

## Introduction

Now I will do nothing but listen . . .  
I hear all sounds running together, combined,  
fused or following,  
Sounds of the city and sounds out of the city, sounds  
of the day and night. . . .

WALT WHITMAN, *Song of Myself*

The soundscape of the world is changing. Modern man is beginning to inhabit a world with an acoustic environment radically different from any he has hitherto known. These new sounds, which differ in quality and intensity from those of the past, have alerted many researchers to the dangers of an indiscriminate and imperialistic spread of more and larger sounds into every corner of man's life. Noise pollution is now a world problem. It would seem that the world soundscape has reached an apex of vulgarity in our time, and many experts have predicted universal deafness as the ultimate consequence unless the problem can be brought quickly under control.

In various parts of the world important research is being undertaken in many independent areas of sonic studies: acoustics, psychoacoustics, otology, international noise abatement practices and procedures, communications and sound recording engineering (electroacoustics and electronic music), aural pattern perception and the structural analysis of language and music. These researches are related; each deals with aspects of the world soundscape. In one way or another researchers engaged on these various themes are asking the same question: what is the relationship between man and the sounds of his environment and what happens when

those sounds change? Soundscape studies attempt to unify these various researches.

Noise pollution results when man does not listen carefully. Noises are the sounds we have learned to ignore. Noise pollution today is being resisted by noise abatement. This is a negative approach. We must seek a way to make environmental acoustics a *positive* study program. Which sounds do we want to preserve, encourage, multiply? When we know this, the boring or destructive sounds will be conspicuous enough and we will know why we must eliminate them. Only a total appreciation of the acoustic environment can give us the resources for improving the orchestration of the world soundscape. For many years I have been fighting for ear cleaning in schools to eliminate audiometry in factories. Clairaudience not ear muffs. It is an idea over which I do not wish to exercise permanent ownership.\*

The home territory of soundscape studies will be the middle ground between science, society and the arts. From acoustics and psychoacoustics we will learn about the physical properties of sound and the way sound is interpreted by the human brain. From society we will learn how man behaves with sounds and how sounds affect and change his behavior. From the arts, particularly music, we will learn how man creates ideal soundscapes for that other life, the life of the imagination and psychic reflection. From these studies we will begin to lay the foundations of a new interdisciplinary—acoustic design.

*From Industrial Design to Acoustic Design* The most important revolution is aesthetic education in the twentieth century was that accomplished by the Bauhaus, that celebrated German school of the twenties. Under the leadership of architect Walter Gropius, the Bauhaus collected some of the great painters and architects of the time (Klee, Kandinsky, Moholy-Nagy, Mies van der Rohe), together with craftsmen of distinction. At first it seemed disappointing that the graduates of this school did not rise to rival their mentors as artists. But the purpose of the school was different. From the interdisciplinary synergy of faculty skills a whole new study field was created, for the school invented the subject of industrial design. The Bauhaus brought aesthetics to machinery and mass production.

It devolves on us now to invent a subject which we might call acoustic design, an interdisciplinary in which musicians, acousticians, psychologists, sociologists and others would study the world soundscape together in order to make intelligent recommendations for its improvement. This study would consist of documenting important features, of noting differences, parallels and trends, of collecting sounds threatened with extinction, of studying the effects of new sounds before they are indiscriminately

\*For definitions of *ear cleaning*, *clairaudience* and other special terms, see the glossary.

released into the environment, of studying the rich symbolism sounds have for man and of studying human behavior patterns in different sonic environments in order to use these insights in planning future environments for man. Cross-cultural evidence from around the world must be carefully assembled and interpreted. New methods of educating the public to the importance of environmental sound must be devised. The final question will be: is the soundscape of the world an indeterminate composition over which we have no control, or are *we* its composers and performers, responsible for giving it form and beauty?

*Orchestration Is a Musician's Business* Throughout this book I am going to treat the world as a macrocosmic musical composition. This is an unusual idea but I am going to nudge it forward relentlessly. The definition of music has undergone radical change in recent years. In one of the more contemporary definitions, John Cage has declared: "Music is sounds, sounds around us whether we're in or out of concert halls: cf. Thoreau." The reference is to Thoreau's *Walden*, where the author experiences in the sounds and sights of nature an inexhaustible entertainment.

To define music merely as *sounds* would have been unthinkable a few years ago, though today it is the more exclusive definitions that are proving unacceptable. Little by little throughout the twentieth century, all the conventional definitions of music have been exploded by the abundant activities of musicians themselves. First with the huge expansion of percussion instruments in our orchestras, many of which produce nonpitched and arrhythmic sounds; then through the introduction of aleatoric procedures in which all attempts to organize the sounds of a composition rationally are surrendered to the "higher" laws of entropy; then through the opening-out of the time-and-space containers we call compositions and concert halls to allow the introduction of a whole new world of sounds outside them (in Cage's 4'33" *Silence* we hear only the sounds external to the composition itself, which is merely one protracted caesura); then in the practices of *musique concrète*, which inserts any sound from the environment into a composition via tape; and finally in electronic music, which has revealed a whole gamut of new musical sounds, many of them related to industrial and electric technology in the world at large.

Today all sounds belong to a continuous field of possibilities lying *within the comprehensive dominion of music*. Behold the new orchestra: the sonic universe!

And the musicians: anyone and anything that sounds!

*Dionysian Versus Apollonian Concepts of Music* It is easier to see the responsibilities of the acoustical engineer or the audiologist toward the world soundscape than to understand the precise manner

in which the contemporary musician is supposed to attach himself to this vast theme, so I am going to grind my axe on this point for a moment longer.

There are two basic ideas of what music is or ought to be. They may be seen most clearly in two Greek myths dealing with the origin of music. Pindar's twelfth Pythian Ode tells how the art of aulos playing was invented by Athena when, after the beheading of Medusa, she was touched by the heart-rending cries of Medusa's sisters and created a special *nomos* in their honor. In a Homeric hymn to Hermes an alternative origin is mentioned. The lyre is said to have been invented by Hermes when he surmised that the shell of the turtle, if used as a body of resonance, could produce sound.

In the first of these myths music arises as subjective emotion; in the second it arises with the discovery of sonic properties in the materials of the universe. These are the cornerstones on which all subsequent theories of music are founded. Characteristically the lyre is the instrument of Homer, of the epos, of serene contemplation of the universe; while the aulos (the reed oboe) is the instrument of exaltation and tragedy, the instrument of the dithyramb and of drama. The lyre is the instrument of Apollo, the aulos that of the Dionysian festivals. In the Dionysian myth, music is conceived as internal sound breaking forth from the human breast; in the Apollonian it is external sound, God-sent to remind us of the harmony of the universe. In the Apollonian view music is exact, serene, mathematical, associated with transcendental visions of Utopia and the Harmony of the Spheres. It is also the *anāhata* of Indian theorists. It is the basis of Pythagoras's speculations and those of the medieval theoreticians (where music was taught as a subject of the quadrivium, along with arithmetic, geometry and astronomy), as well as of Schoenberg's twelve-note method of composition. Its methods of exposition are number theories. It seeks to harmonize the world through acoustic design. In the Dionysian view music is irrational and subjective. It employs expressive devices: tempo fluctuations, dynamic shadings, tonal colorings. It is the music of the operatic stage, of *bel canto*, and its reedy voice can also be heard in Bach's Passions. Above all, it is the musical expression of the romantic artist, prevailing throughout the nineteenth century and on into the expressionism of the twentieth century. It also directs the training of the musician today.

Because the production of sounds is so much a subjective matter with modern man, the contemporary soundscape is notable for its dynamic hedonism. The research I am about to describe represents a reaffirmation of music as a search for the harmonizing influence of sounds in the world about us. In Robert Fludd's *Utriusque Cosmi Historia* there is an illustration entitled "The Tuning of the World" in which the earth forms the body of an instrument across which strings are stretched and are tuned by a divine hand. We must try once again to find the secret of that tuning.

*Music, the Soundscape and Social Welfare* In Hermann Hesse's *The Glass Bead Game* there is an arresting idea. Hesse claims to be repeating a theory of the relationship between music and the state from an ancient Chinese source: "Therefore the music of a well-ordered age is calm and cheerful, and so is its government. The music of a restive age is excited and fierce, and its government is perverted. The music of a decaying state is sentimental and sad, and its government is imperiled."

Such a theory would suggest that the egalitarian and enlightened reign of Maria Theresa (for instance, as expressed in her unified criminal code of 1768) and the grace and balance of Mozart's music are not accidental. Or that the sentimental vagaries of Richard Strauss are perfectly consistent with the waning of the same Austro-Hungarian Empire. In Gustav Mahler we find, etched in an acid Jewish hand, marches and German dances of such sarcasm as to give us a presentiment of the political *dance macabre* soon to follow.

The thesis is also borne out well in tribal societies where, under the strict control of the flourishing community, music is tightly structured, while in detribalized areas the individual sings appallingly sentimental songs. Any ethnomusicologist will confirm this. There can be little doubt then that music is an indicator of the age, revealing, for those who know how to read its symptomatic messages, a means of fixing social and even political events.

For some time I have also believed that the general acoustic environment of a society can be read as an indicator of social conditions which produce it and may tell us much about the trending and evolution of that society. Throughout this book I will suggest many such relationships, and though it is probably in my nature to do this emphatically, I hope the reader may continue to regard the method as valid even if some of the equations seem disagreeable. They are all open to further testing.

*The Notation of Soundscapes (Sonography)* The soundscape is any acoustic field of study. We may speak of a musical composition as a soundscape, or a radio program as a soundscape or an acoustic environment as a soundscape. We can isolate an acoustic environment as a field of study just as we can study the characteristics of a given landscape. However, it is less easy to formulate an exact impression of a soundscape than of a landscape. There is nothing in sonography corresponding to the instantaneous impression which photography can create. With a camera it is possible to catch the salient features of a visual panorama to create an impression that is immediately evident. The microphone does not operate this way. It samples details. It gives the close-up but nothing corresponding to aerial photography.

Similarly, while everyone has had some experience reading maps, and many can draw at least significant information from other schematics of the visual landscape, such as architects' drawings or geographers' contour maps, few can read the sophisticated charts used by phoneticians, acousticians or musicians. To give a totally convincing image of a soundscape would involve extraordinary skill and patience: thousands of recordings would have to be made; tens of thousands of measurements would have to be taken; and a new means of description would have to be devised.

A soundscape consists of events *heard* not objects *seen*. Beyond aural perception is the notation and photography of sound, which, being silent, presents certain problems that will be discussed in a special chapter in the Analysis section of the book. Through the misfortune of having to present data on silent pages, we will be forced to use some types of visual projection as well as musical notation, in advance of this discussion, and these will only be useful if they assist in opening ears and stimulating cliraudience.

We are also disadvantaged in the pursuit of a historical perspective. While we may have numerous photographs taken at different times, and before them drawings and maps to show us how a scene changed over the ages, we must make inferences as to the changes of the soundscape. We may know exactly how many new buildings went up in a given area in a decade or how the population has risen, but we do not know by how many decibels the ambient noise level may have risen for a comparable period of time. More than this, sounds may alter or disappear with scarcely a comment even from the most sensitive of historians. Thus, while we may utilize the techniques of modern recording and analysis to study contemporary soundscapes, for the foundation of historical perspectives, we will have to turn to earwitness accounts from literature and mythology, as well as to anthropological and historical records.

*Earwitness* The first part of the book will be particularly indebted to such accounts. I have always attempted to go directly to sources. Thus, a writer is trustworthy only when writing about sounds directly experienced and intimately known. Writing about other places and times usually results in counterfeit descriptions. To take an obvious instance, when Jonathan Swift describes Niagara Falls as making "a terrible squash" we know he never visited the place; but when Chateaubriand tells us that in 1791 he heard the roar of Niagara eight to ten miles away, he provides us with useful information about the ambient sound level, against which that of today could be measured. When a writer writes uncounterfeitingly about directly apprehended experiences, the ears may sometimes play tricks on the brain, as Erich Maria Remarque discovered in the trenches during the First World War when he heard shells exploding about him followed by the rumble of the distant guns that fired them. This aural illusion is perfectly accountable, for as the shells were traveling at super-

sonic speeds they arrived in advance of the sounds of their original detonations; but only someone trained in acoustics could have predicted this. *All Quiet on the Western Front* is convincing because the author was there. And we trust him when he describes other unusual sound events—for instance, the sounds made by dead bodies. "The days are hot and the dead lie unburied. We cannot fetch them all in, if we did we should not know what to do with them. The shells will bury them. Many have their bellies swollen up like balloons. They hiss, belch, and make movements. The gases in them make noises." William Faulkner also knew the noise of corpses, which he described as "little trickling bursts of secret and murmurous bubbling."

In such ways is the authenticity of the earwitness established. It is a special talent of novelists like Tolstoy, Thomas Hardy and Thomas Mann to have captured the soundscapes of their own places and times, and such descriptions constitute the best guide available in the reconstruction of soundscapes past.

*Features of the Soundscape* What the soundscape analyst must do first is to discover the significant features of the soundscape, those sounds which are important either because of their individuality, their numerousness or their domination. Ultimately some system or systems of generic classification will have to be devised, and this will be a subject for the third part of the book. For the first two parts it will be enough to categorize the main themes of a soundscape by distinguishing between what we call *keynote sounds*, *signals* and *soundmarks*. To these we might add *archetypal* sounds, those mysterious ancient sounds, often possessing felicitous symbolism, which we have inherited from remote antiquity or prehistory.

*Keynote* is a musical term; it is the note that identifies the key or tonality of a particular composition. It is the anchor or fundamental tone and although the material may modulate around it, often obscuring its importance, it is in reference to this point that everything else takes on its special meaning. Keynote sounds do not have to be listened to consciously; they are overheard but cannot be overlooked, for keynote sounds become listening habits in spite of themselves.

The psychologist of visual perception speaks of "figure" and "ground," the figure being that which is looked at while the ground exists only to give the figure its outline and mass. But the figure cannot exist without its ground; subtract it and the figure becomes shapeless, nonexistent. Even though keynote sounds may not always be heard consciously, the fact that they are ubiquitously there suggests the possibility of a deep and pervasive influence on our behavior and moods. The keynote sounds of a given place are important because they help to outline the character of men living among them.

The keynote sounds of a landscape are those created by its geography

and climate: water, wind, forests, plains, birds, insects and animals. Many of these sounds may possess archetypal significance; that is, they may have imprinted themselves so deeply on the people hearing them that life without them would be sensed as a distinct impoverishment. They may even affect the behavior or life style of a society, though for a discussion of this we will wait until the reader is more acquainted with the matter.

Signals are foreground sounds and they are listened to consciously. In terms of the psychologist, they are figure rather than ground. Any sound can be listened to consciously, and so any sound can become a figure or signal, but for the purposes of our community-oriented study we will confine ourselves to mentioning some of those signals which *must* be listened to because they constitute acoustic warning devices: bells, whistles, horns and sirens. Sound signals may often be organized into quite elaborate codes permitting messages of considerable complexity to be transmitted to those who can interpret them. Such, for instance, is the case with the *cor de chasse*, or train and ship whistles, as we shall discover.

The term *soundmark* is derived from landmark and refers to a community sound which is unique or possesses qualities which make it specially regarded or noticed by the people in that community. Once a soundmark has been identified, it deserves to be protected, for soundmarks make the acoustic life of the community unique. This is a subject to be taken up in Part Four of the book, where the principles of acoustic design will be discussed.

I will try to explain all other soundscape terminology as it is introduced. At the end of the book there is a short glossary of terms which are either neologistic or have been used idiosyncratically, in case doubt exists at any point in the text. I have tried not to use too many complex acoustical terms, though a knowledge of the fundamentals of acoustics and a familiarity with both musical theory and history is presupposed.

*Ears and Clairaudience* We will not argue for the priority of the ear. In the West the ear gave way to the eye as the most important gatherer of information about the time of the Renaissance, with the development of the printing press and perspective painting. One of the most evident testaments of this change is the way in which we have come to imagine God. It was not until the Renaissance that God became portraiture. Previously he had been conceived as sound or vibration. In the Zoroastrian religion, the priest Srosh (representing the genius of hearing) stands between man and the pantheon of the gods, listening for the divine messages, which he transmits to humanity. *Samā* is the Sufi word for audition or listening. The followers of Jalal-ud-din Rumi worked themselves into a mystical trance by chanting and whirling in slow gyrations. Their dance is thought by some scholars to have represented the solar system, recalling also the deep-rooted mystical belief in an extraterrestrial music, a Music of the Spheres, which the attuned soul may at times hear. But these

exceptional powers of hearing, what I have called clairaudience, were not attained effortlessly. The poet Saadi says in one of his lyric poems:

I will not say, my brothers, what *samā* is  
Before I know who the listener is.

Before the days of writing, in the days of prophets and epics, the sense of hearing was more vital than the sense of sight. The word of God, the history of the tribe and all other important information was heard, not seen. In parts of the world, the aural sense still tends to predominate.

... rural Africans live largely in a world of sound—a world loaded with direct personal significance for the hearer—whereas the western European lives much more in a visual world which is on the whole indifferent to him. . . . Sounds lose much of this significance in western Europe, where man often develops, and must develop, a remarkable ability to disregard them. Whereas for Europeans, in general, “seeing is believing,” for rural Africans reality seems to reside far more in what is heard and what is said. . . . Indeed, one is constrained to believe that the eye is regarded by many Africans less as a receiving organ than as an instrument of the will, the ear being the main receiving organ.

Marshall McLuhan has suggested that since the advent of electric culture we may be moving back to such a state again, and I think he is right. The very emergence of noise pollution as a topic of public concern testifies to the fact that modern man is at last becoming concerned to clean the sludge out of his ears and regain the talent for clairaudience—clean hearing.

*A Special Sense* Touch is the most personal of the senses. Hearing and touch meet where the lower frequencies of audible sound pass over to tactile vibrations (at about 20 hertz). Hearing is a way of touching at a distance and the intimacy of the first sense is fused with sociability whenever people gather together to hear something special. Reading that sentence an ethnomusicologist noted: “All the ethnic groups I know well have in common their physical closeness and an incredible sense of rhythm. These two features seem to co-exist.”

The sense of hearing cannot be closed off at will. There are no earlids. When we go to sleep, our perception of sound is the last door to close and it is also the first to open when we awaken. These facts have prompted McLuhan to write: “Terror is the normal state of any oral society for in it everything affects everything all the time.”

The ear's only protection is an elaborate psychological mechanism for filtering out undesirable sound in order to concentrate on what is desirable. The eye points outward; the ear draws inward. It soaks up information. Wagner said: “To the eye appeals the outer man, the inner to the ear.” The

ear is also an erotic orifice. Listening to beautiful sounds, for instance the sounds of music, is like the tongue of a lover in your ear. Of its own nature then, the ear demands that insouciant and distracting sounds would be stopped in order that it may concentrate on those which truly matter.

Ultimately, this book is about sounds that matter. In order to reveal them it may be necessary to rage against those which don't. In Parts One and Two I will take the reader on a long excursion of soundscapes through history, with a heavy concentration on those of the Western world, though I will try to incorporate material from other parts of the world whenever it has been obtainable. In Part Three the soundscape will be subjected to critical analysis in preparation for Part Four, where the principles of acoustic design will be outlined—at least as far as they can be determined at the moment.

All research into sound must conclude with silence—a thought which must await its development in the final chapters. But the reader will clearly sense that this idea also links the first part of the book to the last, thus uniting an undertaking that is above all lyrical in character.

One final warning. Although I will at times be treating aural perception and acoustics as if they were abstractable disciplines, I do not wish to forget that the ear is but one sense receptor among many. The time has come to move out of the laboratory into the field of the living environment. Soundscape studies do this. But even they must be integrated into that wider study of the total environment in this not yet best of all possible worlds.

## PART ONE

### *First Soundscapes*

In those days men's ears heard sounds  
whose angelic purity cannot be conjured  
up again by any amount of science or magic.

HERMAN HESSE, *The Glass Bead Game*



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*Listening*

*Acoustic Ecology and Acoustic Design* The most important revolution in aesthetic education in the twentieth century was that accomplished by the Bauhaus. Many famous painters taught at the Bauhaus, but the students did not become famous painters, for the purpose of the school was different. By bringing together the fine arts and the industrial crafts, the Bauhaus *invented* the whole new subject of industrial design.

An equivalent revolution is now called for among the various fields of sonic studies. This revolution will consist of a unification of those disciplines concerned with the science of sound and those concerned with the art of sound. The result will be the development of the interdisciplines acoustic ecology and acoustic design.

Ecology is the study of the relationship between living organisms and their environment. Acoustic ecology is therefore the study of sounds in relationship to life and society. This cannot be accomplished by remaining in the laboratory. It can only be accomplished by considering on location the effects of the acoustic environment on the creatures living in it. The whole of this book up to the present chapter has had acoustic ecology as its theme, for it is the basic study which must precede acoustic design.

The best way to comprehend what I mean by acoustic design is to regard the soundscape of the world as a huge musical composition, unfolding around us ceaselessly. We are simultaneously its audience, its performers and its composers. Which sounds do we want to preserve, encourage, multiply? When we know this, the boring or destructive sounds will become conspicuous enough and we will know why we must eliminate them. Only a total appreciation of the acoustic environment can give us

the resources for improving the orchestration of the soundscape. Acoustic design is not merely a matter for acoustic engineers. It is a task requiring the energies of many people: professionals, amateurs, young people—anyone with good ears; for the universal concert is always in progress, and seats in the auditorium are free.

Acoustic design should never become design control from above. It is rather a matter of the retrieval of a *significant aural culture*, and that is a task for everyone. Nevertheless, in provoking this design concern, certain figures have important roles to play. In particular, composers, who have too long remained aloof from society, must now return to give assistance to human navigation. Composers are architects of sounds. They have had the most experience devising effects to bring about specific listener responses, and the best of them are masters at modulating the flow of these effects to provide complex and variable experiences which some philosophers have described as a metaphor for the life-experience itself.

But composers are not yet ready to assume the leadership role in reorchestrating the world environment. Some are still devoting themselves with waspish bitterness to a Parnassus of two or three. Others, sensing the importance of the larger theme of environmental reconstruction, are fumbling ineptly with it, betrayed by inexperience or hedonism. I recall meeting a young Australian composer who told me he had given up writing music after becoming infatuated with the beauties of cricket song. But when asked how, when and why crickets sang, he couldn't say; he just liked taping them and playing them back to large audiences. I told him: a composer owes it to the cricket to know such things. Craftsmanship is knowing all about the material one works with. Here is where the composer becomes biologist, physiologist—himself cricket.

The true acoustic designer must thoroughly understand the environment he is tackling; he must have training in acoustics, psychology, sociology, music, and a great deal more besides, as the occasion demands. There are no schools where such training is possible, but their creation cannot long be delayed, for as the soundscape slumps into a lo-fi state, the wired background music promoters are already commandeering acoustic design as a *bellezza* business.

*The Modules for Acoustic Design* A module is a basic unit to be used as a guide for measuring. In the human environment it is the human being who forms the basic module. When architects organize spaces for human habitation, they use the human anatomy as their guide. The doorframe accommodates the human frame, the stair the human foot, the ceiling the human stretch. To demonstrate the binding relationship between architectural space and the human beings for whom it is created, Le Corbusier made a man with an upstretched arm his modular symbol and imprinted it on all his buildings.

The basic modules for measuring the acoustic environment are the

human ear and the human voice. Throughout this book I have been thumping the theory that the only way we can comprehend extrahuman sounds is in relationship to sensing and producing sounds of our own. To know the world by experience is the first desideratum. Beyond that lie the wonderful exercises of the imagination—the music of the stones, the music of the dead, the Music of the Spheres—but they are only comprehensible by comparison with what we can hear or echo back ourselves.

We know a good deal about the behavior and tolerances of the ear and the voice. When, as today, environmental sound reaches such proportions that human vocal sounds are masked or overwhelmed, we have produced an inhuman environment. When sounds are forced on the ear which may endanger it physically or debilitate it psychologically, we have produced an inhuman environment.

There are few sounds in nature that interfere with our ability to communicate vocally and almost none that in any way pose a threat to the hearing apparatus. It is interesting to consider, for instance, that while the naked voice can be raised to quite a loud level (say about 80 decibels at a distance of a few feet), it cannot be raised in normal human intercourse to a point where it might endanger the ear (over 90 decibels).<sup>\*</sup> In discriminating against low-frequency sounds, the human ear conveniently filters out deep body sounds such as brainwaves and the movement of blood in our veins. Also, the human hearing threshold has been set conveniently just beyond a level which would introduce a continuous recital of air molecules crashing together. The quiet efficiency of all body movements is another stroke of genius. And has anyone speculated on how inconvenient it would be if the ears, instead of being placed on the side of the head, had been placed next to the mouth, where they would have been subjected to close-quarter vocal garrulity and soup-slurping?

God was a first-rate acoustical engineer. We have been more inept in the design of our machines. For noise represents escaped energy. The perfect machine would be a silent machine: all energy used efficiently. The human anatomy, therefore, is the best machine we know and it ought to be our model in terms of engineering perfection.

Contrary to these simple lessons in acoustic ecology, we live in a time when human sound is often suppressed while mechanical jabberware is encouraged. While some of our students were measuring the noise of a downtown construction site in Vancouver, they were entertained by some members of the Hare Krishna sect, an Eastern movement dedicated to the worship of God with song in the streets. In 1971 this group was arrested under the noise abatement by-law, was convicted, appealed the conviction and lost the appeal. This by-law expressly excludes all noise made by construction and demolition equipment—though the students discovered

<sup>\*</sup>From Scarborough, England, comes the news that a British fisherman won what was billed as the World Shouting Competition by raising his voice to 3 decibels at a distance of three meters.



that such noise often ran as high as 90 decibels at precisely the point where the Hare Krishna singers were arrested. True, singing or hawking in the streets is frequently annoying; but when it disappears, so does humanism.

*Ear Cleaning* The first task of the acoustic designer is to learn how to listen. *Ear cleaning* is the expression we use here. Many exercises can be devised to help cleanse the ears, but the most important at first are those which teach the listener to respect silence. This is especially important in a busy, nervous society. An exercise we often give our students is to declare a moratorium on speech for a full day. Stop making sounds for a while and eavesdrop on those made by others. It is a challenging and even frightening exercise and not everyone can accomplish it, but those who do speak of it afterward as a special event in their lives.

On other occasions we prepare for listening experiences with elaborate relaxation or concentration exercises. It may take an hour of preparation in order to be able to listen clairaudiently to the next.

Sometimes it is useful to seek out one sound with particular characteristics. For instance, try to find a sound with a rising starting pitch, or one that consists of a series of short nonperiodic bursts; try to find one that makes a dull thud followed by a high twitter; or one that combines a buzz and a squeak. Such sounds will not be found in every environment, of course, but the listener will be forced to inspect every sound carefully in the search. There are numerous other exercises like this in my music education booklets.\*

Sometimes it is useful to document only single sounds in the soundscape in order to get a better impression of their frequency and patterns of occurrence. Car horns, motorcycles, airplanes can be counted by anyone with ears, and it is surprising how discriminating one becomes when isolating one sound from many. Social surveys can also be conducted simultaneously in which citizens are asked to estimate the number of such sounds they imagine occur over a given time period. In repeated exercises of this sort, we have discovered that the imagined traffic is much below the actual volume—often as much as 90 percent. For instance, when we asked West Vancouverites to estimate the number of seaplane flights over their homes in 1969, the average estimate was 8 per day compared with an actual count of 65. In 1973 the same experiment was repeated in the same area. This time the average estimate had risen to 16, but the actual count had also risen to 106. Exercises like this extend ear cleaning to a wider public. To be reminded of a sound is to think about it; to miss it is to listen for it next time.

The tape recorder can be a useful adjunct to the ear. Trying to isolate a sound for high-fidelity recording always reminds the ear of details in the

\* *The Composer in the Classroom, Ear Cleaning, The New Soundscape, When Words Sing*, Toronto, 1965, etc.

soundscape that have previously gone unnoticed. Sound events and soundscapes can be recorded for later analysis and if merited can be permanently stored for the future. It goes without saying that only the best tape recorders should be used for this purpose. When we record sounds we provide them with cards giving the following information:

No. \_\_\_\_\_ Title: \_\_\_\_\_

Date recorded: \_\_\_\_\_ Name of recordist: \_\_\_\_\_

Equipment used: \_\_\_\_\_ 7½ i.p.s. mono \_\_\_\_\_

\_\_\_\_\_ 15 i.p.s. stereo \_\_\_\_\_

\_\_\_\_\_ other quadraphonic \_\_\_\_\_

Place recorded: \_\_\_\_\_ Distance from source: \_\_\_\_\_

Atmospheric conditions: \_\_\_\_\_ Intensity: \_\_\_\_\_ dBA

\_\_\_\_\_ dBB

\_\_\_\_\_ dBC

Historical observations: \_\_\_\_\_

Sociological observations: \_\_\_\_\_

Additional observations: \_\_\_\_\_

Names, ages, occupations and addresses of local people interviewed: \_\_\_\_\_

Sounds threatened with extinction should be noted in particular and should be recorded before they disappear. The vanishing sound object should be treated as an important historical artifact, for a carefully recorded archive of disappearing sounds could one day be of great value. We are currently building such an archive. Our list is very extensive, but a few examples will suffice for illustration.

The ringing of old cash registers.  
Clothes being washed on a washboard.  
Butter being churned.  
Razors being stropped.  
Kerosene lamps.  
The squeak of leather saddlebags.  
Hand coffee grinders.  
Rattling milk cans on horse-drawn vehicles.  
Heavy doors being clanked shut and bolted.  
School hand bells.  
Wooden rocking chairs on wooden floors.  
The quiet explosion of old cameras.  
Hand-operated water pumps.

We train students in soundscape recording by giving them specific sounds to record: a factory whistle, a town clock, a frog, a swallow. It is not easy if the result is to be "clean," without distracting interferences. How often has the novice recordist, sent out to record a "complete" passage of an aircraft, switched off the machine before the sound has dropped totally below the ambience? Even the life of the more experienced recordist is often hazardous. On one occasion, for example, a small boy had watched our recording team setting up their sound level equipment and tape recorders to measure and record a particular noon whistle. Just as it began, the boy, who had been carelessly left next to a microphone, said: "Is that the whistle you want, mister?"

One of the recordist's biggest problems is to devise ways of recording social settings without interrupting them. The equipment is conspicuous, and in many situations so is the recordist. Peter Huse catches this in a few lines from his poem *Waves*.

we stagger into a lounge.

Bruce in my leather trenchcoat squeaks  
and points the way with his goatee as I,

tweedpocket patched with tape,  
floppy beret  
wired with earphones, and gold-heavy

Nagra  
digging into my shoulder,  
cutting two tracks, I

angle the mikes in the handset as if  
the machine is off but  
the pots are ganged together at 83,

it's on RECORD and hidden inside the leather case  
Scotch 206 crosses the heads onto  
the take-up reel and we're getting

overlapping heart-shapes of late night  
fluorescent ferry atmosphere, a blonde siren  
looms toward us.

(Zoom-in jerky, wobbling frame. Engine rumble.  
Door swinging. Close-up: her twisted face left  
centre looking left. Shuffling, scraping of chairs. A  
few slurred voices, hers loudest, grates the most.)

Note bleached hair. Smell her  
boozy breath. She's drunk and that and hard up.

(Cut to get whole grouping: Tintoretto/home movie  
only harsh lights, blue filter. Two men laugh.)

She waves to us, she is singing  
"I wanna hol' your han' . . ."  
and we get it on tape.

*A Tourist in the Soundscape* The student of acoustic design should keep a soundscape diary, constantly noting interesting variations in sounds from place to place and time to time. The ear is always much more alert while traveling in unfamiliar environments, as proved by the richer travelogue literature of numerous writers whose normal content is acoustically less distinguished. This at least seems to be true of such authors as Thoreau, Heinrich Heine and Robert Louis Stevenson. Returning from a trip to Rio de Janeiro (1969), an American student was able to produce a much more vivid account of the Brazilian soundscape than of the city in which he lived.

#### *Rio de Janeiro*

Street hawkers  
Bargaining in the marketplace  
Live chickens and birds in the markets  
Man going around swatting flies in restaurants  
Ice being chipped from blocks (no crushed ice)  
Cars and wagons on cobblestones  
Street cleaners sweeping by hand  
Strange dial tone, busy signal and ringing  
of telephones  
Predominance of old cars from 40s and 50s  
Singing and dancing in the streets; music  
echoing through the whole city from  
amplifiers (Carnival)  
Old hand-operated elevators  
Steam engines in the country  
Total silence in the classroom when  
teacher enters  
No electrical machines in businesses  
and banks  
250,000 people shouting together  
in a stadium  
Cockatoos  
Monkeys  
Cutting of jacaranda

#### *New York*

Traffic  
Horns of taxis  
Bums on streets  
in the Village  
Busses  
Subway trains  
Foreign languages  
on streets and  
in restaurants  
Occasional drunks  
on streets at  
night  
Police sirens

When one travels, new sounds snap at the consciousness and are thereby lifted to the status of figures. But the acoustic designer must be trained to perceive all aspects of *any* soundscape unmistakably, otherwise how should he be able to adjudicate it properly? How should he be able

to gauge the effect of signals and soundmarks and know the function of keynotes and background sounds?

It is not enough to remain a tourist in the soundscape, but it is a useful stage in the training program. It enables a person to become detached from the functioning environment in order to perceive it as an object of curiosity and aesthetic enjoyment. Like tourism itself, this type of perception is a recent development in the evolution of human civilization. As the American geographer David Lowenthal has written: "Perception of *scenery* is only open to those who have no real part to play in the landscape." Lowenthal illustrates the observation with quotations from Mark Twain and William James.

To Mark Twain's steamboat traveler, the sunset glows eloquently over the rippling silvery water. To the pilot however: "This sun means that we are going to have wind tomorrow . . . that slanting mark on the water refers to a bluff reef which is going to kill somebody's steamboat one of these nights . . . that silver streak in the shadow of the forest is the 'break' from a new snag."

William James, an early tourist in North Carolina, was able to register the defacement of a beautiful forest by the farmers: "But, when *they* looked on the hideous stumps, what they thought of was personal victory. The chips, the girdled trees, and the vile split rails spoke of honest sweat, persistent toil and final reward." To James, however, "The impression on my mind was one of unmitigated squalor. The settler had . . . cut down the more manageable trees, and left their charred stumps. . . . The larger trees he had girdled and killed . . . and had set up a tall zigzag rail fence around the scene of his havoc. . . . The forest had been destroyed; and what had 'improved' it out of existence was hideous, a sort of ulcer, without a single element of artificial grace to make up for the loss of Nature's beauty."

Because of his dependence on visual stimuli, modern man has allowed himself to be led by the tourist industry into believing that tourism consists simply of sightseeing. But the sensitive human being knows that environment is not merely what is seen or possessed. A good tourist inspects the whole environment, critically and aesthetically. He never merely "sightsees"; he hears, smells, tastes and touches. A tourist of the soundscape would demand not *Sehenswürdigkeiten* but *Hörenswürdigkeiten*. With increased leisure all men could become tourists of the soundscape, remembering affectionately the entertainment of soundscapes visited. All it would take is a little travel money and sharp ears.

*Soundwalks* A listening walk and a soundwalk are not quite the same thing, or at least it is useful to preserve a shade of distinction between them.

A listening walk is simply a walk with a concentration on listening. This should be at a leisurely pace, and if it is undertaken by a group, a good rule is to spread out the participants so that each is just out of earshot of

the footsteps of the person in front. By listening constantly for the footsteps of the person ahead, the ears are kept alert; but at the same time a privacy for reflection is afforded. Sounds heard and missed can be discussed afterward.

The soundwalk is an exploration of the soundscape of a given area using a score as a guide. The score consists of a map, drawing the listener's attention to unusual sounds and ambiances to be heard along the way. A soundwalk might also contain ear training exercises. For instance, the pitches of different cash registers or the duration of different telephone bells could be compared. Eigentones could be sought in different rooms and passages.\* Different walking surfaces (wood, gravel, grass, concrete) could be explored. "If I can hear my footsteps as I walk, I know I am in an ecological environment," said a student. When the soundwalker is instructed to listen to the soundscape, he is audience; when he is asked to participate with it, he becomes composer-performer. In one soundwalk a student asked participants to enter a store and to tap the tops of all tinned goods, thus turning the grocery store into a Caribbean steel band. In another, participants were asked to compare the pitches of drainpipes on a city street; in another, to sing tunes around the different harmonics of neon lights.

A series of ingenious soundwalks ought to be of interest to the tourist industry, and it would be of great value also in introducing ear cleaning into schools.

Exercises such as these are the root of the acoustic design program. Yet they require no expensive equipment and they do not camouflage simple acoustic facts with pictures or statistical displays which, being silent, are *not acoustic information*.

When a school of acoustic design worthy of the title finally comes into existence, ear cleaning must be its basic course.

\**Eigenton* is the German word used to refer to the fundamental resonance of a room, produced by the reflection of sound waves between parallel surfaces. It can be located empirically by singing different notes. The room (particularly an empty one) will resonate quite loudly in unison with the voice when the right note is sounded.