Paul Robison sang *Old Man River*.

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