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THE MUSIC OF THE ENVIRONMENT

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The soundscape of the world is changing. Modern man is beginning to inhabit a world with an acoustical environment radically different from any he has hitherto known. These new sounds, which differ in quality and intensity from those of the past, have already alerted researchers to the dangers of the imperialistic spread of more and larger sounds into every corner of man's life. In various parts of the world important research is being undertaken in many independent areas of sonic studies: acoustics, psychoacoustics, otology, audiology, noise abatement practices and procedures, communications and sound recording engineering (electroacoustics and electronic music), aural pattern perception and the structural analysis of speech and music. These researches are related; each is dealing with aspects of the world soundscape, the vast musical composition which is unfolding around us ceaselessly. In one way or another researchers engaged on these various themes are asking the same questions: what is the relationship between man and the sounds of his environment and what happens when these sounds change? 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? These researches have been given an additional impetus lately since noise pollution has now emerged as 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. 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. Ear cleaning in the schools to eliminate audiometry in factories. Clairaudience, not ear muffs.

The following thoughts are crosshatchings on this theme designed to suggest how a new subject of acoustic design might develop, knitting together scientific discipline and artistic imagination.

The Musician is an Architect of Sounds

Throughout this essay I am going to treat the world soundscape as a macrocosmic musical composition. This is perhaps 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 heard around us whether
we're in or out of concert halls: cf. Thoreau.⁽¹⁾

The reference is to Thoreau's Walden where the author experiences in the sounds and sights of nature an inexhaustible entertainment.

There are two basic ideas of what music is or ought to be. These may be seen 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 on hearing the heart-rending cries of Medusa's sisters after Perseus had killed the Gorgon. In a Homeric hymn to Hermes an alternative origin is proposed. 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. In the former myth, music is conceived as subjective emotion breaking forth from the human breast; in the latter it is external sound possessing secret unitary properties. This is the anāhata of the Indian theorists and the music of the spheres of Pythagoras. It suggests that the universe is held together by the harmonies of some precise acoustic design, serene and mathematical. For many decades, however, it is the other view of music that has dominated Western musical thought. This is the musical expression of the romanticist. Its tempo fluctuations, dynamic shadings and tonal colourings are the means by which the subjective and irrational art of the virtuoso artist is created.

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.

First Sound

What was the first sound heard? It was the caress of the waters.

Some say that all gods and all living creatures originated in the stream of Oceanus which girdles the world, and that Tethys was the mother of all his children.⁽²⁾

The ocean of our ancestors is reproduced in the watery womb of our mother and is chemically related to it. Ocean and Mother. In the dark liquid of ocean the relentless masses of water pushed past the first sonar ear. As the ear of the foetus turns in its amniotic fluid, it too is tuned to the lap and gurgle of water. At first it is the submarine resonance of the sea, not yet the splash of wave. But then--

...the waters little by little began to move, and at the movement of the waters the great fish and the scaly creatures were disturbed, and the waves began to roll in double breakers, and the beings that dwell in the waters were seized with fear and as the breakers rushed together in pairs the roar of the ocean grew loud, and the spray was lashed into fury, and garlands of foam arose, and the great ocean opened to its depths, and the waters rushed hither and thither, the furious crests of their waves meeting this way and that.⁽³⁾

Waves whipped into surf, pelting the first rocks as the amphibian ascends from the sea. And although he may occasionally turn his back on the waves he will never escape their atavistic charm. "The wise man delights in water" says Lao Tzŭ. The roads of man all lead to water. It is the

fundamental of the original soundscape and the sound which above all others gives us the most delight in its myriad transformations.

Voices of the Sea

At Oostende the strand is wide, with a scarcely perceptible rake across to the hotels, so that standing there one has the impression that the sea in the distance is higher than the beach and that sooner or later everything will be lifted away to oblivion by an enormous soft tidal wave. Totally otherwise is the Adriatic at Trieste, where the mountains leap into the ocean with an angular energy and the angry fists of the waves bounce noisily off rocks like India rubber balls. At Oostende the nexus of land is gentle in both vista and tone.

There are no rocks on which to sit at Oostende and so one walks along for miles, south with the waves in the right ear, and north with the waves in the left ear, filling an atavistic consciousness with the full-frequencied throb of water. All roads lead to water. Given the chance, probably all men would live at the edge of the element, within earshot of its moods night and day. We wander from it but the departure is always temporary.

Day after day one walks along the strand, listening to the indolent splashing of the wavelets, gauging the gradual crescendo to the heavier treading and on to the organized warfare of the breakers. The mind must be slowed to catch the million transformations of the water, on sand, on shale, against driftwood, against the seawall. Each drop tinkles at a different pitch,

each wave sets a different filtering on an inexhaustible supply of white noise. Some sounds are discrete, others continuous. In the sea the two fuse in primordial unity. The rhythms of the sea are many: infrabiological -- for the water changes pitch and timbre faster than the ear's resolving power to catch its changes; biological -- the waves rhyme with the patterns of heart and lung and the tides with night and day; and supra-biological -- the eternal inextinguishable presence of water. "Observe measures", says Hesiod in Works and Days; "I will show you the measures of the much-thundering sea."

para thina polyphloisboio thalassēs

says Homer (Iliad I:34) catching onomatopoeically the splendid armies of waves on the sea beach and their recession. Canto Two of Ezra Pound begins,

And poor old Homer blind, blind as a bat.
Ear, ear for sea-surge....

The love of ocean has profound sources and they are recorded in a vast maritime literature of East and West. When water watches the history of the tribe, fingers of ocean grasp the epic. The prime material over which the Odyssey is strung is the ocean. Ezra Pound's Cantos too, open on the ocean, play out much of their dialectic at its edge, move away and then return.

The sea was the fundamental sound of all maritime civilizations. It is the sonic archetype with the most fertile symbolism.

The Transformations of Water: Frozen Water

Water never dies. It lives forever reincarnated as rain, as bubbling brooks, as waterfalls and fountains, as swirling rivers and deep sulking rivers. No two raindrops sound alike. Is then the sound of Persian rain the same as that of the Azores? A mountain stream is a chord of several notes strung out stereophonically across the path of the attentive listener. Water never dies and the wise man rejoices in it.

In vast northern areas of the earth water has a special resonance. The sounds of ice and snow form the fundamental of the northern hinterland as surely as the sea is the keynote of maritime life. The sound of snow underfoot at 40 degrees below zero in Manitoba is different from that in barely freezing Toronto. The Eskimos have at least a dozen words to describe the various states of snow, a nuancing which is absent in, say, the Italian language, where experience with this substance is limited. The squeak of cutter-runners over hard packed snow defies description to those who have not experienced it; though in Canada it has been overwhelmed in recent years by the snarl of the snowmobile. Another indescribable experience for the Northerner is the crack of spring ice on the rivers, as memorable a sound as any geography has ever produced. I have frequently tried to get students to invent onomatopoeic words for the various forms of frozen water that form the keynote of their soundscape for upwards of 6-8 months each year. It seems the Canadian language might be enriched in the same way poets enriched the Greek with their insistence on the "much-thundering sea."

Wind and Rain

Geography and climate provide vernacular notes to the soundscape, for each part of the world has its characteristic sounding elements. In tropical countries it is the torrential rain.

The thunder boomed out overhead and they could hear the rain rushing across the fields. In a moment it was drumming on the iron roof with a deafening noise....⁽⁴⁾

On the dry Saskatchewan prairie it is the wind which is characteristic and ubiquitous.

The wind could be heard in a more persistent song now, and out along the road separating the town from the prairie, it fluted gently along the wires that ran down the highway... The night wind had two voices; one that keened along the pulsing wires, the prairie one that throated long and deep.⁽⁵⁾

Treeless and open, the Canadian prairies are an enormous wind harp, vibrating incessantly with "the swarming hum of the telephone wires." In the more sheltered English countryside, the wind sets the leaves shimmering in diverse tonalities.

To dwellers in a wood almost every species of tree has its voice as well as its feature. At the passing of the breeze the fir trees sob and moan no less distinctly than they rock; the holly whistles as it battles with itself; the ash hisses amid its quiverings; the beech rustles while its flat boughs rise and fall. And winter, which modifies the note of such trees as shed their leaves, does not destroy its individuality.⁽⁶⁾

Apocalyptic Sounds

Perhaps the universe was created silently. We do not know. The dynamics of the wonder which introduced our planet were without human ears to hear them. But the prophets exercised their imagination over the event. "In

the beginning was the word" says John; God's presence was first announced as a mighty vibration of cosmic sound. The prophets had a vision of the end also making a mighty noise.

Howl ye; for the day of the Lord is at hand...
I will shake the heavens, and the earth shall
remove out of her place, in the wrath of the
Lord of hosts in the day of his fierce anger.(7)

By the din of the drums of resurrection they
have pressed tight their two ears in terror.(8)

So when the Trumpet is blown with a single
blast and the earth and the mountains are lifted
up and crushed with a single blow, on that
day shall Terror come to pass.(9)

In the imagination of the prophets the end of the world was to be signalled by a mighty din, a din more ferocious than the loudest sound they could imagine: more ferocious than any known storm, more outrageous than any thunder.

The loudest noise heard on this earth within living memory was the explosion of the caldera Krakatoa in Irlonesia on August 26 and 27, 1883. The actual sounds were heard as far away as the island of Rodriguez, a distance of nearly 4,500 kilometers. On no other occasion have sounds been perceived at such great distances. The shaded portion of the map (illustration one) represents the area over which the sounds were heard on August 27 (each dot represents a reporting station) and together they are equal to slightly less than one-thirteenth of the entire surface of the globe.

It is difficult for the human being to imagine an apocalyptic noise as it is for him to imagine a definitive silence. Both experiences exist in

theory only for the living since they set limits to life itself, though they may become unconscious goals towards which the aspirations of different societies are drawn. It is disconcerting to realize that the ferocious acoustical environment modern man is beginning to produce betrays an escatological thrust.

Clairaudience

We will not argue for the priority of the ear. Modern man, who seems to be in the process of deafening himself apparently regards this as a trivial mechanism. In the West the ear has given way to the eye as the most important gatherer of environmental information. 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 Middle East the message of Mohammed is still heard through the recitation of his Koran. Sāma is the Sufi word for audition or listening. The followers of Jalāl al-Dīn Rūmī worked themselves into the sāma state by whirling in mystical dances. Their dancing is thought by some scholars to have represented the solar system, recalling also the deep-rooted mystical belief in the music of the spheres, which the attuned soul could at times hear. In the Zoroastrian religion the priest Srosh (representing the genius of hearing) stands between man and the pantheon of the gods transmitting the divine messages to humanity.

When man was fearful of the dangers of an unexplored environment, the whole body was an ear. In the virgin forests of North America, where vision was restricted to a few feet, hearing was the most important sense. The Leather-

Stocking Tales of Fenimore Cooper are full of beautiful and terrifying surprises.

...for, though the quiet deep of solitude reigned in that vast and nearly boundless forest, nature was speaking with her thousand tongues, in the eloquent language of night in the wilderness. The air sighed through ten thousand trees, the water rippled, at places, even roared along the shores; and now and then was heard the creaking of a branch, or a trunk, as it rubbed against some object similar to itself, under the vibrations of a nicely balanced body... When he desired his companions, however, to cease talking, in the manner just mentioned, his vigilant ear had caught the peculiar sound that is made by the parting of a dried branch of a tree, and which, if his senses did not deceive him, came from the western shore. All who are accustomed to that particular sound will understand how readily the ear receives it, and how easy it is to distinguish the tread which breaks the branch from every other noise of the forest... "Can the accursed Iroquois have crossed the river, already, with their arms and without a boat?" (10

The Rural Soundscape

When men lived mostly in isolation or in small communities their ears operated with seismographic delicacy. In the rural soundscape sounds are generally uncrowded, surrounded by pools of stillness. For the farmer, the pioneer or the woodsman the minutest sounds have significance. The shepherd, for instance, can determine from sheep bells the precise state of his flock.

Just before dawn he was assisted in waking by the abnormal reverberation of familiar music... In the solemn calm of the awakening morn that note was heard by Gabriel beating with unusual violence and rapidity. This exceptional ringing may be caused in two ways - by the rapid feeding of the sheep bearing the bell, as when the flock breaks into new pasture, which gives it an intermittent rapidity, or by the sheep starting off in a run, when the sound has a regular palpitation. (11

The sounds of the environment signalled in many ways.

He was disturbed in his meditation by a grating noise from the coach-house. It was the vane on the roof turning round, and this change in the wind was the signal for a disastrous rain. (12)

Even when sounds had no special messages, poets among men knew how to make larger interpretations of them. Goethe, his ear pressed to the grass:

When I hear the humming of the little world among the stalks, and am near the countless indescribable forms of the worms and insects, then I feel the presence of the Almighty, Who created us in His own image.... (13)

When Phillip Grove travelled the Manitoba prairies in his buggy in 1916, often by night or in dense marsh fog, he travelled by ear as much as eye.

I had become all ear. Even though my buggy was silent and though the road was coated with a thin film of soft clay-mud, I could distinctly hear from the muffled thud of the horses' hoofs on the ground that they were running over a grade... I listened intently for the horses' thump. Yes, there was that hoof-beat again - I was on the last grade that led to the angling road across the corner of the marsh.... (14)

The Hi-Fi and the Lo-Fi Soundscape

A hi-fi system is one possessing a favourable signal to noise ratio. The hi-fi soundscape is one in which discrete sounds can be heard clearly because of the low ambient noise level. The country is generally more hi-fi than the city; night more than day; ancient times more than modern. In a hi-fi soundscape even the slightest disturbance can communicate interesting or vital information. The human ear is alert, like that of an animal.

...footfalls followed a round drive in the rear of the hotel, taking their tone in turn from the dust road, the crushed-stone walk, the cement steps and then reversing the process in going away. (15)

In a lo-fi soundscape individual acoustic signals are obscured in an over-dense population of sounds. The pellucid sound - a footstep in the snow, a train whistle in the distance or a church bell across the valley - is masked by broad-band noise. Perspective is lost. On a downtown street corner there is no distance; there is only presence. Everything is close-miked. There is cross-talk on all the channels, and in order for the most ordinary sounds to be heard they have to be monstrously amplified. In the ultimate lo-fi soundscape the signal to noise ratio is 1 to 1 and it is no longer possible to know what, if anything, is to be listened to.

Muscle Sounds I: The Industrial Revolution

The industrial revolution began to produce the lo-fi soundscape. Let us briefly chronicle its development. When industry first intruded into town life it was immediately conspicuous by the aberration of its novel noises. Stendhal, writing in 1830, noticed how it upset the rhythms of French provincial towns.

No sooner has one entered the town than one is startled by the din of a noisy machine of terrifying aspect. A score of weighty hammers, falling with a clang which makes the pavement tremble, are raised aloft by a wheel which the water of the torrent sets in motion. Each of these hammers turns out, daily, I cannot say how many thousands of nails. A bevy of fresh, pretty girls subject to the blows of these enormous hammers, the little scraps of iron which are rapidly transformed into nails. (16)

By the early twentieth century such sounds had become more acceptable to the urban ear, "blending" with the natural rhythms of antiquity. As Thomas Mann described it,

We are encompassed with a roaring like that of the sea; for we live almost directly on the swift-flowing river that foams over shallow ledges at no great distance from the poplar avenue... Upstream, in the direction of the

city, construction troops are building a pontoon bridge. Shouts of command and the thump of heavy boots on the planks sound across the river; also, from the further bank, the noise of industrial activity, for there is a locomotive foundry a little way downstream. Its premises have been lately enlarged to meet increased demands, and light streams all night long from its lofty windows. Beautiful glittering new engines roll to and fro on trial runs; a steam whistle emits wailing head-tones from time to time; muffled thunderings of unspecified origin shatter the air, smoke pours out of the many chimneys to be caught up by the wind and borne away over the wooded country beyond the river, for it seldom or never blows over to our side. Thus in our half-suburban, half-rural seclusion the voice of nature mingles with that of man, and over all lies the bright-eyed freshness of the new day.⁽¹⁷⁾

Ultimately the throb of the machine began to intoxicate man everywhere with its incessant vibrations.

As they worked in the fields, from beyond the now familiar embankment came the rhythmic run of the winding engines, startling at first, but afterwards a narcotic to the brain.⁽¹⁸⁾

Before long, the noises of modern industrial life swung the balance against those of nature. This significant flashpoint occurred about the time of the First World War, the first mechanized war of history. In 1913 the futurist Luigi Russolo proclaimed the event in his manifesto The Art of Noises:

In antiquity, life was nothing but silence. Noise was really not born before the 19th century, with the advent of industry. Today noise reigns supreme over human sensibility... In the pounding atmosphere of great cities as well as in the formerly silent countryside, machines create today such a large number of varied noises that pure sound, with its littleness and its monotony, now fails to arouse any emotion... Let's walk together through a great modern capital, with the ear more attentive than the eye, and we will vary the pleasures of our sensibilities by distinguishing among the gurglings of water, air and gas inside metallic pipes, the rumbling and rattlings of engines breathing with obvious animal spirits, the using and falling of pistons, the stridency of mechanical saws, the loud jumping of trolleys on their rails, the snapping of whips, the whipping of flags. We will have fun imagining our orchestration of department stores' sliding doors the hubbub of the crowds, the different roars of railroad stations, iron foundries, textile mills, printing houses, power plants and subways. And we must

not forget the very new noises of Modern Warfare. (19

Russolo invented an orchestra of noise makers, consisting of buzzers, howlers and other gadgets calculated to advance his philosophy. The "pastorale" and the "nocturne" give way before machine-music like Honneger's Pacific 231 (1924), an imitation of a locomotive, Antheil's Ballet mécanique (1926), which employed a number of airplane propellers, Prokofiev's Pas d'acier (Dance of Steel), Mossolov's Iron Foundry and Carlos Chávez's HP (Horsepower) all dating from 1929. This blurring of the edges between music and environmental sounds is the most striking feature of twentieth century music. Finally in the practices of musique concrète it became possible to insert any sound from the environment into a composition via tape; while in electronic music the hard-edge sound of the tone generator may be indistinguishable from the police siren or the electric tooth-brush.

Muscle Sounds II: The Internal Combustion Engine

The internal combustion engine now provides the fundamental sound of contemporary civilization. It is the keynote, as surely as water was the keynote of thalassocratic civilization, and the wind is the keynote of the steppes.

In the external combustion engine a load of water is mixed with a load of coal to produce driving energy. Coal and water are bulky and heavy. The steam locomotive was accordingly confined to public enterprises. The internal combustion engine is light and easy to operate; it transferred power to the individual. In industrially advanced societies the average citizen may

operate several internal combustion engines in the course of an average day (car, motorcycle, truck, lawnmower, tractor, generator pump, etc.) and its sound will be heard in his ear many hours each day.

When two swaths of broad-band noise of the same intensity are superposed the result is an increase of approximately three decibels. Two cars, each producing a sound of 80 decibels thus give a sound of 83 decibels. Assuming constant engine noise, each doubling of production in the automobile industry would give an elevation of three decibels of broad-band noise to the sonic environment. In fact, automobile engines are not uniformly constructed. The American manufacturers, for instance, produced their quietest automobiles about 1960. Since that time they have been getting louder as a result of the trend toward larger displacement engines and higher compression ratios; in 1971 the Detroit manufacturers began, in their sales campaigns, to make the higher radiated noise levels of their machines an advertised feature.

The 1971 Muscle Cars

This sleek, high-powered monster
is American Motors' 7 Javelin AMX.
Press the accelerator, it roars.
(Magazine advertisement.)

Illustration two shows the increases in various household machines in Canada over a decade, a rise far in excess of the population increase. In the United States also, more automobiles are manufactured annually than babies.

Even more dramatic is the increase of some industrial tools. In 1959 Canada manufactured \$8,596,000 worth of power chain saws; by 1969 this had risen to \$26,860,000. The power chain saw produces a sound of between 100 and

120 dBA giving it a sweepout in a quiet forest of 8-10 square kilometers. It is possible to theorize that by 1967 the combined ramming of the 147,941 power chain saws produced that year, if operated simultaneously, could cover about one-tenth of Canada's 9,222,977 square kilometers with their sound. As chain saws bang thrillingly throughout the forests of the world the contemporary woodsman loses all contact with the music of nature.

The verie essence and, as it were, spring-heade and origine of all musiche is the verie pleasaunte sounde which the trees of the forest do make when they growe. (20

Someone once observed - I think it was Aldous Huxley - that for contemporary urban man half the imagery of traditional poetry was lost. The same thing is happening to the soundscape, where the sounds of nature are being lost under the combined jamming of industrial machinery.

All machines share one important feature: they are low-information, high-redundancy sounds. Just as the sewing-machine gave us the long line in clothes, the motor gave us the flat line in sound. The flat continuous line in sound is an artificial construction; it is found rarely, if ever, in nature. A few years ago, while listening to the stone masons' hammers on the Takht-e-Jamshid in Teheran, I suddenly realized that in earlier societies the vast majority of sounds were discrete or interrupted, while today the majority are continuous. At what precise point in the history of the soundscape this took place is difficult to fix, but in the modern world the balance has turned and the result is that we are now subjected to a broadband noise that is both boring and hypnotic with suggestibility. This is only one of the important changes in the acoustic environment, and there can be little doubt that these changes are affecting the way modern man

listens. There are others also, and we should be studying them to understand better the changing psychology of aural perception.

Schizophonia

The Greek prefix schizo means split, separated. Schizophonia refers to the split between an original sound and its electroacoustical transmission or reproduction. It is another twentieth-century development.

Originally all sounds were originals. They occurred at one time and in one place only. Sounds were then indissolubly tied to the mechanisms which produced them. The human voice travelled only as far as one could shout. Every sound was uncounterfeitable, unique. Sounds bore resemblances to one another, such as the phonemes which go to make up the repetition of a word, but they were not identical. Tests have shown that it is physically impossible for nature's most rational and calculating being to reproduce a single phoneme in his own name twice in exactly the same manner.

Since the invention of electroacoustical equipment for the transmission and storage of sound, any sound, no matter how tiny, can be blown up and shot around the world, or packaged on tape or record for the generations of the future. We have split the sound from the maker of the sound. Sounds have been torn from their natural sockets and given an amplified and independent existence. Vocal sound, for instance, is no longer tied to a hole in the head but is free to issue from anywhere in the landscape. In the same instant it may issue from millions of holes in millions of public and private places around the world.

The twentieth century has given us the ability to dislocate sounds in time as well as space. A record collection may contain items from widely diverse cultures and historical periods in what would seem, to a person from any century but our own, an unnatural and surrealistic juxtaposition.

Most recently, the quadraphonic sound system has made possible a 360 degree soundscape of moving and stationary sound events which allows any sound environment to be simulated in time and space. This provides for the complete portability of acoustic space. Any sonic environment can now become any other sonic environment. When I originally coined schizophonia in The New Soundscape I said it was intended to be a nervous word. Related to schizophrenia, I intended it to convey the same sense of aberration and drama. The benefits of electroacoustic transmission and reproduction of sound are well-enough celebrated, but they should not obscure the fact that at precisely the time hi-fi was being engineered, the world soundscape was slipping into a lo-fi condition. Indeed the overkill of hi-fi gadgetry contributes generously to the lo-fi problem.

A character in one of Borges' stories dreads mirrors because they multiply men. The same might be said of radios. As the cry broadcasts distress, the loudspeaker communicates anxiety. "We should not have conquered Germany without... the loudspeaker," wrote Hitler in 1938.⁽²¹⁾ In the USA, Americans were listening to 268,000,000 radios by 1969. Modern life has been ventriloquized.

Towards the Integrity of Inner Space

The desire to dislocate sounds in time and space has been evident for some time in the history of Western music, so that the recent technological developments are merely the consequences of aspirations that have been building for some centuries. The introduction of dynamics, echo effects, the splitting of resources, the separation of soloist from the ensemble, are all attempts to create virtual spaces which are larger or different from natural room acoustics; just as the simultaneous breaking forward to find new musical resources and the turning back to recover the past represents a desire to transcend the present.

If I speak of music it is because I believe music to be a barometer giving clues to our whole attitude towards making and hearing sound. Certainly in the growth of the orchestra we have a clue to the present day imperialistic spread of sounds of all kinds. And there is little difference between Beethoven's attempts to épater le bourgeois with sforzando effects and that of the modern teen-ager with his motorcycle. The one is an embryo of the other.

The concert hall made concentrated listening possible, just as the art gallery encouraged, focused and selected viewing. Music designed for outdoor performance - such as most folk music - does not demand great attention to detail, but brings into play what we might call "peripheral hearing," similar to the way the eye drifts over an interesting landscape. Today the transistor is reviving interest in the outdoor concert while headphone listening is isolating the listener in a private acoustic space. Messages

on earphones are always private property. "Head space" is a popular expression with the young, referring to the geography of the mind, which can be reached by no telescope. Drugs and music are the means of invoking entry. In the headspace of earphone listening, the sounds not only circulate around the listener, they literally seem to emanate from points in the cranium itself, as if the archetypes of the unconscious were in conversation. There is a clear resemblance here to the functioning of Nada Yoga in which interiorized sound (vibration) removes the individual from this world and elevates him towards higher spheres of existence. When the yogi recites his mantra he feels the sound surge through his body. His nose rattles. He vibrates with its dark, narcotic powers. Similarly when sound is conducted directly through the skull of the headphone listener, he is no longer regarding events on the acoustic horizon; no longer is he surrounded by a sphere of moving elements. He is the sphere. He is universe. While most twentieth-century developments in sound production tend to fragment the listening experience and break up concentration, headphone listening directs the listener towards a new integrity with himself.

Prime Unity or Tonal Centre

In the Indian anāhata and in the Western music of the spheres man has constantly sought some prime unity, some central sound against which all other vibrations may be measured. In diatonic or modal music it is the fundamental or tonic of the mode or scale that binds all other sounds into relationship. In China an artificial centre of gravity was created in 239 B.C. when the Bureau of Weights and Measures established the Yellow Bell or Huang Chung as the tone from which all others were measured.

It is, however, only in the electronic age that an international tonal centre has been achieved; in countries operating on 60 cycles, it is this sound which now provides the resonant frequency. Where C is tuned to 256 cycles, this resonant frequency is B natural. In ear training exercises I have discovered that students find B natural much the easiest pitch to retain and to recall spontaneously. To relate all sounds to one sound which is continuously sounding (i.e., a drone) is a special way of listening. In respect to this development there is an interesting feature of Indian music which might bear further investigation in terms of its relevance for young people growing up in the electronic culture of today. Alain Daniélou explains: "The modal group of musical systems to which practically all Indian music belongs, is based on the establishment of relations between a permanent sound fixed and invariable... the [drone] and successive sounds, the notes... Indian music... is built on the independent relationship of each note to the tonic. The relationship to the tonic determines the meaning of any given sound. The tonic must therefore be constantly heard."⁽²²⁾ Could this account for the recent popularity of Indian music among the young of the West? One of the key words in the vocabulary of young Americans these days is "vibration", i.e., a cosmic sound giving prime unity, a concentration or gathering point from which all other sounds are perceived tangentially.

Sound Walls

The high density of the modern soundscape has produced another phenomenon of interest: the sound wall. Walls used to exist to delimit physical and acoustic space, to isolate private areas visually and to screen out acoustic interferences. Often this second function is unstressed, particularly in modern

buildings. Confronted with this situation modern man has discovered what might be called audioanalgesia, that is, the use of sound as a painkiller, a distraction to dispel distractions. The use of audioanalgesia extends in modern life from its original use in the dental chair to wired background music in hotels, offices, restaurants, and many other public and private places. Air conditioners, which produce a continuous band of pink noise, are also instruments of audioanalgesia. It is important in this respect to realize that such masking sounds are not intended to be listened to consciously. Thus, the Muzak corporation in North America deliberately chooses music that is nobody's favourite and subjects it to unvenomed and innocuous orchestrations in order to produce a wrap-around of "pretty" designed to mask unpleasant distractions in a manner that corresponds to the attractive packages of modern merchandising to disguise frequently cheesy contents.

Walls used to exist to isolate sounds. Today sound walls exist to isolate.

✓ In the same way the intense amplification of popular music does not stimulate sociability so much as it expresses the desire to experience individuation... aloneness...disengagement.

Encircled by sound walls, contemporary man appears to invite the distraction of wired background music. The teenager lives in the continual presence of his radio, the housewife in the presence of her television set, the worker in the presence of engineered music systems designed to increase production. From Sacramento (California) comes news of an unusual development: a library wired for rock music in which patrons are encouraged to talk. On the walls are signs stating "no silence". The result: circulation, especially among the young, is up.

Music is used to mask noise. Noise may also be used to mask music. A prominent firm of American acoustical architects recently made the following recommendation to a university music department: "Music Library: There should be enough mechanical noise to mask page turning and foot movement sounds."⁽²³⁾

The mask hides the face. Sound walls hide characteristic soundscapes under fictions.

Signals in the City: Church Bells and Police Sirens

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. To give a totally convincing image of a soundscape would involve extraordinary patience; thousands of recordings would have to be made and tens of thousands of measurements taken. What the analyst must do is to discover the significant features of the soundscape, those sounds which are important either because of their individuality or their domination.

The soundscape of eighteenth-century Isfahan, for instance, will have significant features different from those of a Western city.

I had in succession watched the distant din of the king's band, the crash of the drums, and the swell of the trumpets, announcing sunset. I had listened to the various tones of the muezzins, announcing the evening prayer; as well as to the small drum of the police, ordering the people to shut their shops, and retire to their homes. The cry of the sentinels on the watch-towers of the king's palace was heard at distant intervals....⁽²⁴⁾

Looking at the profile of a medieval European city we at once note that the

castle, the city wall and the church spires dominate the scene. In the modern city it is the high-rise apartment, the bank and the factory chimney which are the highest buildings. This tells us a good deal about the dominant social institutions of the two societies. In the soundscape also there are sounds which obtrude over the acoustic horizon, and they must form the subject of our first investigations into the urban soundscape.

Two such sounds, for instance, are sirens and church bells. Each must be loud enough to emerge clearly out of the ambient noise of the community; each has an important social function. The messages, however, are different. The siren broadcasts distress; it is a centrifugal sound designed to scatter people in its path. The church bell, on the other hand is centripetal; it attracts and unifies the community.

Church bells appear to have been widespread in Europe by the eighth century. In England they were mentioned by The Venerable Bede at the close of the seventh century. I have called it a centripetal sound, but it is fair to mention that originally it was centrifugal also, designed to frighten away evil spirits as much as to unify the faithful. Up until the present century it was the loudest sound heard in the community. Spengler has suggested that the gigantic presence of church and clock bells in Western Europe, ringing out with relentless periodicity, gave that part of the world its profound sense of history and destiny.⁽²⁵⁾

Throngs of pitched bells or carillons were especially popular in the Netherlands, where they irritated Charles Burney on his European tours. "The great

convenience of this kind of music," Burney wrote, "is that it entertains the inhabitants of a whole town, without giving them the trouble of going to any particular spot to hear it...."⁽²⁶⁾ At a suitable distance, however, church-bells could be powerfully evocative as innumerable authors have testified. Robert Louis Stevenson, for instance:

On the other side of the valley a group of red roofs and a belfry showed among the foliage. Thence some inspired bell-ringer made the afternoon musical on a chime of bells. There was something very sweet and taking in the air when he played; and we thought we had never heard bells speak so intelligibly, or sing so melodiously as these... There is so often a threatening note, something blatant and metallic, in the voice of bells, that I believe we have fully more pain than pleasure from hearing them; but these, as they sounded abroad, now high, now low, now with a plaintive cadence that caught the ear like the burthen of a popular song, were always moderate and tunable, and seemed to fall in with the spirit of still, rustic places, like the noise of a waterfall or the babble of a rookery in spring.⁽²⁷⁾

Wherever the missionaries took Christianity the church bell was soon to follow, acoustically demarking the civilization of the parish from the wilderness beyond its earshot. But today the church bell is on the decline. While in Santiago (population 25,000) there are 45 ecclesiastical buildings with 114 bells,⁽²⁸⁾ our researches on the Vancouver soundscape have revealed that of 211 churches, 156 no longer have bells. Of those with bells, only 11 still ring them, though 20 have electric carillons or play recorded music.

The bell has special acoustic properties. It takes some time for the blow of the clapper to overcome the inertia of the metal so that it embraces within its signature a sharp impact followed by a rounded orb of swelling sound. That this sound is judged round by most people is evident from research being

carried out by one of my colleagues, Joan Henderson, in which she has asked large numbers of people to draw spontaneous pictures when sounds are played to them on tape. By means of these and related studies we are hoping to reveal something of the symbolism various sounds possess (illustration three). The bell may have inherited archetypal properties similar to those claimed by Jung for the mandala. Jung felt this shape symbolized unity or integrity and perfection.

In Greek mythology the Sirens were nymphs who destroyed those who passed their island by means of their singing, at once piercing yet dulcet as honey. Circe warned Odysseus of the Sirens and thus enabled him to elude their fatal song by plugging the ears of his men with wax and having himself bound to the mast of his ship.

The Sirens thus signify mortal danger to man and this danger is broadcast by means of their singing. There is good evidence that the Greek word "siren" may be etymologically related to the words for wasp and bee.⁽²⁹⁾ Modern man has reidentified the concept of danger with the wasp's song. In North America emergency vehicles employ the revolving disk siren which continuously sweeps up and down a wide frequency range. Previously gongs or hand bells were preferred for the sounding of alarm. In Great Britain "the siren was introduced only after World War Two by some brigades but the bell continued to be the traditional audible warning for fire appliances in the British Fire Service... However, during the 1960's, due to worsening traffic conditions and the increasing use of larger and diesel engined commercial vehicles...a number of tests were carried out using four different warning devices... Following

these tests it was decided to standardize on the use of a two-tone horn for fire appliances. This was subsequently adopted for other emergency service vehicles, i.e., police and ambulance, and its use is now restricted to vehicles of the emergency services!"⁽³⁰⁾ In 1964 the familiar two-tone horn was adopted and the intensity fixed at not less than 88 dB at a distance of 50 feet under calm conditions.⁽³¹⁾

The sweeping siren used on Canadian police cars has been measured by our students at 96 dBA at the same distance. In recent years a new type of "yelping" siren has also been introduced, measuring 102 dBA at the same distance. The United States is now manufacturing a "yelping" siren for police car use which measures 122 dB at 10 feet.⁽³²⁾

It ought to be possible to calculate the rise in ambient city noise fairly accurately by studying the intensities of emergency warning systems over the years. In Mozart's day, Vienna was quiet enough that fire signals were given by the shouts of a scout mounted atop St. Steven's Cathedral.⁽³³⁾

Sound Symbolism

Most sounds of the environment have symbolism. This symbolism has so far been little explored, but it will have to be investigated thoroughly if we wish to make meaningful decisions as to which sounds we wish to keep and which we wish to eliminate.

"A word or an image is symbolic when it implies something more than its obvious and immediate meaning. It has a wider 'unconscious' aspect that is never precisely defined or fully explained."⁽³⁴⁾ A sound object is symbolic when it stirs in us emotions or thoughts beyond its actual mechanical sensations

as sound.

The sounds of nature are mostly pleasing to man. Water in particular has splendid symbolism. Rain, a fountain, a river, a waterfall, the sea, each makes its unique sound but all share a rich symbolism. They speak of cleansing, of purification, of refreshment and renewal.

The sea has always been one of man's primary symbols in literature, myth and art. It is symbolic of eternity: its ceaseless presence. It is symbolic of change: the tides; the ebb and flow of the waves. Heraclitus said, "You never go down to the same water twice." It is symbolic of the law of the conservation of energy: from the sea, water evaporates, becomes rain, then brooks and rivers, and finally is returned to the sea. It is symbolic of reincarnation: water never dies. When angry it symbolizes "that state of barbaric vagueness and disorder out of which civilization has emerged and into which, unless saved by the efforts of gods and men, it is always liable to relapse."⁽³⁵⁾ W.H. Auden continues: "The sea is where the decisive events, the moments of eternal choice, of temptation, fall, and redemption occur." The shore is symbolic of safety; the sea is symbolic of the unknown; the tension in our hearts is made audible by the crashing of breakers.

The Greeks distinguished between Pontos, the mapped and navigable, and Okeanos, the infinite universe of water. Pontos corresponds to the closed world of Euclidian geometry, Okeanos to mystery and tempestuousness. For modern man, the sea, which is down from everywhere, comes to be treated as a trough into which pollutants are dumped. But the ancestral sea symbolism

hangs on even as a distant expiring murmur, blending with newer forms of music, as Thomas Mann, born on the Baltic, affectionately recalled in Tonio Kröger.

...he played the violin - and made the tones, brought out as softly as ever he knew how, mingle with the splashing of the fountain that leaped and danced down there in the garden beneath the branches of the old walnut tree.

The fountain, the old walnut tree, his fiddle, and away in the distance the North Sea, within sound of whose summer murmurings he spent his holidays - these were the things he loved, within these he enfolded his spirit, among these things his inner life took its course. (36)

Natural sounds have the most profound symbolism. They have endured the longest. They have been listened to attentively by poets and musicians.

Grey peak of the wave,
wave colour of grape's pulp,
Olive grey in the near,
far, smoke grey of the rock-slide,
Salmon-pink wings of the fish-hawk
cast grey shadows in water. (37)

The image has been bitched by the hovercraft industry.

The symbolism of technological sounds is in its own way complicated also, for it is beginning to undergo an interesting transformation. Today the hard-edged throb of motors can be heard around us almost continuously.

Traditionally, the motor symbolized two things: power and progress. Technology has given man unprecedented power, in industry, in transportation, in war, power over nature and power over other men. We have been infatuated with the motor's speed, efficiency, regularity and the extensions of personal and corporate power it has afforded us.

James Watt once observed that to most people noise and power go hand in hand. The machine which operates quietly is much less impressive than the noisy one.

The increasing domination of the soundscape by machine noises has up to now been sanctioned as progressive; the hum and throb of a good motor is a symbol of contemporary power and future prosperity.

But there are ominous signs. We are just beginning to realize that the fallout from unrestrained technological exploitation of the earth's resources is more frightening than first anticipated. As this idea gains more universal acceptance, we may expect the felicitous symbolism of the motor to twist unpleasantly.

The sounds of travel have deeper mysteries. Train whistles, for instance, are powerfully evocative:

Then the shrill whistle of the trains re-echoed through the heart, with fearsome pleasure, announcing the far-off come near and imminent.⁽³⁸⁾

On European trains the whistle is shrill, piping. In North America it is low, powerful, masculine, the utterance of a big engine with a heavy load. On the prairies - so flat that one can see the full train from engine to caboose, spread out like a stick across the horizon - the periodic whistlings resound like low haunting moans.

The Canadian train whistle sounds like a dejected monster. It has two notes which sound muted and wailing; and the pitch descends, unlike that of our English trains which rises in a chirpy and optimistic manner. The Canadian whistle sounds as if it has travelled far and still has a long way to go.⁽³⁹⁾

Farmers knew how to interpret these sounds. "When the train's whistle sounds hollow, the weather will turn colder," runs an Ontario proverb. The train's

whistle was the most important sound in the frontier town, the solo announcement of contact with the outside world. Trains spoke to the heart of every man, and small boys came to greet the panting engine. Trains spoke to each other too. The Canadian Pacific Railway employs a vocabulary of 26 different whistle signals, forming a precise, binary code, for the trains had to be kept running on time. They were the stopclocks of the elementary community, as predictable as clock bells.

The Acoustic Community

Community can be defined in many ways: as a political, geographical, religious or social entity. But I am about to propose that the ideal community may be defined advantageously along acoustic lines.

The house is an acoustic phenomenon, designed for the first community, the family. Within it they may produce private sounds of no interest outside its walls. The idea of a parish is also acoustic and it is defined by the range of the church bells. When you can no longer hear the church bells you have left the parish. Cockneydom is still defined as that area in East London within earshot of Bow Bells. This definition of community also applies to the Orient. In the Middle East it is the area over which the muezzin's voice can be heard as he announces the call to prayer from the minaret.

✓ Aristotle somewhere gives 5,000 as the size of the ideal community and cites as evidence the fact that one man can address that number of people with his naked voice - but not more.

In Goethe's day the city-state of Weimar had a population of about 6,000. Its six or seven hundred houses were for the most part still within the

city wall; but it was the half-blind watchman, whose voice could be heard everywhere throughout the town as he called out the hours of the night, that expressed best the sense of human scale which Goethe and his colleagues found so attractive in Weimar.

Had we recognized these things we could have predicted that the Church would have declined when the sound of the police siren (102 decibels) surpassed that of the church bell (83 decibels), just as the downfall of Islam was signalled when the first loudspeaker was attached to a minaret, or that Goethe's humanism would have passed when the watchman's voice no longer reached all the inhabitants of Weimar. (A further sign of the muzzling of Weimar humanism was a nineteenth-century bylaw forbidding the making of music unless conducted behind closed windows.⁽⁴⁰⁾).

In the lo-fi soundscape of the contemporary megalopolis, acoustic definitions are no longer possible. There is cross-talk on all the channels; there is also anomie and social disintegration. (Or are we to assume the increasing prominence of the siren heralds the coming of The New Order?)

Acoustic Design I: Analysis

The most important revolution in aesthetic education in the twentieth century was that accomplished by the Bauhaus, that celebrated German school of the twenties. Many famous painters taught at the Bauhaus, but the students did not become famous painters. The purpose was different. By bringing together the fine arts and the industrial crafts, Gropius, Klee, Moholy-Nagy and the others invented the whole new subject of industrial design.

It devolves on us now to invent a subject which we might call acoustic design, an interdiscipline 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 new sounds before they are 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.

Many of the sounds of our contemporary environment are accidental. How many of them are desired or necessary? The efficacy of many of those which are intentional has never been questioned. Take, for instance, the telephone bell. Who invented it? Certainly not a musician! Perhaps it is just a bad pun on the name of its inventor? It may be that a device which permits anyone to jump onto your desk unannounced should have an obnoxious sound, but the matter probably merits more careful consideration. Why could not everyone choose his own telephone signal? In a day when cassettes and tape loops are cheap to manufacture this is entirely feasible.

Car horns are another example of a sonic "absolute" bequeathed anonymously to the world by an inventor who never took music lessons. In North American cars the interval of the two horns is set at a major or minor third. In Turkish cars they are pitched at the interval of a major or minor second. While in some

cultures this is considered an exceedingly dissonant diad, there are examples in the Balkans, for instance from certain regions of Western Bulgaria, of folk singing in which two voices sing together in major or minor seconds, the singers considering this a consonant interval. In the interest of preserving idiosyncracies in the world soundscape some thought should be given to using the characteristic intervals and motives of local musical cultures in tuning environmental signals of all kinds. In Java, for instance, it might be the unique "shortened" fifth that could serve for the car horn, for this interval is, I understand, found in no other culture, though it is basic to the tuning of gamelan orchestras and is said to derive from the characteristic call of an island bird.

It would also be useful to have complete information on how horns are used and abused in different communities. We have determined that an average of 70 car horns are blown per hour at the downtown intersection of Georgia and Granville in Vancouver. In Moscow they are less frequent; in a one-hour count on Gorki Street 17 were heard. In Teheran or New York, on the other hand, the numbers would be exceedingly high. (Parenthetically, I might mention one memorable drive from Pergamum to Aescelapion, a distance of seven kilometers, during which my chauffeur blew his horn 289 times at nothing in particular.) Vancouver has a monstrous horn mounted on top of one of its highest buildings, which signals twelve o'clock by playing the opening phrase of the Canadian national anthem. One block away this sound is 96 dBA - 100 dBC. This hectoring attempt at the patriotic unification of the community (and which came into existence without the citizenry being consulted) is one of the

most salient sounds of the contemporary Vancouver soundscape.

Each community has its idiosyncratic sounds, and they should receive special attention and, if necessary, protection. The unique sound object deserves to make history as surely as any Beethoven symphony. Its memory cannot be erased by months or years. Many of our students have constructed sound walks in the city, maps showing where and when sounds of special interest may be heard. Tourism is not merely a matter of "sight-seeing". A tourist in the soundscape should be provided with Hörenswürdigkeiten as well as Sehenswürdigkeiten.

When the soundscape is as dynamic as it is today new sounds are constantly appearing and others are disappearing. Those which are disappearing should be collected. We are currently building an archive of all the disappearing sounds from the British Columbia soundscape. 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;
Razor being stropped;
Kerosene lamp;
The squeak of leather saddle bags;
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.

It is only by exercising considerable imagination that the soundscapes of past societies can be reconstructed. Novels, works of art, anthropological studies, and other documents must be studied in detail for clues; but we are

finding it is indeed possible to develop plausible tone-pictures of lost societies by the careful examination of documents as diverse as Thomas Hardy's West Country novels, the paintings of Breughel, Fenimore Cooper's Leather-Stocking Tales or the tales of The Thousand and One Nights. A geographical comparison of contemporary soundscapes is easier; all it requires is good ears and travel money.

This gathering of cross-cultural information is most desirable if we are to plan future acoustic environments imaginatively and judiciously. If we do not do this, as I have been trying to point out in this essay, we run the risk of sinking into an environmental sound sewer which is characterized exclusively by its amplitude and brutality. Illustration four, which is based on some of our early tabulations from the type of documents mentioned above, shows how the hard-edged sounds of modern technology are now masking out the voices of their human inventors.

Acoustic Design II: The Module

In many cases human sounds are being deliberately suppressed while those of technology are permitted to intensify. While some of my students were measuring the noise profile of a downtown construction site, they were entertained by some members of the Hari Krishna sect, an Eastern movement dedicated to the worship of God with song in the streets. In 1971 this group was arrested under the City of Vancouver noise abatement bylaw, were convicted, appealed the conviction and lost the appeal.⁽⁴¹⁾ This bylaw expressly excludes all noise made by construction and demolition equipment - though my students discovered that such noise often ran as high as 90 decibels at precisely the

point where the Hari Krishna singers were arrested. Hawking and singing in the streets may indeed be a nuisance, but when it disappears, so does humanism. In the humane environment it is the human being who forms the basic module or guide for all measurements. When architects organize spaces for human beings to inhabit they use human anatomy as the guiding module. 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 aesthetic symbol and imprinted it on all his buildings. The basic modules for the human acoustic environment are the human ear and the human voice. We know a good deal about the behaviour and tolerances of each of these organs. Thus, we may speak of acoustic ecology, the delicate balance between living organisms such as man and their acoustical environment. When environmental sound reaches such proportions that human vocal sounds are masked or overwhelmed we have created an inhuman environment.

It is interesting to consider that while the voice can be raised to quite a loud level (about 75 decibels) at no time can it be raised beyond a level where it might endanger the ear (about 85-90 decibels). 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.

God was a first-rate acoustical engineer. We must profit from the insights our scientific research can give us into these matters.

Acoustic Design III: Quiet Groves and Times

The huge noises of our civilization are the result of imperialistic ambitions. Territorial expansion has always been one of our aims. Just as we refuse to leave a space of our environment uncultivated, unmastered, so too we have refused to leave an acoustic space quiet and unpunctured by sound. The moon probes are undoubtedly a great achievement, but they may likewise be interpreted as an expression of that same imperialism that made Western man a world colonial power.

The amplifier was also invented by an imperialist; for it responds to the instinct to dominate others with one's own sound. But in a crowded and restless world, imperialism loops back on itself; its proponents become its victims as the locus of the battlefield shifts. For the first time in history, Constantin Doxiadis reminds us, man is less safe in the heart of his city than outside the city gates.

Just as man requires time for sleep to refresh and renew his life energies, so too he requires quiet periods for mental and spiritual recomposure. At one time stillness was a ^{precious} ~~preccious~~ article in an unwritten code of human rights. Man held reservoirs of stillness in his life to facilitate this restoration of the spiritual metabolism. Even in the hearts of cities there were the dark, still vaults of churches and libraries, or the privacy of drawing-room and

bedroom. Outside the throb of cities the countryside was accessible with its lulling whir of natural sounds. There were still times too. The holy days were quiet before they became holidays. In Christendom Sunday was the quietest day before it became Fun-day. The importance of these quiet groves far transcended the particular purposes to which they were put. We see this now that they are being destroyed. The city park is situated next to the parkway, the library is next to a construction or demolition site, the church is next to a heliport.

Acoustic design will want to pay special attention to the repatriation of quiet groves and times. Gençlik Park in Ankara is merely one of many in the cities of the world today that has been wired throughout for background music, though the volume at which it is played is louder than most. This practice betrays an important principle of acoustic design: always to let nature sing for itself.

A park or a garden is a place where nature is cultivated. It is a humanized treatment of landscape. It may contain human artifacts (a bench, a swing) but they must harmonize with the natural inheritance (trees, water) - otherwise we no longer have a park but a highway or a slum. If synthetic sounds are introduced, if we venture to produce what I would call "the soniferous garden", care must be taken to ensure that they are sympathetic vibrations of the garden's original notes. The wind chimes of the Japanese, or the once-popular aeolian or wind harp, are reinforcements of natural sounds in the same way as the trellis reinforces the presence of the rose. The object in creating a soniferous garden would be to work up from natural sounds, materials, formations. This is the work of one of my colleagues, John Grayson, who is de-

veloping what he calls a "public instrumentarium." This consists of a number of simple instruments constructed from natural materials, designed to be permanently installed in a park so that the citizens of a community might come together and play together. In his specifications Grayson requests an ambient noise level of no more than 45 decibels for his public instrumentarium; and the total sound level of all the instruments together is designed not to exceed 80 decibels - that is, it does not exceed the human voice level (illustration five).

The Recovery of Positive Silence

In October 1969 the General Assembly of the International Music Council of Unesco passed a most interesting resolution.

We denounce unanimously the intolerable infringement of individual freedom and of the right of everyone to silence, because of the abusive use, in private and public places, of recorded or broadcast music. We ask the Executive Committee of the International Music Council to initiate a study from all angles -- medical, scientific and juridical - without overlooking its artistic and educational aspects, and with a view to proposing to UNESCO, and to the proper authorities everywhere, measures calculated to put an end to this abuse.

For the first time in history an organization involved primarily in the production of sounds suddenly turned its attention to their reduction. In the present article I have been suggesting that a saturation point has been reached with regard to all sounds. It remains to discuss how best to accomplish their reduction. I have suggested that the least effective way would be by the introduction of more noise abatement bylaws, sound-proof walls or ear plugs. An uncomprehending public with a developed appetite for noise would scarcely accept these means, unless they were necessary for public health - though in many instances this can now be demonstrated to be the case.

My approach, over which I do wish to exercise permanent ownership, has been to treat the world soundscape as a huge macrocosmic composition which deserves to be listened to as attentively as a Mozart symphony.⁽⁴²⁾ Only when we have truly learned how to listen can we make effective judgements about the world soundscape. I am especially anxious that musicians should take the initiative in this field, because musicians are the architects of sounds; they are concerned with making balances and arrangements of interesting sounds to produce desired aesthetic effects.

Silence is the most potentialized feature of Western music. Because it is being lost, the composer today is more concerned with silence; he composes with it. Anton Webern moved composition to the brink of silence. The ecstasy of his music is enhanced by his sublime use of rests. By this means he produces hi-fi works in which diminutive but stunning musical gestures inhabit containers of stillness.

Simultaneous with Webern's rediscovery of the value of silence in music, his compatriot Freud discovered its value for psychoanalysis.

The analyst is not afraid of silence. As Saussure remarked, the unconscious monologue of the patient on the one side and the almost absolute silence of the psychiatrist on the other was never made a methodological principle before Freud.⁽⁴³⁾

In the West, silence has for many centuries been unfashionable. It will be recalled that when Galileo's telescope first suggested the infinity of space, the philosopher Pascal was deeply afraid of the prospect of an infinite and eternal silence.

Le silence éternel de ces espaces infinis m'effraye⁽⁴⁴⁾

When silence is conceived as the rejection of the human personality, the ultimate silence is death. Then man likes to surround himself with sounds in order to nourish his fantasy of perpetual life. In Western society silence is negative, an embarrassment, a vacuum. Silence for Western man equals communication hang-up. If one does not speak, the other will speak. This has not always been so, nor is it so for all peoples today. I have seen Arabs sitting quietly in a circle saying nothing for long stretches of time. Even the conversation of farmers is much more leisurely than that of city-dwellers.

In the West we may assume that silence as a condition of life and a workable concept disappeared sometime towards the end of the thirteenth century, with the death of Meister Eckhart, Ruysbroeck, Angela de Foligno and the anonymous English author of The Cloud of Unknowing. This is the era of the last great Christian mystics and contemplation as a habit and skill began to disappear about that time.

I am about to suggest that the soundscape will not again become ecological and harmonious until silence is recovered as a positive and felicitous state in itself. We need to regain that state in order that fewer sounds could intrude on it with pristine brilliance. The Indian mystic Kirpal Singh expresses this eloquently:

The essence of sound is felt in both motion and silence, it passes from existent to non-existent. When there is no sound, it is said that there is no hearing, but that does not mean that hearing has lost its preparedness. Indeed, when there is no sound, hearing is most alert, and when there is sound the hearing nature is least developed. (45)

It is this same idea that Rilke expresses in his Duino Elegies when he speaks of "die unterbrochene Nachricht der Stille." Silence is indeed news for those possessing clairaudience.

Among our students we have declared days of moratorium on speech. In our classes we have also been trying to employ some yogic or relaxing exercises as a preparation to the listening and creating experience. Little by little the muscles and the mind relax and the whole body becomes an ear. This may take some time but at the conclusion, students have told me, they have heard music as never before.

It is in exercises such as these that I have come to believe our ultimate hope lies in improving the acoustic design of the world. Still the noise in the mind: that is the first task -- then everything else will follow in time.

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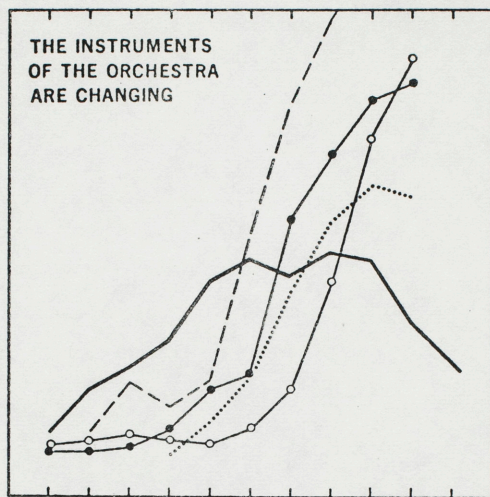
Bylines to Illustrations

- #1. Map showing the places reporting having heard the sound of the Krakatoa explosion on August 26-27, 1883. Each dot represents a reporting station and the shaded portion indicates the general area over which we may assume the sounds were heard. Map prepared from the Report of the Krakatoa Committee of the Royal Society, London, 1888.
- #2. Graph prepared from the records of The Dominion Bureau of Statistics, Ottawa, showing the increase in production of domestic gadgetry in Canada, compared to the decline in piano manufacturing.
- #3. The illustration shows examples of spontaneous drawings produced to tape recordings of two sounds: A) a church bell and B) a car horn. In the upper series the forms tend to be rounded suggesting harmony or integrity; in the lower they are more angular and aggressive.
- #4. The table shows the increase in technological sounds and the decrease in natural sounds throughout human history. It is based on the study of many accounts in art, literature and anthropology of the kinds of sounds heard during different historical periods.
- #5. Artist's sketch of the "Public Instrumentarium" for children, devised by John Grayson. The playground consists of a number of instruments constructed from natural materials, and is to be installed permanently in a park. Although the instruments are "acoustic" they are tuned to a fundamental frequency of 60 cycles--the prime tone of the contemporary American soundscape. The combined sound level of all the instruments played together is designed not to exceed 80 decibels.

ILLUSTRATION #1



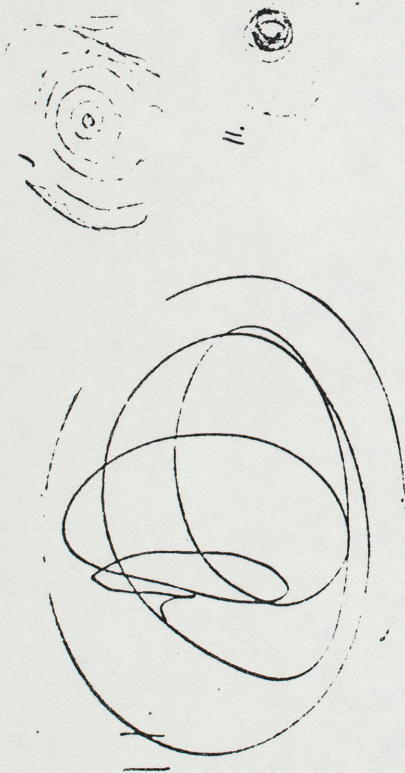
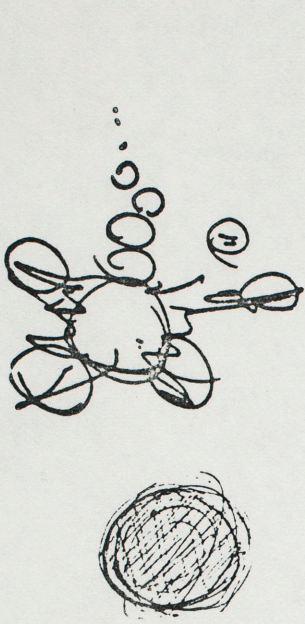
ILLUSTRATION #2



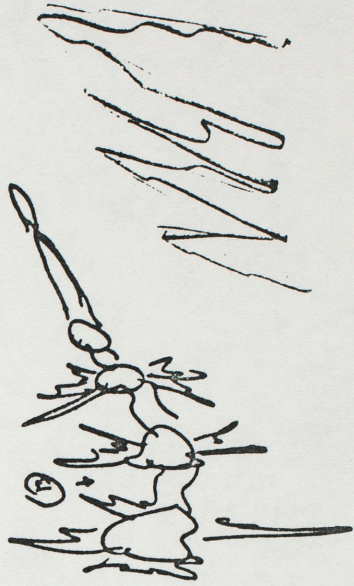
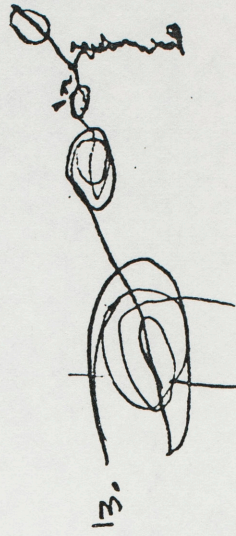
1958 59 60 61 62 63 64 65 66 67 68

- growth of power tools in Canada
- growth of motorcycles in Canada
- growth of blenders, juicers, mixers etc., in Canada
- - - growth of power lawnmowers in Canada
- decline of pianos in Canada

ILLUSTRATION #3



A



13

B

	Natural Sounds	Human Sounds	The Sounds of Tools and Technology
Primitive Cultures	69%	26%	5%
Medieval, Renaissance and Pre-Industrial Cultures	34%	52%	14%
Post-Industrial Cultures	9%	25%	66%
Today	6%	26%	68%

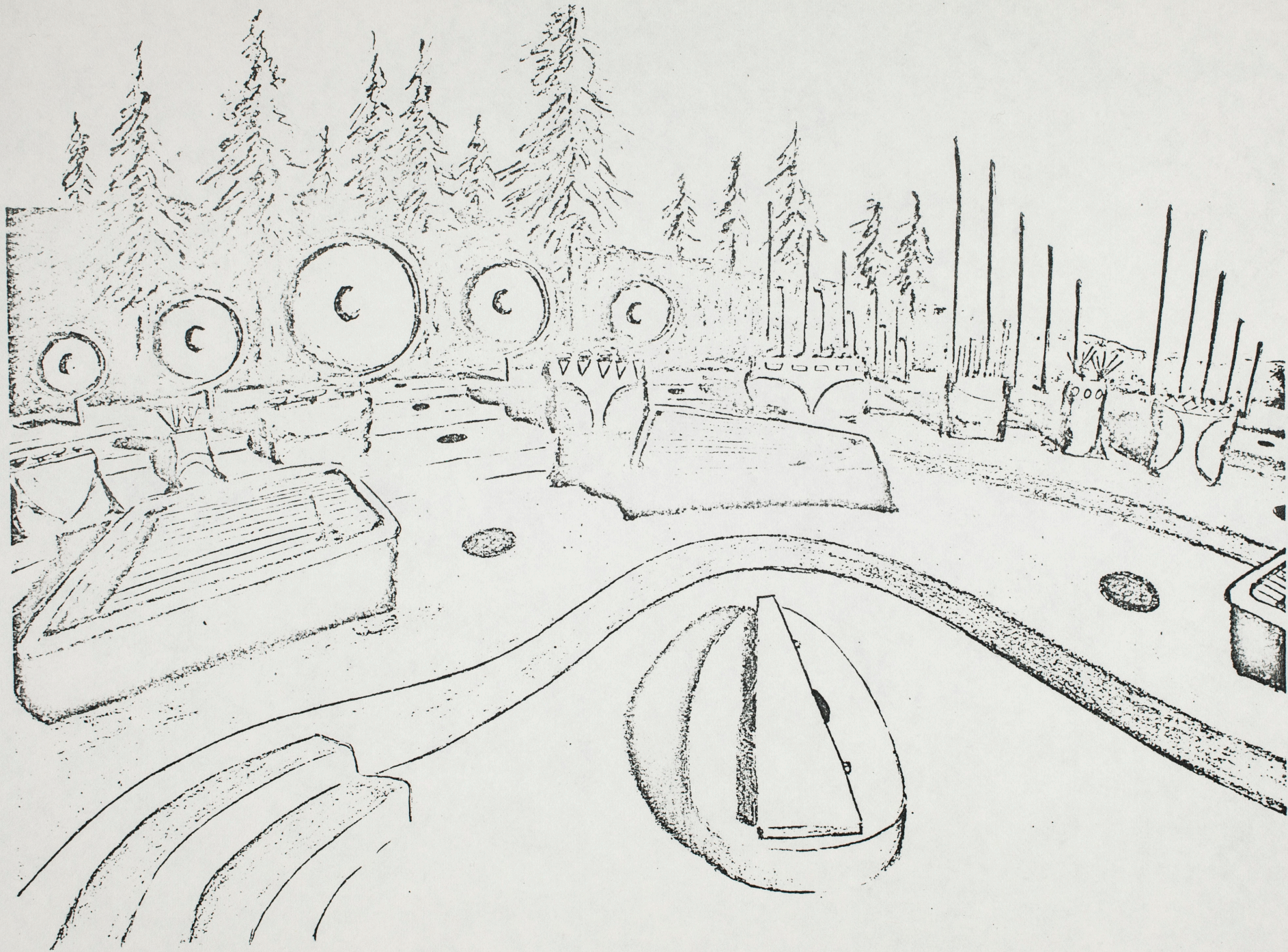


ILLUSTRATION #5

Biographical Note

R. Murray Schafer is a leading Canadian composer. He has received commissions from The Canadian Broadcasting Corporation, The Serge Koussevitzky Music Foundation, The Fromm Music Foundation and numerous other organizations. In 1969 his Requiems for the Party Girl received the Fromm Music Foundation Award. Among his other compositions are the opera Loving, the orchestral piece Son of Heldenleben, and the choral works Gita and From the Tibetan Book of the Dead.

Mr. Schafer has been active in music education and has also written several books on various musical subjects. At present he is engaged as a Professor of Communications Studies at Simon Fraser University in British Columbia, where he has been developing a program which he calls "Studies in the World Soundscape."