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Media Studies: IDEAS
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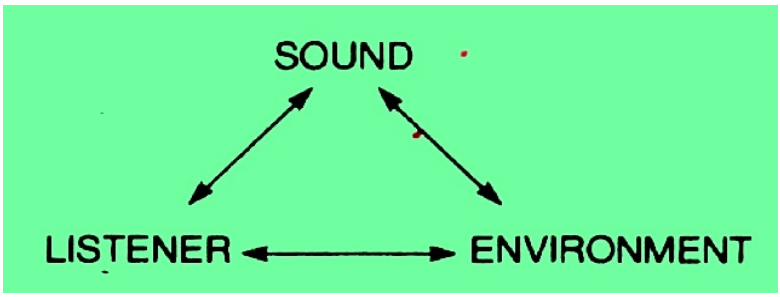
The Abduction of Meaning:
using sound to explain and alter the phenomenal world

We approach the multi-faceted concept that Charles Peirce termed 'abduction' first through Gregory Bateson's interpretation: seeking insight through analogies, and seeing patterns of relationship. That is, to combine the thread of one set of observations with another data set we infer a conclusion. Belief revision, in philosophy and in artificial intelligence, is the process of updating and adapting beliefs and theories in view of new information, and is often the result of the abduction principle. "Artwork prompts the viewer to perform an abduction that imbues the artwork with intentionality" according to Alfred Gell (1984) . "The abductive inference converts what may be a surprising fact into something plausible upon considering it hypothetically as the result of applying a certain rule to a concrete case." (W. Casta-ares, 1994) Our main concern in this paper is that "**It is abduction which introduces innovation, which starting from facts, broadens our knowledge by means of explanatory theories."** (Nubiola, 1997). Of its creative nature, "abduction concedes to the subject a maximum of freedom to explain the inexplicable credibly". (Nubiola)

All of these scholarly references serve as an introduction to some ideas that may at first sound unlikely, but when viewed as a logical platform of expression, one can begin to accept both as science and as art:

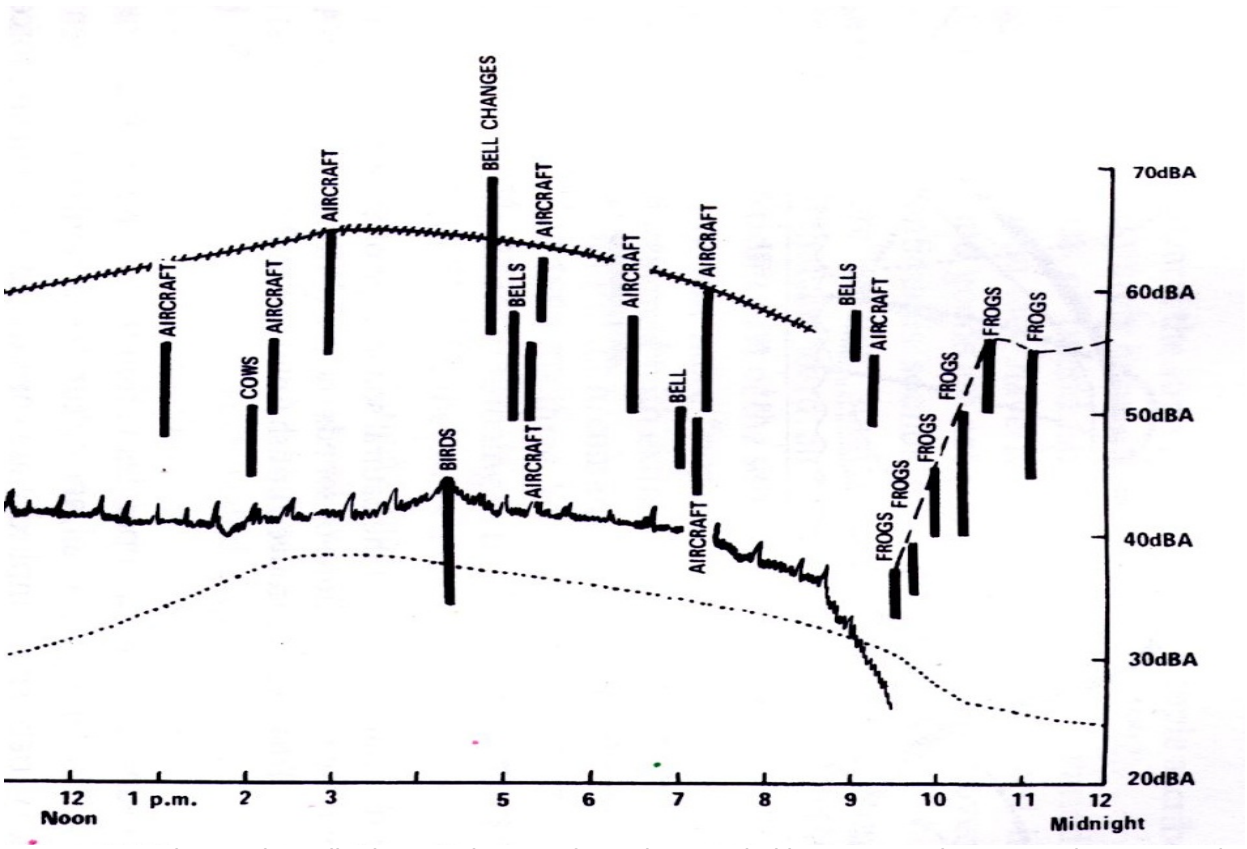
> *Listening to the sun, Playing the weather, Disrupting viruses and bacteria with sound waves, Converting amino acid proteins into musical sequences, Interspecies communication through playback of their own songs, Data streams of continual lightning strikes as a musical determinant.*

It is probably due in large part to R. Murray Schafer 's breakthough study "The Tuning of the World" (Schafer, 1977) that the concept of Acoustic Ecology was born. Not that such a thing didn't exist before! (that's like saying Henry Hudson discovered the Hudson River - actually it was already there, existing in it's own "*dialectical nunc*".) [Groethuysen, Bogue p.137]



The mediating relationship of listener to environment through sound. (Truax, p12)

What did the city sound like 100 years ago? or 300, or 500? Because of technology and human intervention, we have radically altered the soundscape. No more clacking horses hooves on brick, now it's the super heavy bass in surround-sound car radios. Not street vendors hawking their wares, but people talking out loud to no-one on invisible phones. Although it's too far a stretch in terms of life and death issues to equate the two, Shafer's book did for the Soundscape what Rachel Carson's *Silent Spring* did for the Environment - **made us aware**. "*Today it must have top priority,"* Marshall McLuhan wrote in a short blurb for the book. Sonography, which is analogous to geography, is the notation that was developed to profile sound in the spacial environment.



Time and Amplitude Soundscape of a 12 hour period in BC, Canada (Truax, 2001)

At this point the ideas inherent in the practice of **Sonification** make alot of sense. One takes a stream of data and converts it, with consistency, and with some method of choice (timbre, tonality, orchestration) into sound. This could also be considered Music, if we allow Edgar Varese's definition: "music is organized sound". Whether music is a language, or a problem-solving methodology, or a therapy, or an art, is a moot point. One could even call it entertainment, which as Niklas Luhman so delightfully describes "has the function of destroying superfluous time in modern leisure culture." (Luhman, 2000).

In **Sonification**, or in other practices involving sound such as Sonar (echo-location) or Sonication (audible vibrations causing molecular change) it is "functionality, rather than simply aesthetic quality or the absence of annoyance," that "becomes the criterion for design". (Truax, p14).

A valuable study of solar winds was conducted recently at the University of Michigan, in which researchers needed an acoustic model, or musical representation, to hear information and detect patterns that their eyes might have missed. Instead of the numbers displayed graphically, the data was 'sonified'. One could hear the variations of intensity in charged particles and audibly monitor sunspots. This could be crucial because increased activity of electromagnetic waves could damage computers and other electronic communication. Composer Robert Alexander interpreted the data provided by researchers Jason Gilbert and Jim Raines. The speed and density data of solar wind was collected by NASA satellite (http://www.physorg.com/news186418364.html)

An early and well known use of Sonification was the 1970 record by composer Charles Dodge – *Earth's Magnetic Field*. The original liner notes state: "The solar wind may be viewed as pushing against Earth's magnetic field, in turn producing an equal but opposite push on the solar wind. . . any changes in [the solar wind] are quickly reflected at the Earth's surface as changes in the magnetic field". (New World Records, 1998).

Another group of scientists have also claimed "We have converted genome-encoded protein sequences into musical notes to reveal auditory patterns without compromising musicality. The conversion will help make genomic coding sequences more approachable for the general public, young children, and vision-impaired scientists." (Takahashi and Miller, 2007). The science involved in this is actually fascinating and for an artist, there couldn't be a more basic cellular means of self expression. The question is: does the body hear this, does the organism resonate (couple) with the information? Audio samples of their work are on this site: (http://genomebiology.com/2007/8/5/405)

"*Every abduction may be seen as a double or multiple description of some object or event or sequence*."- Gregory Bateson, Mind and Nature

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Andrea Polli is a digital media artist and a pioneer of weather **sonification**. She was Director of Integrated Media Arts at Hunter College/CUNY. Her work addresses issues related to science and technology in contemporary society. She is interested in global systems, the real time interconnectivity of these systems, and the effect of these systems on people and the environment. '*Atmospherics/Weather Works*' (2004) is a 16-channel **sonification** of two historic storms that passed through New York City in 1991. What she presented was not an audio recording of the storm, but rather the data feed of complex changing relationships between wind, temperature, humidity and pressure over time, that are taken and modeled, or simulated. Those numbers now become the basis for a musical or sonic realization. Listen to the piece here: http://artport.whitney.org/gatepages/may04.shtml. In another installation piece, a real time daily weather model, images and data from the North Pole are presented with a 4-channel sonification and visualization of the information. The project makes use of custom software she helped to develop. The data is not only affecting the pattern of sounds but the actual sounds themselves. Polli quotes Herbert Marcuse "the 'data' are reshaped and reordered in accordance with the demands of the art form."(the Aesthetic Dimension) and her work involves reshaping and reordering information using data sonification. (icad.org is the site for the international community of auditory display). Read full Interview on www.earroom.wordpress.com. Her work was featured at the Media Ecology Convention of 2010 at the University of Maine.

SONICATION is almost the opposite approach as **SONIFICATION.** In general it's the act of applying sound waves to agitate particles in a sample or to disrupt particles in a solution. In microbiology it's the process of dispersing or inactivating biological material (like viruses) by sound waves. A medical application of *Sonication* uses high frequency sound waves to disrupt biological membranes of bacteria. A teeth cleaning can be done this way, for example, or a bee's buzzing wings to release pollen from a flower. A **sonogram** is similarly projecting sound, but different in that it would be taking a picture with sound waves bouncing off the object (spatialization of ultrasound echo).

The most dangerous use of sound would be the Sonic Gun. "The weapon is called a long range acoustic device (LRAD), and consists of a powerful amplifier and signal generator connected to a parabolic reflector-speaker. It creates a super loud mind-numbing shriek and channels the sound along a very narrow beam. The operator wears ear protection, and stands behind the speaker. The idea is to begin by talking, a function this unit can perform over hundreds of metres. If that does not work, then the operator can ratchet up to the shrieking. Apparently the effect is stunning, and disabling, and can cause permanent hearing damage." (Mike McKenzie, http://seatalk.blogspot.com). It was used successfully against Somali pirates in 2005. And for the first time in public

[on the public] against protesters at the Pittsburg G20 conference in Sept 2009!

Now back to health issues: if you happen to be working on frozen brain tissue, "Proteins from frozen tissue samples need to be extracted efficiently and without degradation to make the best use of a limited resource and to ensure, as much as possible, that an accurate representation of the proteins in the living tissue is obtained. **Sonication** and ball mill grinding give considerably higher extraction yield than other means of tissue disintegration. The aerosol that forms during **sonication** results in a loss of about 7.5% of the material as well as constituting a potential infection hazard. Sonication is also difficult to perform without risk of contamination of the sample. Ball mill grinding can be performed in a sealed cryogenic tube, obviating all risk of losses, infection and contamination. We recommend ball mill grinding. Human tissue should be regarded as potentially contagious, and treated accordingly. (Protein Extraction From Frozen Brain Samples , Christer Ericsson and Monica Nistér, Karolinska Institutet, Stockholm, Sweden). http://www.biobanks.se/documents/Protein%20Extraction%2020030807.pdf One could also extract protein from plant leaf tissue by **sonication**. (http://www.biology-online.org)

Other studies and sound-art pieces dealing with the environment would include Annea Lockwood's "Sound Map of the Hudson River" which portrays the soundscape not of one place, but an Ecosystem, as the listener sonically moves along the length of the river. I happened to see the installation twice, in different locations, and it was the same recorded material, so I actually (and figuratively) stepped into the same river twice. David First in his "Krackpot" composition had a few musicians (including myself) perform while an internet feed from Alaska was sending his computer continually updated data on lightning strikes. These are called Schumann Resonances, which cause the earth to resonate as if it were a giant bell. Through use of the MAX/MSP software, he assigned sound processing to tones that were altered in real time by the data - until a Moose knocked over the array.

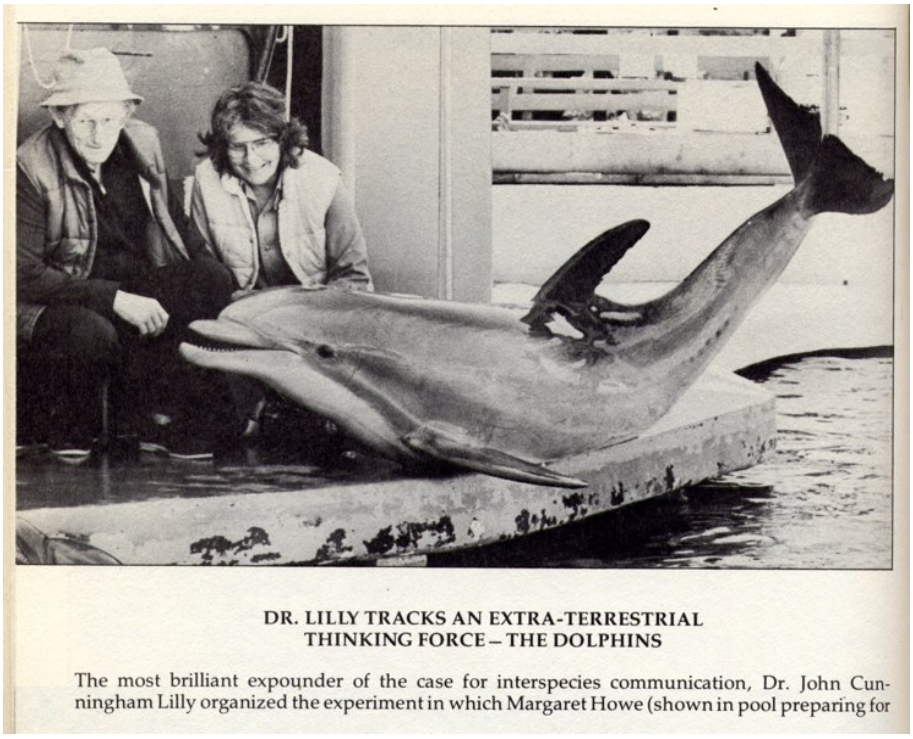
"**Playback** is the technique of rebroadcasting natural or synthetic signals to animals and observing their response . . . without the potential confounding effects of other activities of the signaller." (Peter K. McGregor, ed, 1992). An early study used a recorded fox puppy call which caused a male fox to bring food to an empty box. But it can also be useful in determining the size , distance, and movements of wolf packs in the wild, for instance. Humans can easily imitate some animal sounds, and without dragging sound equipment into the field, "wolf howling has been a popular feature in Algonquin Park [Ontario]". (Douglas Pimlott 1969). Animals have purpose in their calls, one of which is sometimes territorial. Interpreting the sounds and abducting the meaning, "animals can use

vocalizations to signal their fighting ability when the chance of escalating conflict is high, thus avoiding unnecessary fights between individuals that differ greatly in quality. The advantage to low quality individuals is that they would avoid injuries, and high quality individuals would avoid wasting time on a fight they would have won anyway." (McGregor)

But in a lethal use of sound along the Mediterranean migratory flyways in Cyprus, Italy and Malta, electronic recordings of birdsongs are used illegally to attract birds which are then killed in massive numbers for sport as well as food:

> "As it's waters are fished clean by trawlers with sonar and efficient nets, it's skies are vacuumed clean of migrants by the extremely effective technology of birdsong recording." (Johnathan Franzen)

And on the other side of the great divide:



DR. LILLY TRACKS AN EXTRA-TERRESTRIAL THINKING FORCE – THE DOLPHINS

The most brilliant expounder of the case for interspecies communication, Dr. John Cunningham Lilly organized the experiment in which Margaret Howe (shown in pool preparing for

Jim Nollman, while playing electric guitar and waterphone with Orcas, (Killer Whales) of Vancouver Island: "They taught *me* a song, and when I turned out to be a slow learner, from their standpoint, they worked with me until I knew what I was doing and could duplicate it" (Ted Crail, 1981). . . they'd come for rehearsal at the same time every night. "Part of performing the experiment successfully is recognizing that Orcas desire the contact."

The importance of this kind of learning and artful interaction is obvious. Bateson, who worked with Dr. John Lilly does not believe that dolphins have language for things or data, "but like ourselves and other mammals, they are preoccupied with the patterns of their relationships." (Bateson, 1966)

Finally, I'd like to address some issues in mythology which deal with sound, noise, and the environment. If we think that the 21st century is the loudest and noisiest ever, because of our technological advancement, think again. In the Epic of Gilgamesh from the 3rd millenium BC we read in the Sumerian account of the flood that:

In those days the world teemed, the people multiplied, the world bellowed like a wild bull, and the great god was aroused by the clamour. Enlil heard the clamour and he said to the gods in council, "The uproar of mankind is intolerable and sleep is no longer possible by reason of the babel." So the gods in their hearts were moved to let loose the deluge. (Truax, p93) .

Was the Biblical flood of Noah the same event? Was it also a punishment - just as the Sumerian gods tried to drown out the noise of mankind - or rather was it a cybernetic re-adjustment for the unseemly direction mankind was taking. Or maybe this deluge was the last major episode of global warming that ended the Ice Age. And myths had to be created to explain it. But that's *my* abduction.

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