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“FROM CACOPHONY TO SYMPHONY -- Holistic listening and how engendering a musical sensibility to the soundscape might help to heal the environment, and enrich our culture.”

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FROM CACOPHONY TO SYMPHONY

Holistic listening and how engendering a musical sensibility to the soundscape might help to heal the environment, and enrich our culture.

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Introduction

In the course of researching this paper, I've discovered that despite the schism that intellectually and artificially separates human kind from the environment on which we depend, *listening* to the environment has never been a lost art (though it has sometimes been in disfavour). Musicians, philosophers and scientists with a musical bent are invariably in the forefront of those paying attention to the sounds, and possibly the messages emanating from the natural world.

Music may be the avenue that will enable us to communicate with and comprehend the environment we come from and live in. Humans have differentiated themselves from the animal world with the evolution of symbolic language. However unique the lexical component of human language, it also contains many essential musical components that increase the richness of its information content. This musical, supra-lexis meaning is conveyed in the form of speech prosody. By exploiting pitch, rhythm, cadence and phrasing to convey emotional and perhaps symbolic content, human linguistic communication preserves the musical roots of language and keeps alive an ancient connection to other forms of non-linguistic, musical communication common to primates, birds, cetaceans and perhaps millions of other species.

Recent advances in audio technology increase our ability to perceive greater pitch range, recognize patterns and gather audio underwater. Still other audio processing techniques enhance our ability to perceive auditory information. As a benefit of these advances, we are beginning to move beyond the limited idea that the *meaning* of non-human species' vocalizations are restricted merely to survival messages like "get out of my territory" or "come mate with me". Indeed, we are becoming aware of modes of intra-species aural communication we did not previously know existed. This paradigm shift in animal behaviour studies enabled by the advent of electronic tools, has allowed us to see that non-human species communicate with syllables, phrases, ultrasonic and infrasonic components, and that, like us, these modes of communication are *learned* and *improvised* upon and have their own evolving, regional culture very much like *our* language and like *our* music.

1) Electroacoustic Music, Traditional Music and Soundscape

Since 1948, the year that Pierre Schaeffer first introduced the idea that recorded sound can be used as musical material, composers have used supra-musical sound to create compositions that challenge the traditional separation between the organized soundfield of the musical experience and the supposedly chaotic soundfield of all sound which is supra-musical. John Cage in the United States and R. Murray Schaefer in Canada were among the many composers who shared Pierre Schaeffer's inspiration to hear all sounds as having musical potential; that sound is organized into music by the listener, and that the job of the composer is to present the materials in a context that encourages the listener's brain to create symphony out of cacophony.

Electroacoustic composers are fundamentally different than tonal composers. The act of using extra-musical material to compose brings the sound artist and electroacoustic composer into a more intimate relationship with sound and soundscape. Selecting recorded sounds and incorporating them into compositions–"instrumentation" in the context of electroacoustic music–forces the composer to focus on the micro level: the timbral quality of a sound, its noise content and the envelope within which the sound evolves and is completed. Electroacoustic composers must also pay attention to the macro level: the context within which individual sounds exist. One example of this would be the way in which an electroacoustic composer might listen to the complexity of interactions between discreet sounds in a recording of a soundscape in order to asses its *musical* merit.

However, electroacoustic music does share some important similarities with "traditional" music in the way that it is structured, its attention to phrase, gesture, pitch, rhythm and even meter. It could be argued that structure in electroacoustic music is the element closest to "traditional composition." Though electroacoustic composition is sometimes described as a form of music focusing on those aspects of 'sound art' that do not have pitch and meter at their core, I think that the way in which we listen to electroacoustic music, traditional music and our environment is entirely dependant upon pitch and rhythm and to a certain extent, meter. Rhythm and pitch are the two focuses of reference with which our brains parse the audible spectrum. The cues provided by rhythm and pitch, allow human beings to determine the spatial relationship between sound sources and their location in 3dimensional space. Our brains have evolved to search for the connections between sounds: their similarities and differences. In the proper context, "non-musical" or supra-musical sounds become compositional because our brains are geared to seek out the musical content, to find the patterns and the phrase, even the narrative arc. We naturally distinguish high pitches from low pitches; our brains are constantly measuring sound against the passing of time, we listen for the beginning of a phrase and its completion. In essence, we are listening for the pattern in the soundfield and we recognize the small iterative repetitions as pulse or rhythm. We are also listening for the phrase, the broader overlay of periodicity on the underlying, smaller subdivision of time, and recognizing it as meter.

The soundfield also contains for us a rich sequence of interconnections between unrelated sounds. The difference between recognizing pattern in a soundfield previously conceived of as chaotic, lies in the *scale* at which the musical elements: pitch,

rhythm and meter are analyzed by the listener or utilized by the composer. All of these elements are present for the composer and the listener when working with sonic materials that lie within the range of human hearing and time perception.

2) Soundscape as Music

Electroacoustic music practice in particular serves to increase the interest that people have in paying attention to supra-musical sounds as musical material or at least as sound events that can be as interesting as a composed melody or structured rhythm. By separating out elements, layering recordings of soundscapes, altering recorded sounds etc. in the act of composing, electroacoustic composers are treating the soundscape as a more traditional composer would treat musical elements (rhythmic and melodic motifs, harmonic elements etc.) in the process of composing a work for musical instruments. Correspondingly, the listening ability and pattern perception ability of the general public is increased with exposure to supra-musical sounds once they are re-contextualized as music. In this way, the use of recorded supra-musical sound in musical composition blurs the distinction between the musical experience and the experience of listening to all sounds as though they were music.

Supra-musical sound has insinuated itself into music long before Pierre Schaeffer's "Étude de Chemins de Fer." Prior to the 20th century, Clément Jannequin used birdsong as a compositional tool, and many forms of traditional music the world over employ sounds taken from nature and recreated vocally or implied instrumentally. Yet the advent of recording technology has radically changed the way we access elements of the natural soundscape for compositional purposes. The *reproducibility* of sound has forever altered the way we learn music and the way that we hear the world. It has globalized once local musical practices and has made exotic sounds accessible. Recorded sound has also changed the way we perceive sound and music and has narrowed the gap between information gathering for scientific purposes and the gathering of sonic materials for artistic purposes.

Since the World Soundscape Project was begun in the early 1970s by R. Murray Schafer, Barry Truax, Hildegard Westerkamp and others, interest in categorizing sound with the goal of having a firmer understanding of sound and its effect on us and the environment has expanded exponentially. The intersections between making sound art and the scientific study of sound have increased. As any casual listener to non-commercial radio broadcast can attest, there has been a corollary rise in the popularity of soundscape recordings used as a way of preserving historical data on particular sound environments, as well as the use of soundscape recordings for entertainment. Soundscape recordings available on CD range from the artistic (Stephen Feld, "in the Time Of the Bells[1]) to the shlocky (*Relaxing Sounds of Nature* CD series[2]).

Music listening in the post-John Cage and R Murray Schafer era is inclusive of the concept that all sounds are admissible as musical material. In fact, despite the convenience of the terms musical and supra-musical, the distinction implied is increasingly irrelevant. In short, the ability to record and manipulate traditionally "non musical" sound has brought composers and listeners closer to an appreciation of the inherent musicality of those sounds.

3) Holisitic Listening and how the practice of electroacoustic music allows us to rediscover our inner Neanderthal

As our culture stretches to listen beyond music for the *musical qualities of all sounds*, we are increasingly required to draw on that part of our evolution that benefited from holistic listening. Listening to the soundfield as it is presented and not only selecting out what we recognize, but listening to the totality and the connections within that totality. The search for coherency in all that is presented to the modern human ear has evolved from the listening abilities of our hunter-gatherer ancestors. Their ability to cognitively parse the soundfield for threat or the promise of food is the same ability that we now use to listen to and analyze music. We aurally dissect the musical sound field–separating foreground from background, theme from variation–in a search for musical coherency; the same way our ancestors searched for information that would aid their survival. In this way, musical practice has–to paraphrase composer David Dunn–'acted as a cultural storage cell for latent listening abilities common to our hunter-gatherer ancestors.'

Though we absorb a great deal of emotional information from music, we tend to rely on speech for attaining factual knowledge. Consequently, we devalue music and musical sound as a source of information. In effect, our reliance on the symbolic information contained in human speech has negatively affected our abilities to perceive meaning in non-lexical forms of communication such as animal communication. Dunn puts it this way:

> "Because spoken language is the unique adaptation that humans have as a way to intelligence, humans tend to use it as the arbiter when studying the natural world. We misconstrue the absence of spoken language as an indication of the absence of intelligence and tend to think of human language as a measure for intelligence itself in the biological world." [3]

It is this solipsistic reasoning that interferes with our ability to comprehend animal communication and our ability to remember that we are intrinsically connected to the natural world. In other words, human speech itself interferes with our ability to listen to and communicate with the animal world. Despite this evident disconnection, *musical meaning* finds its way into spoken

[1] Stephen Feld, *The Time of Bells 1-4*, (VoxLox, 2004 -)

[2] Various artists, *Relaxing Sounds of Nature* accessed December 15, 2008 at http://www.hypnosishealthcare.com/naturesounds.html

[3] David Dunn: From a conversation with Paul Scriver, (November 7, 2006).

language.

4) Speech Prosidy: the music behind the message; infant directed speech

It is no great secret to any socialized human being that the words one chooses to communicate are of equal importance to *how* that communication is expressed. Neurologists generally agree that the mechanisms for processing language and those for processing music in the human brain are closely allied. In cases where a person is extremely amusic, he or she is likely to be able to comprehend human speech, but may not be able to grasp the prosody of speech and thus the supra-lexis emotional content. Our ability to interpret emotion and mood implied by music-like vocal inflection–slight variations in pitch contour, and dynamic content–inform us about the emotional state of the speaker and determine our manner of responding. Listening musically helps us to coexist with people in our social environment.

This supra-lexis musical vocabulary–intrinsic to speech–is coded into the sound design for toys, computers, automobiles, and countless other tools as a way of anthropomorphizing them. This aural reflection of an essential human quality, designed into our everyday tools and toys is a sure indicator of the essential role of speech prosody to understanding.

The musical vocabulary that imbues sound with meaning is instilled into the human psyche early in life. Adults and children use a form of communication when talking to infants, elderly people, and pets called "Infant Directed Speech." ID speech (for short), is a more musical form of communication that favors exaggerated pitch content over discursive sentences, and is spoken at a slower rate, with greater prosody and a higher tone than Adult Directed Speech (AD speech). In their paper *Singing, Socializing and the Music Effect,* researchers Meredith J. West, Andrew P. King, and Michael H. Goldstein enumerate the ways in which ID speech conveys meaning via musical content:

> "Across languages and cultures, the pitch contours of ID speech convey similar messages to infants. Prohibition such as "don't do that," is signaled by abrupt rising or falling pitch. Soothing an infant is accomplished through the use of lower, slowly falling pitch contours. Lullabies contain similar acoustic characteristics. In play with babies, we use phrases containing high, exaggerated pitch modulation to get infants' attention and to label objects. The consistency with which we adjust our pitch to match a message allows pre-linguistic infants to learn that all the noise coming from adults' mouths has functional consequences–that certain kinds of sounds predict particular emotions and actions on the part of adults.[4]"

This symbiotic relationship between speech and music has been explored in depth by UC San Diego psychology and music researcher Diana Deutsch. Deutsch has discovered that infants whose mother tongue is a tonal language that relies on pitch to distinguish one synonym from another (i.e. Asian languages like Mandarin or Vietnamese) have a greater chance of developing absolute pitch. Her research shows that speech acquisition in the infant, when combined with repeated pitch information tied directly to particular words, results in an associative link between the specific pitch of certain words and their meaning and that the adult speaker will retain word associated pitch specificity for life.[5] Deutsch's research contributes to the increasingly plausible idea that absolute pitch is more often the norm in newborns but that the ability in newborns acquiring non-tonal language is suppressed as the brain acquires the means to recognize homogeneity between spoken words intoned at various pitches. Tonal languages, on the other hand, use variations in pitch inflection to impart different meaning to homonyms, thus dispensing with the need for the pre-linguistic newborns to suppress pitch information that might occlude their understanding of syntax and symbolism. In essence, the acquisition of a non-tonal language in infants leads to a diminution of absolute pitch. The symbolic and syntactical basis of modern language necessitates that pitch distinction be diminished as an adaptive sacrifice that allows for a larger portion of the brain to be given over to the recognition of non-tonal speech. The implicit importance of this discovery is that perhaps pitch may play an important rôle in imbuing musical information with lexical *meaning.*

5) Speech and the evolutionary basis for the music connection

The linguistic capabilities of the human brain may have developed in tandem with the brain's affinity to music. Some linguists like Steven Mithin, (author of "*The Singing Neanderthals"*) propose that these abilities are interdependent, indeed that prior to the evolution of syntactically based language as we know it, there existed a combined mimetic-musical language that contained no individual words but was a sort of singing language that relied, in part, on gesture and absolute pitch to convey meaning. He calls this hypothetical language "Hmmm" for Holistic-mimetic-musical-multimodal. Mithin's work is, in part, based on the work of linguist Allison Wray. Wray's theory of *Holistic Language* proposes that proto-language may have been more musical–that prosody played a central role in communication and that only eventually did phonocoding (as explained by Marler (2001)[6] is–in the context of bird song–the ability to "create new sound patterns by recombination simply to generate

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[4] Meredith J. West, Andrew P. King, and Michael H. Goldstein, *Singing, Socializing, and the Music Effect*, 11,12, article retrieved from the webpage: http://musicandnature.publicradio.org/interviews/#west , (accessed March, 27, 2007).

[5] Diana Deutsch, "The Puzzle of Absolute Pitch", Current Directions in Psychological Science, Volume 11, Number 6, December 2002: 202, 203.

[6] Peter Marler, ed. Nils L. Wallin, Björn Merker, Steven Brown *Origins of Music and Speech: Insights from Animals* from *The Origins of Music,* (Cambridge, Massachusetts, MIT Press. 2001) 38-44

signal diversity" as a means to vary innate songs) begin to give way to segmentation, eventually resulting in symbolic language – the segments becoming words.[7]

Understanding the roots of human linguistic ability has been aided in recent years by a dramatic increase in research into animal communication, with the result that the widely held belief that animal vocalizations were no more than an auditory extension of their facial expressions–the so called GOP–"growns of pain" (Donald Griffith 1992) idea–has given way to more nuanced understanding. It is now widely observed that mammals and birds exploit phonocoding. (Marler tables) The verdict is still out as to whether non-human species communication employs lexicoding[8]. Though Mithin's theory that music and language co-evolved is an interesting one, it is so far, difficult to prove. It his however increasingly evident that musical improvisation is an ability shared between human and non-human species[9]. In fact, animal behaviour and linguistic research has begun to show that there are greater similarities between human and animal communication abilities than previously believed. Cross-species similarities in communication lie within the sphere of music making, not in syntax based language. So it is not surprising then that music makers themselves (myself included) should begin to exploit some of the evidence that the scientific community have embraced as inspiration for creating more artistic pieces…

The broadening of the scientific understanding of animal communication behaviour has been aided by improvements to audio recording and analyzing techniques. The microphone and the sonogram have been indispensible to the work of field biologists like Marler. Yet it is only very recently that scientists discovered that their very close research ally, the laboratory mouse, can sing! Because male mice sing at pitches in the ultrasonic range, many octaves above the hearing of humans, scientists have remained unaware of this fact until now–many, many decades along in the symbiotic relationship between scientist and mouse. The work of researchers Tim Holy and Zohngsheng Guo was enabled by advances in audio technology (fueled in no small part by market forces created by audio enthusiasts and musicians) that enabled them to first perceive the presence of ultrasonic mouse vocalizations and secondly to alter the time scale that the audio recordings of those vocalizations existed in so that it could be analyzed on a scale more familiar to humans. Holly and Guo were able to record frequencies in the ultrasonic range centering around 32 kilohertz, then, using a phase vocoder algorithm, transpose the mouse song downwards by 6 octaves while retaining the original temporal span of the song. An understanding of a phenomena like the one discovered by Holy and Guo is achieved by the ability to alter the scale at which these phenomena occur into a scale that is perceptible to humans. In this case, an understanding that male mice sing under certain conditions and that this singing is remarkably similar to bird song–albeit it in a frequency that is inaudible to humans–would have been impossible without the aid of current audio technology and processing techniques. One could say that the emergent technology allows for the ability to hear and to understand previously hidden natural phenomena.

For the Scientist and composer who studies the auditory world of non-human species, there is a great deal of acoustic information–critical to the existence of many of those species–that exists in frequency and time ranges well outside of the bounds of human hearing and pattern perception. While it is now known that elephants, bats and dolphins use infrasonic and ultrasonic frequencies to communicate and navigate, prior to the invention of the microphone, recording devices and analyzing tools, human beings could only wonder at how these species could function. Without the means to eavesdrop on their extraordinary vocal abilities, we naturally assumed them to be dumb. While technological developments have in effect opened the human ear to a world of sound hitherto inaccessible, artistic practice which employs these technological innovations has expanded the human ability not only to *perceive* that which was previously inaudible but has also allowed us to *conceive* a rich cognitive, social and conscious universe of animal existence previously beyond our own human sphere of understanding.

6) Conclusion

The lineage of composers who have acquired musical materials from nature is a long one. The earliest composers are pre-historic. If modern accounts of hunter-gatherer tribes are any indication, it is quite likely that our hunter-gatherer ancestors relied on our extraordinarily versatile larynx to imitate birdcalls and animal vocalizations for aural camouflage and to attract game. Further, it is interesting to consider the possibility that through these essentially musical activities, active listening, interpretation, and imitation, our ancestors evolved human communication out of a skill set that is essentially a musical one.

Similar to the way in which the ability to understand non-tonal language (homonyms) has resulted in the suppression of absolute pitch, our ability to understand the natural world has been upstaged by the more species-centric development of symbolic language. Through an application of musical listening skills, perhaps we can overcome this evolved deficiency in understanding and sew together the unconnected elements of the apparently chaotic soundfield into a coherent musical message.

It is possible that the avenue back to an enlightened awareness of our interconnectedness is realizing that we may not share lexical, symbolic language with other species, but we do share music, and that musical communication–listening and interacting–will bring us closer to a very dearly needed reconciliation with the natural world. The first step in understanding what the world is saying to us is in accepting that we are surrounded by musical messages and that to understand these messages we have accept the musical heritage we share with all beings. To borrow an idea from R. Murray Schaeffer, so long as we tune our ears, perhaps we'll be able to tune ourselves to the world.

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[7] Steven Mithen, *The Singing Neanderthals*, (Cambridge, Massachusetts, Harvard University Press, 2006), 3-5.

[8] Marler, Peter, 32-42

[9] This is obvious of course, human beings have recognized the musical qualities of animal vocalizations for eons. The question is, how does music function as a social mechanism and as a vehicle for conveying information.