Sound in Context: Acoustic Communication and Soundscape Research
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ABSTRACT

Research activities at Simon Fraser University over the past 25 years that bridge environmental acoustics and music are summarized, including soundscape studies, acoustic communication, soundscape composition, and the granulation of sampled sound. Gaps in traditional disciplinary approaches in dealing with environmental sound are identified, and an acoustic communicational model is proposed as an interdisciplinary alternative. Examples drawn from the author's compositions, and the work of R. Murray Schafer, Hildegard Westerkamp and the World Soundscape Project are discussed.

Introduction

A concern for environmental sound is the site where music and noise studies can potentially meet, yet the marriage seems to be an uneasy one, if only because loud music can be regarded as a noise source when it is unwanted in a community, and because contemporary music frequently uses sounds that seem "noisy" to many listeners. A more systemic problem is that a coherent knowledge base concerning environmental sound has not developed, at least not to the degree that it exists for music and speech. I am going to argue that environmental sound is problematic because it points to a blind spot in the dominant paradigm of nearly every discipline which touches on it, a few of which I propose to summarize here.

a) Western music theory, having followed composition in its path toward increasing abstraction and the primacy of pitch relationships, finds itself powerless to deal with the largely unpitched material of environmental sound. A concern for timbre might have developed, and indeed, in isolated instances has been proposed (Erickson, 1975; Wishart, 1985), but progress has been slow and generally relegated to the periphery of music theory. The lack of notation and the necessity to rely on aural judgement seem to present the most serious initial problems.

Moreover, musicologists themselves cannot agree on the role of timbre within a musical language. At one extreme, Jean-Jacques Nattiez (1992) claims that a "style or a new system [of musical language] cannot develop, transform itself and enjoy an organic life unless it possesses a syntax ... [and] objects defined uniquely by way of their timbral properties cannot give rise to a syntax." This position seems to correspond to the often heard conservative opinion that electroacoustic instruments shoul d take their rightful place as just another member of the orchestra, another source of timbral variety to support the instrumental music model. A more radical position is taken by John Shepherd (1987) who argues that timbrally based composition is less ab stract than pitch-time music and more situated within the world of lived experience. He remarks that "As the essence of individual sonic events, timbre speaks to the nexus of experience that ultimately constitutes us all as individuals. The texture, the grain, the tactile quality of sound brings the world into us and

reminds us of the social relatedness of humanity."

b) Psychoacoustics, having been dominated until recently by reductionistic, parameter-based models, has concentrated more on material from speech and music which are relatively well behaved, than on the more unruly sounds of nature. In tracing the evolution of the field, Stephen McAdams (1987) has suggested that the earlier emphasis by Gestalt theorists on the integrity of the whole is returning within contemporary models of perceptual organization such as cognitive approaches to audition (McAdam s & Bigand, 1993), auditory scene analysis (Bregman, 1990) and listening theory (Handel, 1989). However, as advanced as these models have become, they have been applied almost exclusively to speech and music, and one finds in these books only passing refe rences to listening within environmental contexts, an exception being the work of Ballas and Howard (1987) who suggest that top-down and bottom-up strategies similar to language processing may be involved.

c) Sound analysis and synthesis, following closely the models of acoustics and psychoacoustics, have relied on linear models, such as Fourier analysis, and the principle of independently controllable parameters. Reasonable simulations of speech a nd music have been achieved, but I have yet to hear a convincing synthesis of any environmental sound. Even though producing such sounds through resynthesis, based on analysis, may be possible using various models, researchers typically focus on speech and instrumental sounds as source material. I have suggested elsewhere (Truax, 1992a) that we may be on the cusp of a paradigm shift toward models that deal with the complexity of environmental sounds more effectively.

d) Audio artists of all persuasions often deal with environmental sound in a practical way, operating on a theoretical basis that extends from the sound effects of the foley artist, for which the sacred triumvirate of dialogue, music and effects circumscribes all possible approaches to film sound, to the acousmatic tradition of Pierre Schaeffer which starts, promisingly enough, with the complexities of real world or concrete sound, but quickly detaches such sound from its source as an object for perception. Both in theory and practice, this approach abstracts the sound from the real world and hence preserves the European paradigm of art as the highest abstraction from reality. Although the sound object recorded out of context eschews its natural origins, the implications of those origins return with the sound event recorded within an environmental context. Theorists typically analyze the semiotic attributes of such sounds, despite the fact that semiotics has been largely developed with visual and linguistic signs and arbitrarily applied to their aural equivalents (Metz, 1985). Radiophonic artists may be the closest in their direct involvement with and use of environmental sounds (Lander & Lexier, 1990), but with many such artists one senses the dominance of conceptual approaches, with little sophistication in the design and compositional treatment of the material.

e) Sociologists and communication experts similarly show a pronounced visual bias, or what might be called a "deaf spot" for sound, when they deal with perceptual matters at all, which they tend to do awkwardly, with little of the sensory refinement characteristic of the musician. Even communication theorists who deal with listening (Wolvin & Coakley, 1993) focus almost exclusively on speech and music. This is an unfortunate lacuna as knowledge about how sound acquires meaning and functions to create social and psychological order (Attali, 1985), not to mention the profound impact of electroacoustic technology to drastically alter that order, would be a significant contribution to a theory on which to base environmental music. (Note that even a l abel such as "environmental music" is obviously problematic in its possible confusion with Muzak, background or New Age music, music performed in various environments, eco-propaganda, and so on.)

f) Acoustical engineering and audiology are applied fields that deal largely with the trauma

produced by environmental sound, generally termed noise, and its physical and psychological damage. Given the rather large potential for consequences ran ging from health risks to social disruption and lawsuits, it is not surprising that a huge research literature has been created in these fields, not to mention the cadre of professionals who constitute what may be called the institutional response to thes e problems. Critics of the field argue that such institutions have a vested interest to "manage" the risk potential, not to eliminate it, and do so by maintaining the dominant paradigm (Hetu, 1994). More constructive approaches (e.g. hearing conservation, acoustic design) may be found but are hindered by the lack of consensus about positive criteria (as opposed to the absence of negative effects) except in narrowly defined situations.

Thus, when we look to the body of Western research that deals with environmental sound, we find the glaring absence of a coherent knowledge base; instead, there exist fragmentary, isolated pockets of expertise, conventionally based on simplistic models of energy or signal transfer with resultant "effects." The absence of cognitive approaches (to the level we have come to expect in music and speech) is disheartening, and a "complete" model of how sound functions within a complex system of psychological, s ocial and environmental relationships seems tentative and remote at best. Further on I will suggest how a communicational approach may circumvent many of these problems.

An interdisciplinary approach intended to integrate knowledge about sound has characterized the work at Simon Fraser University (SFU) in Canada over the past 25 years. It began with a study of environmental sound and all aspects of its behaviour and comm unicational roles apart from its potential musical value. In fact, the original aim of this work was largely educational and archival, motivated by a concern for the deteriorating state of the world soundscape. Admittedly the aural sensibilities of the or iginal participants, mainly composers, played an important role, and of course, musical compositions inevitably sprang from this work. However, the basic aim was not to further exploit the environment as a source of musical material, but rather to exploit the knowledge base of musical design in order to re-design the soundscape and to reawaken people's perceptual appreciation of its importance.

The contributions of three composers and their colleagues at SFU may be singled out, R. Murray Schafer, Hildegard Westerkamp and myself. Schafer founded the World Soundscape Project (WSP), supervised its activities and those that led up to it at SFU (196 5-1975), and through his publications, most notably The Tuning of the World (Schafer, 1977), established a largely descriptive basis for soundscape studies. Westerkamp was a member of the original WSP group and has perhaps the most consistently worked bot h educationally and compositionally with environmental sound, in all formats including concert, radio and live performance. Most recently she has been instrumental in helping found the World Forum for Acoustic Ecology (WFAE) that connects groups and individuals around the world who are concerned with the soundscape, principally via a newsletter which she edits. I joined the WSP in 1973 following postgraduate studies at the Institute of Sonology in Utrecht (where my work in computer music began), and besid es being responsible for the teaching and research program at SFU (1975-present), have published Acoustic Communication (Truax, 1984) which extends the theoretical and applied basis of soundscape studies within acoustic and electroacoustic contexts. Since 1987 my compositional work has been exclusively with digitally sampled environmental sound for which I have developed techniques for its granulation and processing (Truax, 1990a, 1994b). In the remainder of this article I intend to summarize some of the most salient features of this work as they pertain to the dilemma of the introduction of environmental sound into composition.

The WSP and the Soundscape Composition

The basic concept of the World Soundscape Project and its establishment by R. Murray

Schafer occurred at Simon Fraser University during the late 1960s and early 1970s, the details of which have been documented by Keiko Torigoe (1982). It grew out of Scha fer's initial attempt to draw attention to the sonic environment through a course in noise pollution, as well as from his personal distaste for the more raucous aspects of Vancouver's rapidly changing soundscape. This work resulted in two small educationa l booklets, The New Soundscape (Schafer, 1969) and The Book of Noise (Schafer, 1970), plus a compendium of Canadian noise bylaws (WSP, 1972). However, the negative approach that noise pollution inevitably fosters - always being against something - pointed to a lack of knowledge about what one wanted to achieve as a positive example. It also proved not to engender enthusiasm in students, but rather cynicism and a fatalistic attitude that nothing much could be done. A more positive approach had to be found, the first attempt being an extended essay by Schafer (1973) called "The Music of the Environment," in which he describes examples of acoustic design, good and bad, drawing largely on examples from literature.

Schafer's call for the establishment of the WSP was answered by a group of highly motivated young composers and students, and, supported by The Donner Canadian Foundation, the group embarked first on a detailed study of the immediate locale, published as The Vancouver Soundscape (WSP, 1978a), and then in 1973, on a cross-Canada recording tour by Bruce Davis and Peter Huse. In 1975, supported by another research grant, Schafer led a larger group on a European tour that included lectures and workshops in s everal major cities, and a research project that made detailed investigations of the soundscape of five villages, one in each of Sweden, Germany, Italy, France and Scotland. The tour completed the WSP's analogue tape library which includes more than 300 tapes recorded in Canada and Europe with a stereo Nagra, all of which have been catalogued, their subject matter classified, and many of the sounds analyzed according to spectrum and level. The work also produced two publications, a narrative account of th e trip called European Sound Diary and a detailed soundscape analysis called Five Village Soundscapes (WSP, 1977a, 1977b). Excerpts of the field recordings were prepared to accompany both documents, though only those for the latter were published. Schafer 's definitive soundscape text, The Tuning of the World (Schafer, 1977), and my reference work for acoustic and soundscape terminology, the Handbook for Acoustic Ecology (WSP, 1978b), completed the publication phase of the original project.

Although the principal work of the WSP was to document and archive soundscapes, to describe and analyze them, and to promote increased public awareness of environmental sound through listening and critical thinking, a parallel stream of compositional activity also emerged that created, perhaps less intentionally, what I have called the genre of the "soundscape composition" (Truax, 1984). Although in Emmerson's terminology (1986) the soundscape composition may be defined in terms of "mimetic discourse" an d "abstracted syntax," what also characterizes it most definitively is the presence of recognizable environmental sounds and contexts, the purpose being to invoke the listener's associations, memories, and imagination related to the soundscape.

The mandate to involve the listener in an essential part of the composition, namely to complete its network of meanings, grew naturally out of the pedagogical intent of the Project to foster soundscape awareness. At first, the simple exercise of "framing " environmental sound by taking it out of context, where often it is ignored, and directing the listener's attention to it in a publication or public presentation, meant that the compositional technique involved was minimal, involving only selection, tran sparent editing, and unobtrusive cross-fading. In retrospect this "neutral" use of the material established one end of the continuum occupied by soundscape compositions, namely those that are the closest to the original environment, or what might be called "found compositions." The aesthetic proposed by John Cage of treating any such material as music can be justified in that it emphasizes the listening process as being musical, not necessarily the inherent content. However, the WSP avoided proclaiming any such distinctions by first of all, not attributing these "compositions" to a single

individual (instead, they were collectively authored by the group), and secondly, by emphasizing the educational rather than the possible aesthetic intent of the exercise.

A subtle but important extension of this practice occurred with the "Entry to the Harbour" sequence from The Vancouver Soundscape recordings where, in order to simulate the experience of entering Vancouver harbour on a boat, past the various foghorns and buoys, it was necessary not only to compress the event in time, but also to mix together all of the separately recorded components, with appropriately engineered illusions of their approaching and receding. A recording of an actual boat trip would have b een dominated by motor noise which would mask the desired sound signals and natural sounds. Of course, this abandoning of the ear as a navigational aid in favour of modern electronic instrumentation and visual orientation is indeed symptomatic of the mode rn experience that leads away from soundscape awareness, and historical examples drawn from aural history accounts with boat captains were reported in the written document. But the purpose of the composition was to stimulate soundscape awareness by presen ting a possible, if simulated, aural experience. By being potentially familiar but strangely imaginary at the same time, the composition invoked various levels of listening activity, ranging from identification to symbolic communication. The piece begins with a resonant, low pitched diaphone, suggesting solitude, darkness and primal nature, and ends with an unloading sequence and people retrieving baggage in a small, confined room with bright high frequency scrapes and a squeaky door. This form suggests a larger metaphorical transition for both the city and the individual that is symbolized by the simulated voyage. Every sound can be heard as it was originally recorded, but the discourse of the resulting work is not merely documentary because of its vario us levels of possible meaning.

Between the Canadian and European recording tours in 1974, the WSP members assembled a series of 10 one-hour radio programs for the CBC called Soundscapes of Canada. These included, and for the first time essentially defined, the entire range of soundsca pe compositions, from naturalistic documentaries that were collectively authored through to abstracted compositions attributed to individual composers. In the former category were documentaries including those that are fairly traditionally narrated, such as "Signals, Keynotes and Soundmarks," as well as a set of listening exercises conducted by Schafer, through to "Six Themes of the Soundscape" which substitutes for narration three independent voices each presenting either a factual, subjective, or litera ry, historical perspective on the theme in question.

From the point of view of soundscape composition, the most unique documentary was the collectively authored "Summer Solstice" in which two minutes representing each hour of a midsummer day and night, as recorded beside a pond near a rural monastery outsi de Vancouver, were combined into a 50 minute composition. Although it was introduced with narration and examples in the broadcast version, the piece itself includes only minimal narration in the form of a verbal identification of each hour (done during th e original recording). Edits are transparent with no mixing, so the effect is a compressed span of time that an individual would seldom if ever experience directly. An expanded version of the morning section, called "Dawn Chorus," was also made. The choice of time and location was designed to present to the listener what might be called the natural acoustic ecology, disturbed only minimally by the monastery bell on the one hand, and aircraft and distant train horns on the other. The most striking example of the intricacy of that ecology was observed at dawn when the aural "collision" of high pitched frogs with the dawn chorus of birds in the same frequency range was avoided by the cessation of the former. This is a small example of what Bernard Krause (19 93) terms the "niche hypothesis" of natural species and their acoustic communication patterns where each species occupies a specific frequency band or, as in the solstice example, a different time frame. The "composition" of the Summer Solstice documentary, then, was largely realized by natural forces with the studio manipulation

intended to evoke an appreciation of that ecology.

Two interesting, and more humanly composed, documentaries by poet and composer Peter Huse made effective use of field recorded language material. These are both organized from the east to west, the first being "Soundmarks of Canada" which features the un ique sound signals of the country, identified by locals or the recordists themselves, and the second being "Directions" which is entirely composed of fragments of conversation that the recordists had with locals while asking for directions. The close juxtaposition of sound signals and local dialects provides an aural map of the country which is experienced within a short space of time. An even denser collage of found radio material was assembled by Howard Broomfield in his "Radio Program About Radio Progr ams." In this sometimes bizarre piece, the composer plays on the simultaneity on the airwaves of unrelated material, using both historical and current examples, as well as the habit of radio to jump cut between items in a surreal fashion. The piece treats the disembodied soundscape of the broadcast medium as an environment with its own conventions and syntax which the composer gently satirizes. Another experiment in sudden juxtapositions is my "Maritime Sound Diary" in which three "stories" taken from thr ee original recordings are interleaved by an automated signal switching process that, instead of cross-fading the material, jumps into the next sequence in a series of short, then increasing durations. The points of transition throw both soundscapes into high relief, and the narrative line is maintained when the listener picks up each story later, despite the gaps that have intervened.

Several pieces within the set went farther than those described already by using transformations of the environmental sounds that were chosen. Here the full range of analog studio techniques came into play, with an inevitable increase in the level of abs traction. However, the intent was always to reveal a deeper level of signification inherent within the sound and to invoke the listener's semantic associations without obliterating the sound's recognizability. These pieces include Bruce Davis' poetic docu mentary "Bells of Perce" where clouds of filtered bells and voice fragments symbolize the memories surrounding the historic bells in the Gaspe region of Quebec as colourfully described by the parish priest. Davis' pair of works, "Play" and "Work," include more elaborate rhythmic and timbral alterations of the material that highlight the character of the sounds that accompany these two classes of human activity. And finally, my "Soundscape Study" takes a set of sounds with archetypal imagery (e.g. footstep s, a clock ticking and chiming, water gurgling, a tree being chopped, and church bells ringing the Angelus) and subjects them to a series of transformations in speed, pitch, and textural density (usually independently). The piece invites the listener to f ollow the resulting changes in morphology and imagery that the transformations produce, and hence to become more aware of how these variables condition our habitual responses to environmental sound.

Schafer himself did not produce any soundscape compositions with environmental sound directly, the exception being the collaboratively produced (with Bruce Davis and Brian Fawcett) quadraphonic tape Okeanos (1971) that predates the WSP and is based on li terary imagery of the sea. However, soundscape concepts influence many of his instrumental and vocal works, and perhaps most strikingly, he has created site-specific works, such as Music for Wilderness Lake (Westerkamp, 1981) which takes place at dawn and dusk, and several music theatre works for outdoor or unconventional performance environments. He has also continued to write about soundscape studies, such as in his recent collection of essays, Voices of Tyranny, Temples of Silence (Schafer, 1993).

On the other hand, all of Hildegard Westerkamp's compositional work utilizes environmental sound (Zapf, 1981), usually recorded by herself, except for the early piece Fantasie for Horns (1978) which utilizes mainly the WSP sound library to create a music al collage based on the sound of various horns and a creek. Moreover, not all of her works are for concert

performance, many being designed explicitly for radio, including those that were introduced as part of her "Soundwalking" program series on a local community station (Westerkamp, 1994), and more recently, for live performance by her with tape accompaniment, as in Cool Drool (1983), a satire on Muzak, and India Sound Journal (1993), a soundscape diary. Since contemporary radio often functions as an ar tificial "companion" environment, it is particularly suited for presenting environmental compositions that may invite different levels and spans of attention. However, the medium also implies that the listener may enter the work at any moment, and therefo re linear forms that depend on recognizing previously heard material may be inappropriate. Using a series of poems by Norbert Ruebsaat as material, she solves this problem in the lengthy work Cordillera (1980) where a series of wilderness images are linke d together like a landscape with multiple dimensions, and no linear highway to dictate the direction of travel. A striking advantage of the electroacoustic medium, on the other hand, is the layering of what may be called different "levels of remove" where the actual present, the recorded present of the running commentary, the re-enacted and remembered past, as well as imagined events past or future, may co-exist with the listener moving fluidly between them. Westerkamp's performances often exploit this la yering of levels as we hear her voice both live and recorded in a creative use of "schizophonia."

One of her most ambitious projects was the Harbour Symphony commissioned by the Canada Pavilion during Expo 1986, performed by tugboats in Vancouver harbour around Canada Place. This, and all of the radiophonic and live performance works, present the pos sibility of breaking down the concert hall barrier, and hence the division of music and the soundscape, the concertgoer and the general public. Social, cultural and political issues can also be effectively brought into the compositional domain, as in His Master's Voice (1985), Street Music (1982) and Under the Flightpath (1981). The listening process itself can be addressed with a resulting increase in awareness as in the early work Whisper Study (1975) or the more recent Kits Beach Soundwalk (1989). Howe ver, the level of complexity in her soundscape compositions remains the highest with the solo tape works. These include the text-soundscape piece, A Walk Through the City (1981), based on a poem and reading by Norbert Ruebsaat, and the recent works, Crick et Voice (1987) and Beneath the Forest Floor (1992), that gently unfold in what might be called the hyper-realism of the composed soundscape in which voices, both natural and human, carry on an interplay. In all of these works, Westerkamp explores the wid e ranging possibilities of the soundscape composition, inspired by the legacy of the World Soundscape Project.

Acoustic Communication

Most of the gaps in the knowledge base which might inform environmental sound composition, as described at the beginning of this essay, can be traced to the models used by each discipline to determine its explanatory strategy. I have found that, although traditional bodies of knowledge are still useful in specific contexts, the only way to transcend the limitations inherent in each model is to construct a new interdisciplinary paradigm based on different concepts. I believe that communication studies pro vides the most appropriate framework for such a reformulation, and that what I call acoustic communication (Truax, 1984) is an appropriate starting point for understanding the intricate system of meanings and relationships that sound creates in environmen tal contexts.

Unlike the models of the traditional acoustic disciplines which are based on concepts of energy transfer and signal processing, an acoustic communicational model is based on the concept of information exchange. At the centre of the model is the listener because listening is the primary interface where information is exchanged between the individual and the environment. The auditory system may process incoming acoustic energy and create neural signals, but listening involves the higher cognitive levels th at extract usable information and interpret its significance. Listening is also multi-levelled because it can involve various degrees

of conscious attention. We normally think of listening as always attentive, or "listening-in-readiness" as I have termed it (Truax, 1984), and in fact this is the most analytical form that listening takes. However, most of the time, we process acoustic information more at a background level without attention being focussed on it. This information provides the environmental context of our awareness, the ongoing and usually highly redundant "ground" to our consciousness.

However, background listening is still a sophisticated cognitive process, involving feature detection, the recognition of patterns and their comparison to known patterns and environmental "signatures." Moreover, background listening can trigger conscious attention to be focussed on an incoming sound when there is sufficient need or motivation from the listener. We have all experienced the recognition of a particular sound, such as a voice, footsteps, or a door opening, even when we are not listening for it. The sound attracts our attention either because it is unfamiliar ('who could that be?') or instead, precisely because it is familiar and because it has significance ('oh, I need to talk to that person'). I call this situation "listening-in-readiness" because it involves both background and foreground listening strategies. It requires a favourable acoustic environment for information to be available (a good signal-to-noise ratio in technical terms), and an active cognitive processing of patterns and th eir comparison to known ones.

These different levels of listening involve analytical attention being paid to short-term details in the foreground case, and holistic or gestalt pattern recognition in the background case. These two complementary strategies are often described as the re spective provinces of the two hemispheres of the brain, and music is known to involve either or both such strategies depending on the listening context and the listener's training or competence (Bever & Chiarello, 1974; Wagner & Hannon, 1981). But I suspe ct that our traditional experience with environmental sounds predates the development of these cognitive abilities with music, both for the individual and the species, and therefore soundscape experience is fundamental to all forms of listening. However i t is understood, listening is at the centre of the complex relationship between the individual and the environment.

I have suggested elsewhere that instead of listening being the end stage of a series of linear energy transfers from source to listener, we can understand it within a system of information exchange that I call the "acoustic community" where sound mediate s the relation of the listener to the environment (Truax, 1984). In the traditional soundscape that mediation entwines the listener in a unity with the environment and in turn, the sounds come to symbolize that relationship. Hildegard Westerkamp has chara cterised the relationship as a balance between input and output, impression and expression, listening and soundmaking (Westerkamp, 1988). The information we take in as listeners is balanced by our soundmaking activities that in turn shape the environment. Acoustic ecology mirrors and complements the social and biological ecology in traditional societies.

The impact of electroacoustic technology on acoustic systems of communication is typically paradoxical. For instance, it extends the range of listening levels towards more focussed analytical modes of listening on the one hand, and towards more distracte d and passive forms on the other. Not surprisingly, it is the same technological functions that provide the opportunity for both types of experience. For instance, the ability to repeat a sound exactly (an impossibility prior to electroacoustic technology) can reduce a sound to a familiar background and habituate the listener to it, or within a studio context, the same type of repetition may allow the listener to focus on details that would have escaped in a single listening, particularly when aided by ot her forms of transformation. Similarly, the ability to take the sound out of context can focus attention on it (much as photography achieved for the visual sense), but it also allows a sound (including music) to be imposed onto any environment regardless of its appropriateness. Reinforced by repetition, such sounds generally

become accepted by the listening public as somehow "natural", despite the fact that they impose a tempo, mood, and character (or in some cases even a political influence) that the lis tener comes to associate with the environment or product (Truax, 1992c).

Therefore, what we learn from acoustic communication as composers using environmental sound is that these sounds are not only source material that is rich in acoustic complexity, but also rich in a variety of levels of meaning, both personal and cultural , and possibly even cross-cultural. These sounds connect listeners to a web of social and other relationships. Instead of ignoring all of those levels of contextual meaning, which are largely lost through treating the sound abstractly, the composer may us e the artificiality of electroacoustic techniques to amplify those relationships and bring them into the compositional process (Truax, 1994a). Lest the reader conclude that the resulting music is simply one of collage, may I suggest that beyond contextual information, many environmental sounds are also rich in symbolism (Wishart, 1986). As a result, image and metaphor will play a central role in the compositional use of such sounds, and through images and metaphors an aesthetic discourse will follow.

Composing through Environmental Sound

The predominant digital techniques for treating environmental sound compositionally today are samplers and signal processing (or "effects processing" in commercial terms). I regard both as encouraging composition "with" sound rather than "through" or "within" sound. This distinction, which I owe to Walter Branchi (1983), captures the essence of the difference between conventional approaches, including the acousmatic tradition, and the soundscape composition. When one captures what is sometimes called "raw" sound on tape and subjects it to studio processing, whether for mundane sound effects or the abstract material of the acousmatic approach, this manufacturing process with its industrial overtones suggests that one is composing "with" the sound and usin g it for its desired effect and affect, essentially turning it into a consumable product.

The soundscape composition typically reverses the process because in a sense, the sound "uses" the composer, and ultimately the listener, in that it evokes in each a wealth of difficult to verbalize images and associations, all of which guide the composi tion and its reception. The distinction is subtle because it involves a difference in musical process that conventional analysis of the end product (e.g. form, materials, structural organization) may not reveal. As in the acoustic communication model, listening is central to the process as the sound guides the composer's shaping of it, not the other way around. In contrast to the linear model of the composer sending out sonic messages that finally dissipate their energy in the hearer's emotional and other reactions, in the soundscape composition the sound itself mediates the relationship of the composer/listener to the social and environmental context, reflecting it, commenting on it, imagining its ideal form, probing its inner meanings. In essence, one i s both composing and being composed through the sound.

That technology might become intimately involved in this process will surprise some, but only if we regard technology as alien from ourselves. As an embodiment of our knowledge and a tool for extending awareness, technology fits perfectly into the compos itional process, whether at the initial stages of recording, or the later stages of studio transformation and final mixing. The microphone, for instance, can open one's ears to a changed listening perspective, the most dramatic of which is probably close miking where detail becomes more apparent (Westerkamp, 1994). Listening becomes active, unlike the conventional approach of "getting it on tape" where the recordist is merely the conduit for transferring the signal to a storage medium.

Likewise, studio transformation is a key element in the composer's process, so much so that

processes of transformation are often central to the final result presented to the listener (Smalley, 1993). In a manner similar to a child's cognitive development t, active manipulation of the "object" leads to its functional and conceptual understanding, and therefore, similar to its role in childhood, play is an important activity to stimulate that learning. Playing with a sound involves both memory and imaginati on, the "what if" question, and the sense of discovery. What I have always found the most fascinating is the experience of having the expanded awareness facilitated by technological intervention influence perception later under more normal circumstances. Detail, for instance, heard at slower speeds can often remain audible when the speed is returned to normal. The expanded awareness of studio manipulation often carries over into soundscape awareness when similar sounds are heard later.

The technique I have found the most striking in the way it facilitates moving inside a sound is real-time granulation of sampled sound (Truax, 1990a, 1994b). Briefly, the technique divides the sound into short envelopednsformat ion; (b) the listener's knowledge of the environmental and psychological context of the soundscape material is invoked and encouraged to complete the network of meanings ascribed to the music; (c) the composer's knowledge of the environmental and psycholo gical context of the soundscape material is allowed to influence the shape of the composition at every level, and ultimately the composition is inseparable from some or all of those aspects of reality; and ideally, (d) the work enhances our understanding of the world, and its influence carries over into everyday perceptual habits. Elsewhere I have described the ideal balance that should be achieved in such work as matching the inner complexity of the sonic organization to the outer complexity of relations hips in the real world, without one being subordinate to the other (Truax, 1994a). Thus, the real goal of the soundscape composition is the re-integration of the listener with the environment in a balanced ecological relationship.

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