Letter From the Desk of David Challinor
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How often have you heard a tune that was popular when you were a teenager and remembered the lyrics almost instantly? Poems memorized in childhood also tend to stay with us for life. What is it about music or rhyme/rhythm that makes it so readily retrievable? What evolutionary benefit does music have for humans? Such questions have long puzzled scientists, especially neurophysiologists (scientists who study brain circuitry). This letter will consider the role of music in the evolution and behavior of mankind.

One theory proposes that singing, or perhaps music in general, evolved along with speech. In fact, some argue that singing may have preceded syntactic speech when humans imitated bird songs. Hominids certainly communicated successfully with each other more that 300,000 years ago when the hypoglossal nerve that controls the tongue reached its present size, although they probably had not yet mastered syntax, a language quality needed to discuss abstract concepts. Mimicking bird and mammal calls would be an evolutionary advantage if it improved hunting skills, just as today a good duck or turkey caller can lure these birds into range. Such skill must be learned and practiced, but accurate mimicry of animal calls would also be useful for keeping in contact when hunters are out of sight of each other.

The step from simulating calls to musical ability is more difficult to fathom. Gibbons, for example, have a piercing cry to maintain troop contact in the forest canopy. Other primates, such as howler monkeys, also have distinctive calls, but they scarcely seem musical to our ears. The closest to what we consider music may be the mysterious song of humpbacked whales. If animals and birds can make such music for whatever purpose, then it would seem logical that humans could too. I try to imagine a scene a few hundred thousand years ago in which a group of male hominid hunters compete with each other to mimic an animal call most accurately or to have it carry furthest—a prehistoric contest along the lines of Wagner's "Die Meistersinger von Nürnberg."

However song originated, it is surely an integral component of human culture. In the case of music and song, we are disadvantaged in trying to explain its "meaning" because we are looking too deeply into ourselves. The true answer may continue to be elusive but theories abound. William Benzon[*] proposes one explanation for man's need for music: music fosters a feeling of union in small communities by reducing stress or by sharing a happy event. For example, the song "Happy Birthday to You" may now be the most frequently chorused song in the world. I remember years ago hearing it trilled in heavily accented English in a small inn outside Geneva when a dozen seven year olds

[*] *Beethoven's Anvil: Music in Mind and Culture*, Basic Books, 2001. 352 pp.

burst out in song when the cake arrived at their table. Singing during rituals such as birthdays, christenings, marriages and funerals, fosters a sense of cohesiveness. Groups bound by song or music might better maintain a collective harmony, thereby enabling them to operate more cohesively than non-singers and thus gain a selective advantage over their silent competition. This argument may be a bit farfetched, but I mention it only to illustrate the endless possible explanations for music's evolutionary advantage.

A quite different approach to music is that of the well-known cognitive neurophysiologist from MIT, Steven Pinker, who describes music as "auditory cheesecake." I interpret this to mean that it is happily and easily consumed (listened to), but is not essential for survival. In seeking the answer to what music is for, researchers have been tracking the neural pathways in our brains when we both listen to and perform music. Making music requires more complex neural connections than just listening to it, because the auditory inputs have to be precisely integrated with the muscular control of fingers, lips, arms, breathing, vocal cords, etc. For example, the brain has to interpret continuously the touch signals it receives from fingers and/or lips. Once we can understand and trace the neural pathways of a performing instrumentalist, scientists should be able to use this extremely complicated processing to study how the brain works in general.

It turns out that our brains contain specific circuits for perceiving, processing and actually playing music. When listening to song or musical instruments, the auditory nerves of our ears send the sound signals they receive to those specialized parts of our brains' temporal lobes that handle sound. These acoustical receiving areas are in turn divided into primary, secondary and tertiary levels according to how complex the incoming signals are to process. Now the system begins to get complicated because in order to process what you hear the brain has to store bits of music while trying to process the whole musical input. Scientists have not yet determined precisely the brain location where these snatches of music are stored; it may be in the temporal lobes. Even less well understood is where in the brain our incredible long-term storage of tunes lies, but it must certainly be a most efficient neural connection, because once we have learned a song or tune, it generally remains with us for life. For example, when Smithsonian Secretary Charles G. Abbot celebrated his 100th birthday at a dinner in the Castle in 1975, he stood and sang a sea chantey that he had learned in 1911 at age 36 aboard a US Navy sailing vessel on his way to make astronomical observations in the Pacific.

The emotional response to music is evidently processed in a set of circuits more widely distributed in the brain, because these responses can be enormously powerful. Orchestral or choral renditions of certain compositions are effectively used in films and live theatre to set the tone and affect our emotional state. Outstanding examples from movies are Mozart's Piano Concerto 21 in *Elvira Madigan*, Barber's Adagio for Strings in *Platoon* and even the whistled march in *Bridge over the River Kwai*. Who is not affected

by the opening solo in the final movement of Beethoven's Ninth that presages the full-blown chorale of Schiller's Ode to Joy? Or who can forget the photograph of the weeping French as they sang the Marseillaise on the liberation of Paris in 1944. This emotive response to music is probably the hardest for neurologists to explain, because the circuitry for emotions are particularly hard to pin down. However, one scientist, R.J. Zatorre, and his colleagues performed a PET (positron emission tomography) scan on ten music students while the students listened to pieces they had chosen based on the strong emotional reaction it generated in them. The PET imaging showed that their brain's neural pathways were roughly the same as those identified with euphoria and such pleasurable pastimes as eating and sex. The latter two activities are clearly essential to human survival, but is music in the same category or just an added bonus?

There is accumulating evidence that music makes cows more contented and thus helps milk production, or that it has an effect on egg production in chickens, or as some people believe, that it makes children smarter if exposed to it in utero. Whether music will increase productivity in humans is unknown, but it may become better understood or more relevant as we delve ever deeper into the human psyche. Meanwhile, let us continue to enjoy "…the only sensual pleasure without vice" (Samuel Johnson)—although Johnson had not heard rock or grunge music, or music that demeaned the singer's mother—and to consider music's source ever beyond our ken as Lord Byron so beautifully wrote in his epic *Don Juan*:

"There's music in the sighing of a reed;
There's music in the gushing of a rill;
There's music in all things, if men had ears:
This earth is but an echo of the spheres."

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