

Exploring the role of music in human life

By Robert S. Boyd
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WASHINGTON - Scientists are trying to understand why music – a pleasurable but seemingly unnecessary part of life – is universal in all human societies, ancient and modern.

Archaeologists have found evidence of musical activity dating back at least 50,000 years. Even babies as well as some animals, such as birds, whales and monkeys, have a built-in sense of tone and rhythm, according to a set of six papers on the origin and function of music in the July edition of the journal *Nature Neuroscience*.

"Every culture we've ever looked at has music of some sort," Marc Hauser, a neuroscientist at Harvard University in Cambridge, Mass., and author of the leading paper, said in a telephone interview. "But why that is so is a puzzle."

Researchers expect their music studies – aided by the latest techniques of genetics and brain imaging – to shed new light on the way brains work and help people suffering from brain damage or disease.

Music also offers scientists another way to explore the unsolved mysteries of human consciousness. It can help explain how the brain processes external signals – in this case sound waves – that lead people to perform actions such as toe tapping, dancing and singing.

"Music provides a panoramic window through which we can examine the neural organization of complex behaviors that are at the core of human nature," wrote Petr Janata, a brain scientist at Dartmouth College.

Isabelle Peretz, a psychology professor at the University of Montreal, reported that the human brain has a special "module," or network of cells, for music, separate from but overlapping with the areas that handle language. The module has distinct subsystems for melody and for rhythm.

The music module is not a little organ like a gland, Peretz said, but "a mental information processing system" composed of circuits of cells scattered through the brain that are specialized for processing music.

A major riddle is why humans developed the capacity to enjoy and perform music – from humming to composing a symphony – since these activities seem to have little or no practical value.

Scientists think most human skills, such as language and walking on two legs, evolved because they gave humans an advantage over rival creatures.

"Because of its lack of obvious utility, music is typically viewed by scientists as an interesting but evolutionarily irrelevant artifact," said Sandra Trehub, a psychology professor at the University of Toronto.

Charles Darwin, the father of evolutionary theory, wrote in 1871: "As neither the enjoyment nor the capacity of producing musical notes are faculties of the least use to man in reference to his daily habits of life, they must be ranked among the most mysterious with which he is endowed."

Experts have proposed various explanations for the universality of music. Darwin suggested it evolved in our animal ancestors as a sexual system, designed to attract mates. "In this view, animal song became part of courtship, and then part of human nature," Hauser said.

Others observe that music creates social cohesion, strengthening group bonds against outsiders. School pep songs or military marches are obvious applications.

Many assert that the most important function of music is to regulate or influence emotions. "Some sequences of notes are happy, some are sad," Hauser said. "Music affects our emotional response."

It isn't clear which of these theories about the origin of music is correct. "We really can't distinguish between these hypotheses," Hauser acknowledged. "Everything is open to debate."

Researchers are particularly interested in studies comparing the musical abilities of adults with those of human babies and animals. For example, experiments with very young infants showed that they react differently to harmonious and discordant chords, demonstrating that a sense for music is inherited.

According to Trehub, 4-month-old infants are content to listen to unfamiliar folk melodies, but show signs of distress - fussing, squirming, turning away - when dissonant notes are introduced into the melody.

"Toddlers commonly invent songs before they can reproduce conventional songs," she noted. "Similarly, school-age children create songs and chants, such as 'eenie-meenie-miney-mo,' that share a number of features across cultures, including repetition, rhythmic patterning, rhyme and alliteration."

Even monkeys apparently sense the concept of a musical octave.

According to Anthony Wright, a neuroscientist at the University of Texas Health Science Center in Houston, rhesus monkeys, like humans, tended to judge a tape-recorded song, such as "Old McDonald Had a Farm," to be the same when it was shifted up or down by one or two octaves.

But when the melody was transposed by a half-octave, thereby changing its key, the monkeys no longer recognized the tune, a fact they showed by failing to turn their heads toward the speaker.

Comparisons between music and language offer fresh insights into brain function.

Hauser pointed out that music resembles language in that most people in all cultures instinctively know whether a sentence in their language is grammatical or not. Similarly,

almost everyone can tell whether certain patterns of sound are music or mere noise, even if these sounds have never been heard before.

"There are other stimuli that nearly everyone recognizes as unmusical, such as a 'sour' note in a melody," he said.

"For too long, the neuroscience of language has been studied in isolation," wrote Aniruddh Patel, a scholar at the Neuroscience Institute in San Diego. "Music is now stepping into this breach, and via comparative analysis with language, providing a more complete and coherent picture of the mind than can be achieved by studying either domain alone."

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For more information about music and the brain on the Web, go to:

www.musichaspower.org/musicinst/research.html

www.mindinst.org/MIND3/index