

# An Introduction to Acoustic Ecology

by Kendall Wrightson

I try to listen to  
the still, small voice within  
but I can't hear it  
above the din

from *Little Audrey's Story* by Eliza Ward

As a reader of this journal it is possible that you attach a certain significance to sound. Maybe you are a musician, an audio engineer, an architect, a foley artist, a marine biologist, or a composer of sonic art. Maybe you have studied sound in built environments, used sound in performance, in film or video, or researched sound under water and among animals. You may have noticed how important sound can be in communicating mood, meaning and context. Perhaps when listening to a “soundscape”—sound heard in a real or “virtual” environment—you have been transported to another time, another place. Conversely, maybe you have experienced the-here-and-now even more acutely as a result of listening intently. Your awareness of sound—specifically your *level* of awareness of the acoustic environment at any given time—is an issue central to the interdisciplinary of Acoustic Ecology (also known as ecoacoustics).

The philosophy underpinning Acoustic Ecology is simple yet profound: its author—R. Murray Schafer, a musician, composer and former Professor of Communication Studies at Simon Fraser University (SFU) in Burnaby, BC, Canada—suggests that we try to hear the acoustic environment as a musical composition and further, that we own responsibility for its composition (Schafer 1977a, 205). Like many issues emerging from the explosion of ideologies in the late 1960s, the profundity of Schafer's message is now hidden behind a single, soundbite-friendly issue: noise pollution. This is unfortunate since Schafer has far more to offer. However, some 22 years after his ideas were first fully articulated in print, they remain unknown to the general public and mostly unknown to environmental acousticians. Where Schafer is well known—within the contemporary music community—it is mostly for his large-scale, often site-specific, musical/theatrical work rather than his acoustic ecology. Composer John Cage was aware of both; when asked if he knew of any great music teachers, he replied “Murray Schafer of Canada” (Truax 1978, sleeve note).

*So what did Schafer say and what is its relevance at the beginning of a century?*

## Eye Culture

Schafer's starting point was to note the incredible dominance of the visual modality in society—“eye culture,” as it has been termed elsewhere<sup>1</sup>—and to reveal that children's ability to listen was, in his experience, deteriorating. So concerned was Schafer about this problem that he argued passionately for listening skills to become an integral part of the national curriculum. Schafer both demonstrated

and addressed the issue—which he termed “sonological competence”—through the practical exercises he developed in working with music students, such as: list any five environmental sounds (not music) that you remember hearing today; and list five sounds (not music) you like and five you do not.

As a lecturer in Music Technology, I often begin a lecture series with these exercises and I can confirm Schafer's experience: many students do not recall “consciously” having heard any sounds during the day, and many do not complete the sound list even after fifteen minutes. Schafer's response to the problem was to develop a range of “ear cleaning” exercises including “soundwalks,” a walking meditation where the object is to maintain a high level of sonic awareness (see Schafer 1967 and 1969).

By the early 1970s, Schafer had enrolled his colleagues at SFU into his work and the World Soundscape Project (WSP) was created, its first major project being a field study of the Vancouver Soundscape. The study involved level measurements (producing isobel maps), soundscape recordings and the description of a range of sonic features. The study resulted in both a book<sup>2</sup> and a collection of recordings.<sup>3</sup> Further WSP field studies in Europe led to the publication of *Five Village Soundscapes* (Schafer, 1978b) and *European Sound Diary* (Schafer, 1977b). Schafer's *The Tuning of the World* (1977a),<sup>4</sup> remains the best known and the most comprehensive text on Acoustic Ecology.

## Soundscape Features

A fascinating book that changed my understanding of—and relationship with—sound, *The Tuning of the World* formalised the soundscape terminology Schafer had devised during his field studies with the WSP: background sounds he defined as “keynotes” (in analogy to music where a keynote identifies the fundamental tonality of a composition around which the music modulates); foreground sounds (intended to attract attention) are termed “sound signals.” Sounds that are particularly regarded by a community and its visitors are called “soundmarks”—in analogy to landmarks. Natural examples of the latter include geysers, waterfalls and wind traps while cultural examples include distinctive bells and the sounds of traditional activities. (Schafer 1977a: 9, 55-56, 173-175, 272-275; Truax 1978: 68, 119, 127; 1984: 22, 58-60).

Schafer's terminology helps to express the idea that the sound of a particular locality (its keynotes, sound signals and soundmarks) can—like local architecture, customs and dress—express a community's identity to the extent that settlements can be recognised and characterised by their soundscapes. Unfortunately, since the industrial revolution, an ever increasing number of unique soundscapes have disappeared completely or submerged into the cloud of homogenised, anonymous noise that is the contemporary city soundscape, with its ubiquitous keynote—traffic.

The contrast between pre-industrial and post-industrial acoustic environments is well expressed in Schafer's use of the terms “hi-

fi” (high fidelity) to characterise the former and “lo-fi” (low fidelity) to describe the latter (1977a, 272). He defines a hi-fi soundscape as an environment where “sounds overlap less frequently; there is more perspective—foreground and background” (1977a, 43). In transcribing recordings of hi-fi environments, Schafer’s team noted that the level of natural environmental sounds—such as weather and animals—varied in repeating cycles. The team created a rudimentary level versus time diagram charting the more prominent sonic features of the soundscape over a twelve month period (reproduced below as Figure 1).

Schafer concluded that the vocal “give and take” between species (evident in Figure 1) is probably a characteristic feature of natural soundscapes. In addition to the rhythmic balance in sound level Schafer identified in natural habitats, Krause (1993) suggested an equilibrium is also apparent across the audio spectrum. The possibility of a natural spectral balance occurred to Krause during long sojourns in the wilderness as he attempted to record the vocalisations of specific creatures. Listening intently to the soundscape to capture specific sounds (often waiting for up to thirty hours in one sitting), Krause noticed that “When a bird sang or a mammal or amphibian vocalised, the voices appeared to fit in relation to all the natural sounds in terms of frequency and prosody (rhythm)” (1993, 159).

Acoustical spectrographic maps transcribed from 2,500 hours of recordings confirmed his suspicions: animal and insect vocalisations tended to occupy small bands of frequencies leaving “spectral niches” (bands of little or no energy) into which the vocalisations (fundamental and formants) of other animals, birds or insects can fit. As urban areas spread Krause suggested, the accompanying noise might “block” or “mask” spectral niches and, if mating calls go unheard, a species might die out (1993, 158). While there has been little corroborative research into Krause’s “Niche Hypothesis,” (or into Schafer’s suggestion that give and take occurs in terms of sound level), a recent Royal Society for the Protection of Birds (RSPB) study suggested that birds living near roads “... cannot hear one another which leads to difficulty in learning songs and communicating with potential mates” (Barot 1999).

In acoustics, the word “mask” has a very specific meaning.<sup>5</sup> The relevance of this effect for the soundscape is that since quieter sounds do not generally mask each other (unless their frequencies are close together), a hi-fi soundscape can be characterised by its lack of masking from noise and other sounds, with the result that all sounds—of all frequencies—“can be heard distinctly” (Schafer, 43). As SFU colleague Hildegard Westerkamp puts it, there is “no anonymous sound.” The lack of masking facilitates the propagation of

“acoustic colouration” caused by echoes and reverberations that occur as sound is absorbed and reflected from surfaces within the environment, and due to the effects of weather related factors such as temperature, wind and humidity. The resulting colouration offers significant information for the listener, providing cues relating to the physical nature of the environment and expressing its size in relation to the listener. This fosters a sense of place for individuals as they move around the community. SFU colleague Barry Truax conveys this concept well when he states “... the sound arriving at the ear is the analogue of the current state of the physical environment, because as the wave travels, it is charged by each interaction with the environment” (Truax 1984, 15).

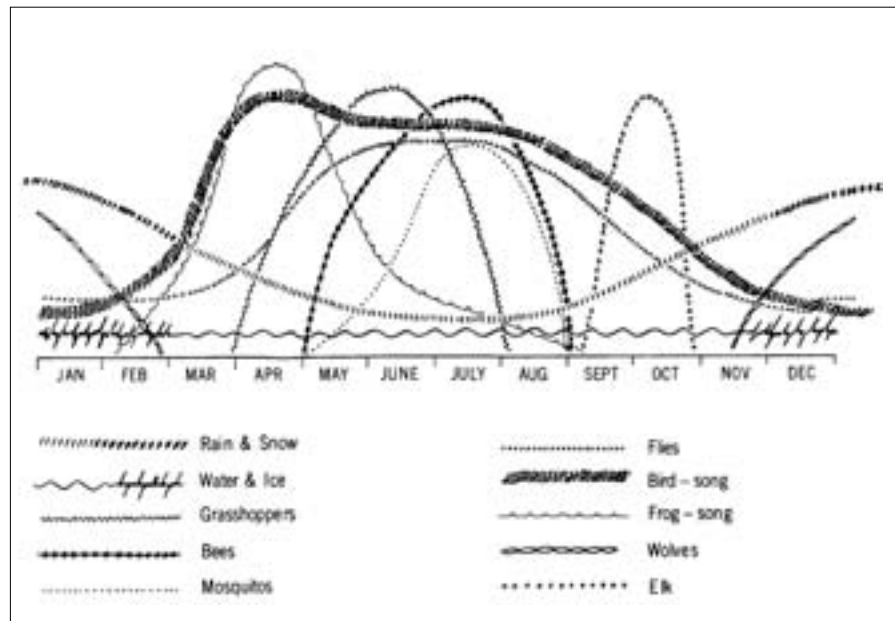
Another characteristic of the pre-industrial revolution, hi-fi soundscape, is that the “acoustic horizon” may extend for many miles. Thus sounds emanating from a listener’s own community may be

heard at a considerable distance, reinforcing a sense of space and position and maintaining a relationship with home. This sense is further strengthened when it is possible to hear sounds emanating from adjacent settlements, establishing and maintaining relationships between local communities.

In the lo-fi soundscape, meaningful sounds (and any associated acoustic colouration), can be masked to such an extent that an individual’s “aural space” is reduced.

Where the effect is so pronounced that an individual can no longer hear the reflected sounds of his/her own movement or speech, aural space has effectively shrunk to enclose the individual, isolating the listener from the environment. If the masking of reflected and direct sounds is so severe that an individual cannot hear his/her own footsteps—which is common on the streets of many cities—“... one’s aural space is reduced to less than that of human proportions” (Truax 1984, 20). Under such extreme conditions, sound is either smothered (in the sense that particular sounds are not heard) or, sounds merge and sonic information mutates into anti-information: “noise.”

While the hi-fi soundscape is—Acoustic Ecologists suggest—balanced in terms of level, spectra and rhythm, the lo-fi soundscape features an almost constant level. This creates a “Sound Wall” (Schafer 1977a, 93), isolating the listener from the environment. Spectrally, the contemporary lo-fi soundscape is biased towards the low frequency range (thanks to the internal combustion engine and sounds related to electric power). Due to the twenty-four hour society, the rhythms of daily routine are, in some localities, significantly eroded.



**Figure 1: The cycles of the natural soundscape of the west coast of British Columbia showing the relative level of sounds (from Truax 1984: 142).**

## The Soundscape and Society

In describing the soundscape's capacity to convey information, Truax (1984) describes sound as a mediator between listener and the environment. This relationship is illustrated in Figure 2.

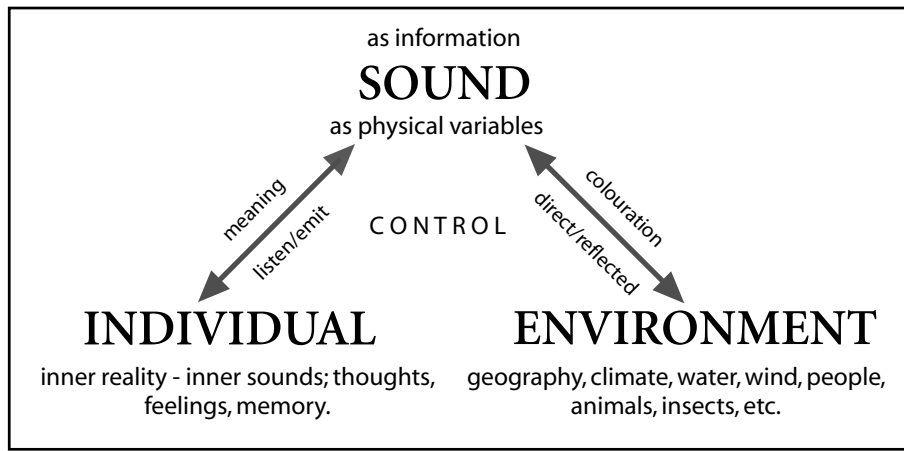
As the soundscape deteriorates, so awareness of the subtleties of environmental sound has withered in proportion. As a result, the meanings sound holds

for the listener in contemporary soundscapes tend to be polarised into extremes—"loud" and "quiet"; noticed or unnoticed; good (I like) or bad (I don't like). Compare this level of sonic awareness (and the results of the listening tests mentioned earlier) with the Kaluli men of Papua New Guinea who, according to Feld (1994) can "... imitate the sound of at least 100 birds, but few can provide visual descriptive information on nearly that many." In other words, environmental sounds for the Kaluli tribe comprise a continuum offering a limitless range of subtleties.

In the developed world, sound has less significance and the opportunity to experience "natural" sounds decreases with each generation due to the destruction of natural habitats. Sound becomes something that the individual tries to block, rather than to hear; the lo-fi, low information soundscape has nothing to offer. As a result, many individuals try to shut it out through the use of double glazing or with acoustic perfume—music. Music—the virtual soundscape—is, in this context, used as a means to control the sonic environment rather than as a natural expression of it. Broadcast speech and music provide the same opportunity for control, turning the sonic environment into a commodity. Networks, transmitters and satellites extend the acoustic community across the entire planet, a fact that has been utilised for fair deeds and foul. Schafer refers to the latter use of sound as "sound imperialism" (1977a, 77).

A 1993 survey of public attitudes to noise in the United Kingdom lists "neighbours"—and specifically sources of broadcast or recorded sound (which Schafer calls "schizophonic" sound)—as the premier source of irritation, toppling traffic from the number one spot it had occupied for many years (Grimwood, 1993). As Slapper (1996) reports: "Nationally, councils now receive 300 complaints a day about unacceptable noise from neighbours" and more disturbingly "Over the past four years, 18 people have been killed" [due to disputes over noisy neighbours].

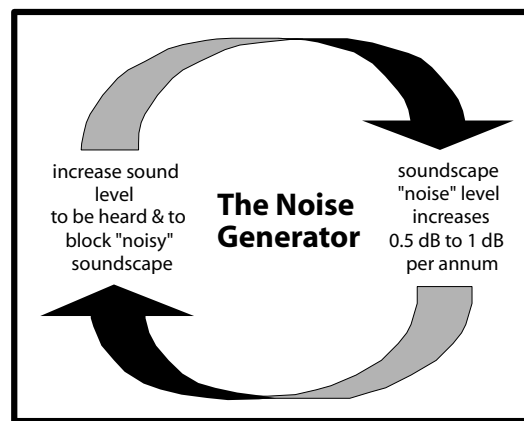
The psychological significance of sound used as a controlling force—as an (offensive) weapon or as a (defensive) barrier against the soundscape—is that the environment and the community become the enemy. As with any war, the environment becomes a battle-



**Figure 2: The mediating relationship of an individual to the environment through sound (modified from Truax 1984, 11).**

is the enemy without, the noise of unwanted thoughts and feelings represents the enemy within. The use of sound as an "audioanalgesic" (Schafer 1977a, 96)—a soundwall to block the unceasing (and often critical) inner dialogue and the uncomfortable emotions the dialogue evinces—provides the illusion of mastery over emotion. A basic tenet of psychotherapy is the notion that unexpressed thoughts and feelings can result in inappropriate actions ranging from a burst of anger over an insignificant event, to the kind of horrific incidents that seem increasingly, to make the front pages of newspapers the world over. Despite an increased awareness of psychotherapeutic principles, the belief that emotion is somehow controlled through distraction prevails.

The physical and psychological cost of unexpressed emotion is an epidemic of stress related illnesses that reflects a struggle to adapt to a new way of living—the speed, busy-ness and sustained arousal of city life. Such is the contrast between the character of life in towns and cities compared to that in rural and tranquil areas, that Newman & Lonsdale (1995) refer to city dwellers as *homo urbanus*. Appreciative descriptions of the "buzz" of the city frequently refer to its noise, as well as its speed and activity (Newman & Lonsdale 1995, 34). As



**Figure 3: The Noise Generator (source: the author)**

the city represents excitement, so the countryside, the plains and wilderness areas have come, for many, to represent boredom and incredibly, a disconnection from life, since "life" has become associated with continuous noise and activity. The corollary to this is that "quiet" and highly differentiated environments—characteristics of hi-fi soundscapes—are equated with boredom, conformity, lassitude, lack of choice "... and most importantly, the fear of being out of touch." (Newman & Lonsdale 1995, 10). The latter expression is a masterly example of sophistry since while being "in touch" with the noise of opinion and technol-

ogy (objectivity), the quiet reality of how "I" feel now (subjectivity)—is devalued or ignored.

In my view, the hi-fi environment represents a deep psychological fear for anyone whose purpose (consciously or unconsciously) is to avoid their feelings. In a wide variety of psychotherapeutic experiences, I have witnessed many times—in myself and others—how being quiet tends to bring emotions to the surface. As psychologist

ground and suffers as much as its inhabitants. Schafer estimated that the battle between sonic expression and control was helping to increase environmental sound levels by around 0.5 to 1 decibel per year—a "noise generator" as illustrated in Figure 3.

## Inner Noise

If community and environmental noise

James Swan quoted in Gallagher (1993, 203) offers: “Just sitting quietly in that atmosphere [a quiet place] allows most people to process a lot of emotions and issues they haven’t been dealing with.”

It is no coincidence that in much art and literature, nature is used to symbolise emotion: both are wild and uncontrollable and the history of humanity could be described in terms of a need to dominate both. This domination has taken the form of ephemeral realities built upon life-as-it-is. In the case of nature, the construction refers to electrically powered communities whose ephemerality is a function of their power source. Contemporary society cannot operate without electricity—if the plug is pulled by nature, terrorists or the depletion of natural resources, society will collapse. As for emotion, the ephemeral constructions are the “schizophonic” sounds, television pictures and eventually, the “data suits” and other “cybersense” technologies that are creating a “virtual” reality. Built on top of the electric society, cyber-reality is twice as ephemeral, doubly fragile.

### Acoustic Ecology Today

Schafer suggests that there are two ways to improve the soundscape. The first is to increase sonological competence through an education programme that attempts to imbue new generations with an appreciation of environmental sound. This he believes, will foster a new approach to design—the second way—that will incorporate an appreciation of sound and thus reduce the wasted energy that noise represents.

Schafer’s ideas are laudable and I endorse them. However it is vital that Acoustic Ecologists do not underestimate what Schafer is asking; in order to listen we need to stop or at least slow down—physically and psychologically, becoming a human being instead of a “human doing.” “Be here now” is one of the main messages to emerge during the 1960s, and a major tenet of the multitude of Eastern philosophies that have been imported into the west ever since. For *homo urbanus*, stopping and listening is a tough call, though many try and keep trying. For others, being here now, listening to the soundscape, valuing the soundscape, is anathema. Porteous (1990) confirms this in his critique of the original WSP surveys noting that “experts” always bring with them their own agenda. In this case, he says, the agenda is that people *should* value the soundscape, specifically a balanced one; surveys of public opinion, he notes, indicate that the people—the “inerts”—do not.

Today, interest in Acoustic Ecology is growing thanks to the activities of the World Forum for Acoustic Ecology (WFAE), which was founded during The First International Conference on Acoustic Ecology in Banff, Alberta, Canada, in August of 1993. Through newsletters, this new journal, regular conferences (since 1993) and more recently a listserver and web site available to anyone with access to the Internet, knowledge of acoustic ecology and the activities of the WFAE is beginning to spread to a wider audience; Westerkamp (1995) reports that the WFAE has enrolled steering committee representatives in Europe, Asia-Pacific, South/Central America and the USA and has had a well-functioning international board since 1998.

In summary then, it is my view that the values espoused by Acoustic Ecology—the value of listening, the quality of the soundscape—are values worth evangelising. However, it is vital that we do not underestimate the enormity of what we are asking at the end of the busiest, loudest century in recorded history.

**Kendall Wrightson** is a lecturer in music technology at London Guildhall University, England, and a freelance writer. The relationship between the

individual, technology, sound and music is a current passion. Kendall is a founder member of SoundscapeUK, the Internet discussion list of the UKI Soundscape Community.

E-mail: [wrightso@lgu.ac.uk](mailto:wrightso@lgu.ac.uk)

<http://www.kwrightson.freemove.co.uk/>

<http://www.mailbase.ac.uk/lists/soundscapeuk/welcome.html>

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### Discography

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*The Vancouver Soundscape 1973/Soundscape Vancouver 1996*, Cambridge Records CSR-2CD 9701, 1996.

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### Notes

1. The dominance of eye culture at the expense of the aural modality is explored in Berendt, J. E. [trans. Nevil, T.] *The Third Ear*, Henry Holt, New York, 1988.
2. Schafer, R. M. [Ed.] *The Vancouver Soundscape*, ARC Publications, 1978a.
3. Now available as a double CD set including a 1996 comparative study: *The Vancouver Soundscape 1973/Soundscape Vancouver 1996*, Cambridge, 1996. Records CSR-2CD 9701.
4. Schafer, R. M. *The Tuning of the World*, Knopf, New York, 1977. [republished in 1994 as *The Soundscape—Our Sonic Environment and the Tuning of the World*, Destiny Books, Rochester, Vermont].
5. Over a relatively narrow frequency range, quiet sounds will be inaudible (i.e. “masked”) in the presence of loud sounds of a lower frequency. If the frequencies of two sounds are within a few hertz, a beating effect is heard which makes it easier to detect the masked tone (Backus, 1977, pp. 101-103).