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<u>Introduction</u>

From the second half of the twentieth century, the radical expansion of the musical palette and the 'conquest of acoustic space' (Bohme, 2000) by humanly produced sounds, have transformed radically our listening experiences both inside and outside concert halls. These changes encouraged an expanded imagination and sensitivity towards sounds, but at the same time introduced the danger of producing or passively accepting a highly saturated and confusing sonic environment, an environment, which could be harmful to humans and other living organisms. Driven from such aesthetic and ecological concerns, the Electroacoustic Music Research and Applications Laboratory of the Ionian University, under the leadership of Andreas Mniestris conducted in 2006-2007 a program named *Research and Analysis of Greek Soundscapes*. The aims of this program were:
1. The foundation of the first soundscape research group in Greece
2. The development of research methodologies towards the study of Greek soundscapes. *1st Phase: Study of Rural Area(s).*
3. The study of the spatio-temporal variation of soundscape in relation to the different sites within the area and to the daily and yearly time cycles.
4. The sampling and collection of various soundscapes from Greece (ultimately aiming to the formation of a sound map of Greece).
5. The creation of soundscape compositions.

One of the fruits of the Greek Soundscapes Program was the acquaintance of young children with their sonic environment and its better understanding. In such an acquaintance, sound was approached not only aesthetically, but also as a medium that would motivate children to explore their environment natural and cultural; a medium which could help them create or restore their relationship with the animate and inanimate objects of their world, by highlighting their unique and shared qualities.

In designing a program for the development of children's aural perception skills, so that they would become able to appreciate sounds, we turned a) to research in perceptual development (see James Gibson, Eleanor Gibson, Eric Clark) and b) to the music education approaches of the composers R.M. Schafer and Pierre Schaeffer.

The research review on perceptual development led to the formulation of the following Perceptual Objectives in the context of an Acoustic Ecology Class for young children.

<u>Perceptual Objectives of an Acoustic Ecology Education</u>

- *Perception of Distinctive Features in sounds or sound sources* (Clarke, 2005; Gibson 1966; E.J. Gibson, 1969)
- *Perception of Invariants in sounds or sound sources* (E.J. Gibson, 1969; Clarke, 2005)
- *Perception of Affordances in music* (sound or sound source properties, abilities and needs of the organism, social context (Clarke, 2005))
- *Increased Perceptual Specialization* (E. Gibson, J.J. Gibson, Pick & Osser, 1962)
- *Perception and Manipulation of Greater Structural Units* (E. Gibson, 1969; Clarke, 2005)
- *Development of Attitude for Exploratory Approach of the Environment* (Clarke, 2005)
- *Understanding the Relationship of Nature-Culture* (Clarke, 2005)

Having decided which aural perceptual skills young children should develop in order to be armed with what Ingold (2000) names an 'educated attention', we then turned for inspiration on "how to develop those skills", to the writings of Pierre Schaeffer and R.M. Schafer. After the second half of the 20th century, through the work of Pierre Schaeffer, the natural sound environment was introduced into the cultural sound-art production, expanding the conventional framework of perceiving musical form. While Pierre Schaeffer considered all kinds of environmental sounds as potential sources for 'musical objects' disregarding intentionally their original contexts (Schaeffer, 1966, 1967), R.M. Schafer developed a different approach towards environmental sound; also inclusive aesthetically, but at the same time critical in terms of the sounds' interactions and balances in their original contexts. From the above approaches soon emerged two distinct streams of sound composition, which in recent years have started becoming increasingly less rigid. In fact, today, there is a strong tendency of mixing the 'aural and mimetic' in electroacoustic compositions, and according to Emmerson (2007), "the two worlds not only sit happily side by side but can strongly reinforce [each other]." (p.15).

R. M. Schafer's and P. Schaeffer's often seemingly contrasting approaches were also found to be complementary in several issues related to their educational applications. For example, concerning the importance assigned to the sound source, in the present Acoustic Ecology Program, children were encouraged to approach sound mainly a) as a medium

which highlights the source and increases its appreciation (see Schafer), but also at times b) as a 'sound object' (see Schaeffer), a sensorial stimulus with no referential connection to its source or context, or more often, a sensorial stimulus with a momentary suspension of its referential meanings.

Pierre Schaeffer himself appeared to encourage listening flexibility. His four ways of listening 'ouir', 'entendre', 'écouter', 'comprendre' offer the listener different perspectives with which to tackle sound. Especially when interpreted rather dynamically (i.e. K4 Graph as proposed by Andea Valle (2008)), these ways of listening could be accessed in children individually or sequentially, in response to appropriate questions or sound games. In the present Acoustic Ecology Program, such exercises appeared to encourage children's development of perceptual flexibility, a skill necessary in both music and everyday listening. The perceptual flexibility was also reinforced--at a different, cross-modality level--through certain of R.M. Schafer's (1986) sound games in which listening was alternated with other sensory systems and their related art modalities. (i.e. singing, to dancing, to drawing).

Schaeffer's (1966) seven sound criteria: *mass, harmonic timbre, grain, 'allure', dynamic, melodic profile, and mass profile,* appeared very useful for the development of children's sound perception, and one of the aims of this project has been to invent and test the appropriate terminology and sound games in order to make the underlined concepts accessible to young children. Furthermore, children have been encouraged to use this terminology (currently under development) in describing sounds, hypothesizing that this analytical approach would foster perceptual refinement. It should be noted that Schaeffer's criteria were applied loosely, by intuitively focusing in short segments of sounds, which were usually presented initially in their original context. If P. Schaeffer's Criteria were functioning as a 'listening zoom lens', in the AcouEco class activities, R.M. Schafer's Sound Dimensions: (Timbre, Amplitude, Melody, Texture, Rhythm) (see *Ear Cleaning*, Schafer, 1967) and his Soundscape concepts (Sound Event, Sound Mark, HiFi/LowFi, Silence, Noise, Sound Pollution) were functioning rather as a 'regular acoustic lens' in listening exercises, encouraging perceptual refinement at a more macroscopic level.

Description of the AcouEco Education Program (Work in Progress)

The pilot application of the proposed program began about two years ago with a class of 7 year-old students at a village school in Corfu Greece. It is a work in progress, as it is being developed and adjusted constantly. We plan to continue its pilot application until this group of children graduates from primary school, which would mean that their exposure to the program would hopefully be at least 4 years. In a subsequent phase, the Program would be applied experimentally to a reasonable sample of both rural and urban schools in Greece.

The class has been meeting one time a week (45 minutes) and it is called 'acoustic ecology' class. For the time being, the children seem to perceive it rather as a 'music games' class. They are a very 'lively' group of 8 year olds who easily move from sound experimentation with voice or instruments to 'chaos'. Therefore, the first and ongoing challenge has been to create types of activities-games, which would allow for sound expression within some structural limits. A very helping hand in molding these structures was provided by music (song), narrative (text) and games. In the following section some examples of the AcouEco class activities are presented:

MUSICAL STRUCTURE AS CONTEXT FOR PERCEPTUAL LEARNING

Passing an instrument around the room, and simultaneous class singing of a short phrase.

While performing their improvised solos, students in turn explored the affordances of a particular musical instrument and tried to find new ways of playing it, before passing it to another student. The length of improvised solos was controlled by a short song, sung by the whole class as background accompaniment to the solos. Therefore, when the song phrase ended, the instrument had to be passed to a new student for his/her solo. During this activity, a sample of the instrument's sound was often recorded and its characteristics (in terms of Schaeffer's criteria) were discussed. At times, students also discussed what the sounds of the particular instrument reminded them of, such as places, events etc. (context, associations– see Schafer), or whether the sound of the instrument played by a student was covering the class singing, or was masked by it (sound pollution, hi-fi/low-fi – see Schafer)

Class singing alternated with 'counted' time frames for solos

A similar approach with the previous activity was applied. However, in this case the group song was not sung concurrently with the instrumental solo improvisations but was rather alternated with the solos, whose length was now determined by silent counting and gesturing from the whole class. As shown here, the above activities provided musical structures which depending on the time frames, the sounds chosen, and the questions asked could be used to direct attention to the sound and its perceptual characteristics (Schaeffer) or to its cause and context (Schafer).

NARRATIVE AS CONTEXT FOR PERCEPTUAL LEARNING

Listening to ' *Stories about Sounds'* and looking at respective spectrograms.

Given young children's difficulty in listening passively to isolated and unidentifiable sounds, Schaeffer's 'dissecting' approach led intuitively to a secondary contextualization. This was pursued by creating new imaginary contexts for sound objects through building 'stories about sounds' which were narrated by the teacher. The narration was interspersed by listening to a small number (2-3) of isolated sounds, as they appeared naturally in the plot. As part of the story, these sounds were some times manipulated and presented aurally and visually (with respective spectrograms) for comparison, or in some instances were even compared to sounds from outside the story. An example of such a story is: '*Mr. Schaeffer's magic envelope'*, in which the wise old composer who lives in 'acouland' helps a young shy flute to hide behind the piano during the beginning moments of her first recital. He does this, by asking the young flute to wear the piano's 'envelope', which he prepares in his laboratory just for her. A second example of this type of activity is provided by the story '*Singing winds against locusts'*, in which winds from different areas of the spectrum unite their forces to create a big mass that drives away the locusts before they destroy the crops in the island of Corfu.

Collective sentences: Who said that word?

From working with children in the AcouEco program, it appeared that not just stories, but sometimes even a sentence could provide structure for their high energy. A sentence-controlled activity will be given here as an example of directing children's attention to Schaeffer's criterion of harmonic timbre. In this game, as many children as the number of words in a sentence stood in line with backs to the class. They were given randomly the same sentence with a different word for every student highlighted. Each one had to utter his/her word at the right time so that the full intact sentence would be heard. The class audience listened without looking and tried to remember who said each word. Based on their collective memory, they then guided the speakers to form a new line according to the place of their words in the sentence. The initial utterance of the sentence was recorded and compared with its subsequent versions (as suggested by the class) to check aurally for mistakes. Students' attention was guided to the harmonic timbre of their classmates' voices, which helped them identify who said what without looking at them. Similar games could be played with sounds of animals, such as with the sounds of two dogs drinking water in succession, or with different instruments playing the same note. The spectrograms of the different sounds could be also compared.

GAMES AS CONTEXT FOR PERCEPTUAL LEARNING

The analytic approach to sound adopted by Schaeffer, was complemented in this program by Schafer's active sound exploration approach. Action is inextricably bound together with perception (Gibson, 1979). As humans become actively engaged with sound making in their environment, their aural perception becomes gradually refined. Schafer has developed a large number of sound games which encourage sound making with voice, body percussion, classroom instruments, or other sound making objects, very often in connection with body movement in space (Schafer, 1986, 1992). Many of these games have been introduced to children during this project and others, with a corresponding philosophy, have been developed and pilot tested.

At the beginning of this program's application, it was decided to use or devise simple computer games for student experimentation with basic sound editing at the school computer laboratory. However, this idea was later abandoned after critical consideration. It was deemed most important for young children to spend time exploring sounds in the social context of their class and with an approach that reinforced body movement in *analogy* to the qualities of sounds and not in isolation and within the limited space of a mouse pad. Their apparent psychological dependency with a popular computer game at the time, and on the other hand their constant demand for 'physical' games reinforced the decision to postpone for a quite later age or even perhaps abandon the idea of using the computer for individual sound games. This issue will be further considered and examined in the future.

Having described the most often used teaching structures, which facilitated perceptual learning in the AcouEco Program, we will now describe the major themes of the program with their related activities and/or games.

MAJOR THEMES OF THE ACOUECO PROGRAM

The Sounds of Animals in Life and Art

The majority of young children appear to have a general curiosity and often attraction with animals, real or imaginary. The sounds of animals were approached here as a vehicle a) for learning more about the animate world, human and non-human, and b) for understanding the relationships between its diverse manifestations. The strong emotions stirred by the sounds of humans and other animals in life and art, were used constructively as motivators for perceptual and conceptual learning and for the development of an ecological approach to the environment. Activities and games under this theme included:

- Listening to stories about animal sounds and then imitating these sounds in class compositions. (ex. 'The Cuckoo story')
- Listening to birdcalls or other animal calls and trying to identify their function (territorial, danger, call, song)
- Identifying animal sounds in compositions (different styles, cultures, mediums, including acoustic and electroacoustic music)
- Identifying the human voice in compositions (different styles, cultures, mediums, including acoustic and electroacoustic music)
- Listening, identifying and imitating body percussion of humans and other animals.

Sound and Silence

Silence is largely culturally defined, and it does not appear to be valued adequately in most western modern civilizations. In many instances, our greatly saturated soundscapes do not allow much space for focused listening, communication, and/or thinking (Reed, 2000). The appreciation of silence and its wise balance in relation to sound has been a skill and value of high importance in the present AcouEco Education Program. In order to assist children in the refinement of their perceptual skills of sound and silence, we used activities such as the following:

- Moving in silence: Game "MOVE CHAIRS" by R.M. Schafer (#72. (R.M. Schafer, (2005).
- Experimenting with different levels of sound-silence in the schoolyard using a sound-level meter.
- Measuring dB levels with a sound-level meter, constructing comparative tables of ambient noise levels at different locations and contexts, and discussing the differences.

The Ear and Listening

Sound perception is only possible if there is a working hearing mechanism. Familiarity with the human ear--its structure and operation--and understanding of the pathway of sound from source to the brain could enhance awareness of the hearing mechanism; especially of its sensitivity, complexity but also its vulnerability to disease and noise pollution. In the AcouEco Program, students were introduced to the human hearing mechanism and to the hearing mechanisms of other animals. Comparisons led to similarities and differences, which augmented the appreciation of special listening and related sound production skills of different animals. Activities under this theme included the following:

- Learning about Hearing and the Ear of Humans and other Animals. (video about the ear, enactment of the sound journey, puzzle of the ear, hearing loss explanation, hearing protection, comparison of human versus other animal hearing).
- Exploring Sound as Navigator (sound as information, sound mark, sound signal, sound pollution, hi-fi / low-fi)
- Sound Localization: Discovering the places of sound sources (i.e. different bird whistles in four corners of the classroom)
- Sound Localization in Electroacoustic Music Compositions.

Soundscapes in Life and Art

The concept of 'soundscape' from its original introduction by R.M. Schafer embraced both aesthetic and ecological perspectives. In the AcouEco Education Program, young children were encouraged to approach soundscape from both of these perspectives, acting in it as artists and also as ecologically informed scientists. Soundscape compositions such as the *'Beneath the Forest Floor'* by Hildegard Westerkamp (in Rothenberg, 1997) made the flow between the two perspectives natural and attractive to children. Activities related to this theme included:

- Making 'silence', writing down individually the sounds of the class soundscape and discussing them in class (see Cumberland, 2001).
- Making 'silence', writing down individually the sounds of the schoolyard and discussing them in class. (ibid)
- Making sounds from images on given cards (pictures from nature, art, everyday objects, environments).
- Listening to soundscape compositions and discussing aesthetic and contextual-ecological issues.

Conclusion

In an Acoustic Ecology Education Program for young children, electroacoustic music and especially its genre of soundscape composition could potentially find its creative niche. By forming links with body movement, stories, games, ecology and all possible subjects of the school curriculum and mainly by being a product of respect for the child's humanity and the environment as a whole, it could perhaps contribute positively in the bringing up of an educated audience for tomorrow's 'symphonies' -- inside and outside concert halls. Such an audience will have developed flexible aural perceptual lenses which could move swiftly and elegantly between Schaeffer's 'reduced listening' and Schafer's rather 'expanded listening' modes. Thus armed, would be able to explore optimally the affordances of his/her sonic environment. It could access, describe, evaluate, preserve and create real world and imaginary soundscapes, allowing for a dynamic dialogue between nature and culture, a dialogue which would enrich the aesthetic experiences but also the appreciation of the environment; a dialogue which will lead to the development of empathy for the natural world (Bevington, 2007).

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