The Significance of Music in the Contemporary World

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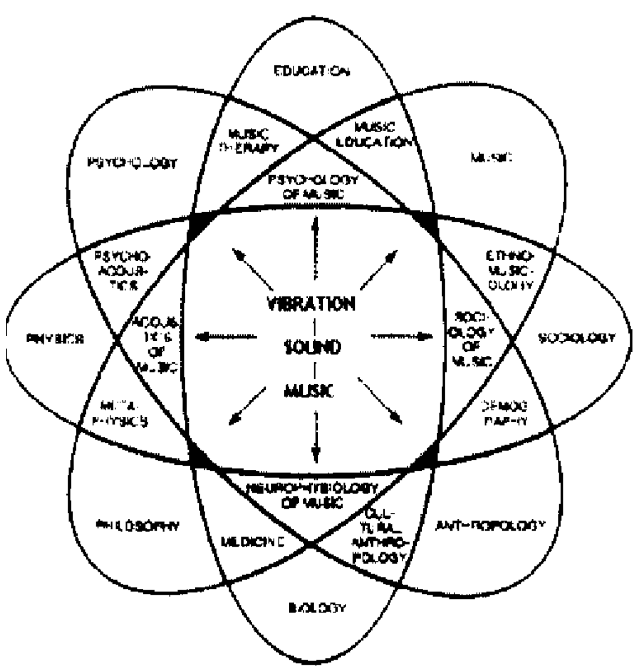
Article:

One of the goals of the Suncoast Music Education Research Symposium was to understand music from multiple perspectives. The purpose of this presentation was to explore this notion and to consider many different and perhaps infrequently recognized ways that music has significance for the contemporary world.

Figure 1 has been used to illustrate the interdisciplinary nature of music psychology (Eagle, 1996). For the purposes of this article, it will be used as a model to explore how music often plays a significant role in a wide variety of disciplines. Due to space considerations, only selected examples are presented. The focus is on breadth rather than depth and in each case, the few points discussed should be taken as token examples rather than full coverage of the topic area.

Figure 1. Molecule model of the interdisciplinary nature of music psychology (after Eagle, 1996).



Astronomical Significance

Musical metaphors are found frequently in astronomy. Consider, for example, that the National Optical Astronomy Observatories (2007) teaches students about helioseismology (the study of wave oscillations in the sun) through a program called *Solar Music.* String theory, a major tenet of quantum physics, is illustrated by the vibratory patterns of a violin string. The term *asteroseismology* refers to the study of vibrations in deep space. NASA has detected vibrations emanating from a black hole 250 million light years distant, which they label as sound waves (Chandra, 2007). The Voyager (2007) space missions, launched in 1977 are traveling at a rate of 1 million miles per day and are just now at the edge of our solar system. They each carry aboard two prototype CD-ROMs that contain information about who we are as a species. Two-thirds of these discs are music (Sagan, 1978).

Genetic Significance

Researchers have developed an algorithm to turn DNA into sound (Ohno, 1993; Ohno & Ohno, 1986.). One goal is to diagnose illnesses by *listening* to the body. Diseased cells make more discordant sounds than healthy cells. Others have converted these DNA sequences into music or used them in musical compositions (Alexjander, 2007; Takahashi & Miller, 2007).

Sonification

Sometimes it is difficult to make sense of a massive amount of visual data. Fortunately, we are remarkably adept at detecting aural patterns and *sonification* is the process of turning data into sounds. Familiar examples include a doctor using a stethoscope to listen to the heart or a mechanic listening to a car engine. A Geiger counter and sonar devices are other examples. Sonification is now being used in fields such as chemistry, physics, engineering, medicine, statistics, geology, meteorology, and computer science (Barrass & Kramer, 1999). This has led to a natural interest in creating music from these data-derived patterns (Kaper & Tipei, 1998; Kaper, Tipei, & Wiebel, 1999).

Engineering Significance

In an interesting article, Phillips (2005) likens the building of rockets to the building of guitars. Both require appropriate dissemination of vibrations. In the case of rockets, rumbling sound waves can literally cause such violent shaking that the ship could break apart. To learn how to dampen resonances, or literally to de-tune a rocket, NASA has built huge sound studios for acoustical testing of rocket parts.

Architectural Significance

In a recent book, Blesser and Salter (2006) write about the concept of aural architecture. In *Spaces speak, are you listening? Experiencing aural architecture,* they explore auditory spatial awareness and its relationship to aural architecture. Discussions move from cave acoustics to home theater audio systems, from evolution to neurobiology, from physics to perception, from science to engineering, from physical to virtual spaces, and from physical sound to emotional response.

Economic Significance

Music plays an enormous role in both U.S. and global economics. The estimated combined value for the music industry, including record sales, live music, and music publishing was $48 billion in 2004 (Williamson & Cloonan, 2007). Apple's iTune has already experienced more than two billion downloads and Apple has sold more than 120 million iPods (Wong, 2007). Other economic figures include such facts as $1.2 billion in U.S. ticket revenues in 2003 (Romanowski, 2001) and $6.9 billion in music publishing revenues for 2000. The Bureau of Economic Analysis reported that U.S. citizens spent $12.7 billion attending arts events in 2005; this is more than the $9.7 spent on attending movies (Nichols, 2006).

Biological Significance

Currently, *Wild music: The sounds and songs of life* (Wild Music, 2007) is on a six-year nationwide tour of informal science centers. This exhibition explores the music of nature and the nature of music. Krause (1987, 1998, 2002) has explored natural soundscapes all over the world and recognizes the interconnection between animal sound-making and human musicality. Many others have explored these issues in species ranging from mice (Kalcounis-Rueppell, Metheny, & Vonhoff, 2006) to whales (Payne, 1995).

Neuroscientific Significance

The biological basis of human musicality is now clearly recognized (Zatorre & Peretz, 2001). The brain basis of music performance has been studied in pianists (Parsons, Sergent, Hodges, & Fox, 2005), conductors (Hodges, Burdette, & Hairston, 2006; Parsons, Hodges, & Fox, 1998) and singers (Brown, Martinez, Hodges, Fox, & Parsons, 2004). In these and many other studies, it has become apparent that neural networks serving musical behaviors are widely distributed throughout the brain. Furthermore, there is increasing evidence that early musical training shapes and reorganizes the brain.

Audiological Significance

Musicians spend an inordinate amount of time in loud environments. Over exposure to loud sounds can lead to noise-induced hearing loss. Some university wind ensemble members experienced up to 206% of their maximum allowable noise dosage during daily rehearsals, when anything over 100% may lead to permanent hearing loss (Walter, Mace, & Phillips, in press). Public school music teachers and university music faculty were also found to be at risk, with band directors, brass players and percussionists the most vulnerable.

Sociological Significance

Although there may be (mis)perceptions that music is unimportant and inconsequential, ironically it may be that there is too much music in our society. We live in a music-saturated society where iPods are ubiquitous and where music is found nearly everywhere—in grocery stores, doctor's offices, airport waiting areas, and so on (Hargreaves & North, 1997). Personal and corporate identity is often shaped and expressed musically (Froelich, 2007).

Psychological Significance

Music has psychological significance for nearly everyone. However, there are some individuals for whom music may occupy even larger significance. Williams Syndrome (WS) is caused by a microdeletion on chromosome 7, which leaves persons mentally asymmetric. That is, they have exaggerated peaks and valleys in various cognitive domains. Though WS individuals may have an IQ of around 65 or 70, they commonly do well, relatively speaking, in language and music, and very poorly in mathematic and spatial reasoning (Levitin & Bellugi, 1998). Some WS musicians are quite accomplished; Gloria Lenhoff , for example, sings thousands of songs in 28 different languages (Lenhoff, Wang, Greenberg, & Bellugi, 1997).

Anthropological Significance

Music has always and everywhere been significant in human behavior. Dramatic proof of the power of music was demonstrated when the Taliban were removed from power in Afghanistan in the early part of the 21st century. During their regime, local musicians were severely censured. As soon as they had the opportunity, musicians dug up instruments from ingenious hiding places and soon began to play and sing again (Lyden, 2002). Barz (2005) wrote a book on medical ethnomusicology that explores another powerful role that music is playing in Africa. Music is used to convey information and to influence social behaviors in the fight against the spread of HIV and AIDS. Speaking to current practices, the Society for Ethnomusicology (2007) has made a position statement against the use of music in torture. Music has been used in interrogation and warfare. High volumes, sensory overload and deprivation, and an array of other tactics are designed to affect a person's spatial orientation, balance and coordination.

Medical Significance

Many physicians use music to reduce pain and anxiety in patients (Pratt & Spintge, 1995; Spintge & Droh, 1992a). Music listening can cause significant changes in blood chemistry and other physiological systems such as heart rate and blood pressure (Hodges, in press). By listening to music of their own choosing, many patients can reduce drug dosages in half. Music, too, is used to enable Parkinsonian and stroke patients to regain walking and other motor skills (Thaut, McIntosh, Rice, Rathbun, & Brault, 1996; Thaut, Rice, & McIntosh, 1997). The International Society for Music Medicine, whose membership is primarily physicians, is an organization dedicated to the use of music to effect health directly (Spintge & Droh, 1992b).

Educational Significance

The *Journal of Research in Music Education* has published music education research since 1953. Since that time, articles in this and many other journals have provided a foundation for evidence-based practice. More recently, Sounds of Learning: The Impact of Music Education, a funded research program, has been launched to determine the outcomes of a quality music education on all aspects of a child's growth and development (Sounds of Learning, 2007). Since 2005, more than $750,000 has been spent to fund 11 research projects. The first of these is now in print, with others on the way. Johnson and Memmott (2006) found that students in schools with exemplary music education programs scored higher on language and mathematics standardized tests than those in schools with weaker music programs. The Sounds of Learning Status Report (2007) provides a comprehensive review of the literature and is accompanied by an online searchable database of 566 relevant articles.

Philosophical Significance

The foregoing discussions provide just a glimpse of the enormous amount of evidence supporting the tremendous impact of music on the human experience. Philosophers from the ancient Greeks to today have written passionately and eloquently in attempting to account for why this is so. Why should music mean so much to us? Why do we spend so much time and energy on music—creating it, performing it, and listening to it? We use music to accompany all manner of mundane, everyday activities such as doing dishes or washing the car and we use it to support, confirm, and express our most profound experiences. Weddings, funerals, religious and civic ceremonies, holidays and celebrations—all are nearly unthinkable without the presence of music. Although we should be concerned about the loss of symphony orchestras and the marginalization of music education programs, we should also be aware of and heartened by the tremendous significance that music has for the contemporary world.

REFERENCES

Alexjander, S. (2007). Retrieved from http://www.oursounduniverse.com/samples/samples.htral on April 22, 2007.

Barrass, S., & Kramer, G. (1999). Using sonification. *Multimedia Systems,* 7(1), 23-31. Barz, G. (2005). *Singing for Life: HIV/AIDS and Music in Uganda.* New York: Routledge.

Blesser, B., & Salter, I. (2006). *Spaces Speak, are you Listening? Experiencing aural architecture.* Cambridge: The MIT Press.

Brown, S., Martinez, M., Hodges, D., Fox, P., & Parsons, L. (2004). The song system of the human brain. *Cognitive Brain Research, 20,* 363-375.

Chandra "Hears" a Black Hole for the First Time. Retrieved from http://chandra.harvard.edu/press/03_releases/press_090903.html on April 21, 2007. Eagle, C. (1996). An introductory perspective of music psychology. In D. Hodges (Ed.),

Handbook of Music Psychology, 2nd ed. 1-X. San Antonio: IMR Press.

Froelich, H. (2007). *Sociology for Music Teachers: Perspectives for Practice.* Upper Saddle River, NJ: Prentice-Hall.

Hargreaves, D. & North, A. (1997). *The Social Psychology of Music.* New York: Oxford University Press.

Hodges, D. (in press). Bodily responses to music. In S. Hallam, I. Cross, & M. Thaut (Eds.), *Oxford Handbook of Music Psychology*. Oxford: Oxford University Press.

Hodges, D., Burdette, J., & Hairston, D. (2006). Aspects of multisensory perception: The integration of visual and auditory information processing in musical experiences. In G. Avanzini, L. Lopez, S. Koelsch, & M. Majno (eds.), 175-185. *The Neurosciences and Music II: From Perception to Performance, Annals of the New York Academy of Sciences,* Vol. 1060.

Johnson, C., & Memmott, J. (2006). Examination of relationships between participation in school music programs of differing quality and standardized test results. *Journal of Research in Music Education,* 54(4), 293-307.

Kalcounis-Rueppell, M., Metheny, J., & Vonhoff, M. (2006). Production of ultrasonic vocalizations by Peromyscus mice in the wild. *Frontiers in Zoology,* 3(3).

Kaper, H., & Tipei, S. (1998). Manifold Compositions, Music Visualization, and Scienctific Sonification in an Immersive Virtual-Reality Environment. *Proceedings of the International Computer Music Conference '98.* Ann Arbor, Michigan, pp. 399-405.

Kaper, H., Tipei, S., & Wiebel, E. (1999). Data sonification and sound visualization. *Computing in Science and Engineering*, 1(4), 48-58.
Krause, B. (1987). The niche hypothesis: How animals taught us to dance and sing. Retrieved from http://www.wildsanctuary.com on November 29, 2007.
Krause, B. (1998). *Into a wild sanctuary.* Berkeley, CA: HeydayBooks.
Krause, B. (2002). *Wild soundscapes: Discovering the voice of the natural world.* Berkeley, CA: Wilderness Press.
Lenhoff, H., Wang, P., Greenberg, F., & Bellugi, U. (1997). Williams syndrome and the brain. *Scientific American*, 277(6), 68-73.
Levitin, D., & U. Bellugi. (1998). Musical abilities in individuals with Williams Syndrome. *Music Perception,* 15(4), 357-389.
Lydon, J. (2002). Afghanistan Musicians. All Things Considered (January 15, 2002). Retrieved from http://www.npr.org/templates/story/story.php?storyId=1136411 on November 29, 2007.
National Optical Astronomy Observatories. Retrieved from http://www.noao.eduJeducation/ighelio/solar_music.html on April 22, 2007. Nichols, B. (2006). Consumer spending on performing arts. Retrieved from http://www.nea.gov/research/Notes/91.pdf on November 29, 2007.
Ohno, S. (1993). A song in praise of peptide palindromes. *Leukemia* 7 (Supplement 2, August 1993): S157-9.
Ohno, S., & Ohno, M. (1986). The all prevasive principle of repetitious recurrence governs not only coding sequence construction but also human endeavor in musical composition. *Immunogenetics*, *14*, 71-78.
Parsons, L., Hodges, D., & Fox, P. (1998). Neural basis of the comprehension of musical harmony, melody, and rhythm. Abstracts for Society for Neuroscience Annual Meeting. *Journal of Cognitive Neuroscience.*
Parsons, L., Sergent, J., Hodges, D., & Fox, P. (2005). The brain basis of piano performance. *Neuropsychologia*, *43(2),* 199-215.
Payne, R. (1995). *Among Whales.* New York: Charles Scribner's Sons.
Phillips, T. (2005). Guitars and Rockets: Surprising Similarity Between. *Science Tuesday*. (November 8, 2005). Retrieved from http://Science.NASA.gov on November 29, 2007. Pratt, R., & Spintge, R. (Eds.). (1995). *MusicMedicine,* 2. St. Louis: MMB.
Romanowski, P. (Ed.). (2001). *Rolling Stone Encyclopedia of Rock & Roll,* 3rd ed. New York: Fireside Books.
Sagan, C. (1978). *Murmers of earth: The Voyager interstellar record.* New York: Random House.
Society for Ethnomusicology. (2007). Position Statement on Torture. Retrieved from http://webdb.iu.edu/sem/scripts/aboutus/aboutsem/positionstatements/position_statement torture.cfm on November 27, 2007.
Sounds of Learning. (2007). Status Report of Sounds of Learning. Retrieved from http://www.uncg.edu/mus/soundsofleaming.html on November 28, 2007.
Spintge, R., & Droh, R. (eds.). (1992a). *MusicMedicine,* 345-349. St. Louis: MMB.
Spintge, R., & Droh, R. (1992b). The International Society for Music in Medicine [ISMM] and the Definition of Musicmedicine and Music Therapy. In R. Spintge & R. Droh (Eds.). *MusicMedicine*, 3-5. St. Louis: MMB.
Takahashi, R., & Miller, J. (2007). Conversion of amino-acid sequence in proteins to classical music: Search for auditory patterns. *Genome Biology*, *8(5),* 405.
Thaut, M., McIntosh, G., Rice, R. , Rathbun, J., & Brault, J. (1996). Rhythmic auditory stimulation in gait training for Parkinson's disease patients. *Movement Disorders, 11(2),* 193-200.
Thaut, M., Rice, R., & McIntosh, G. (1997). Rhythmic facilitation of gait training in hemiparetic stroke rehabilitation. *Journal of Neurological Science*, *151,* 207-215.
Voyager. Space Missions. Retrieved from http://voyager.jpl.nasa.gov/spacecraft on April 23, 2007.
Walter, J., Mace, S., & Phillips, S. (in press). Preventing hearing loss in university schools of music. *Proceedings of the 82nd Annual Meeting, 2006.* Reston, VA: National Association of Schools of Music.
Wild Music. (2007). Retrieved from http://www.wildmusic.org on November 29, 2007. Williamson, J., & Cloonan, M. (2007). Rethinking the music industry. *Popular Music*, *26(2),* 305-322.
Wong, M. (2007). The Apple way. The Associated Press. *Greensboro News & Record,* November 27, 2007.

Zatorre, R., & Peretz, I. (Eds.). (2001). *The biological foundations of music. Annals of the New York Academy of Sciences*, Vol. 930.