sounds may alter or disappear with scarcely a comment even from the most sensitive of historians. [...]

R. Murray Schafer, extract from *The Soundscape: Our Sonic Environment and the Tuning of the World* (New York: Alfred Knopf, Inc., 1977); revised edition (Rochester, Vermont: Destiny Books, 1993) 3–4; 7–8.

Alvin Lucier
Careful Listening is More Important than Making Sounds Happen//*c.* 1979

The Propagation of Sound in Space

For several hundred years Western music has been based on composition and performance. Most attention has been focused on the conception and generation of sound, very little on its propagation. Written notes are two-dimensional symbols of a three-dimensional phenomenon. No matter how complex a system of notation or how real the illusion of depth, written music is trapped on a flat plane. Even musics from oral traditions are rooted in performance rotes and instrumental topologies or rely on texts, stories or social hierarchies. We have been so concerned with language that we have forgotten how sound flows through space and occupies it.

Sounds have specific spatial characteristics. Those of short wave length (high frequencies) are directional; longer ones (lows) spread out. Sound waves flow away from their sources roughly in three dimensional concentric spheres, the nodes and antinodes of which, under certain circumstances, can be perceived in a room as clearly as those of a vibrating string on a violin. Each space, furthermore, has its own personality that tends to modify, position and move sounds by means of absorptions, reflections, attenuations and other structurally related phenomena. Conventional acoustic engineering practice has historically defied these phenomena in an attempt to deliver the same product to everybody in the same space. Accepted as natural occurrences to be enjoyed and used, however, they open up a whole new field of musical composition. For the past several years I have conceived a series of works that explore the natural properties of sound and the acoustic characteristics of architectural spaces as musical objectives.

I was not composing music in 1965 and had lost confidence in the musics of my education. Post-Webern serialism, particularly as I had witnessed it earlier in Darmstadt, seemed florid and complex enough to be obsolete, and the tape music of that period seemed to be only an extension of that language. I felt the need for a new idea. When the physicist Edmond Dewan offered his brain wave equipment with which to explore the possibility of making music, I had a ready and open mind. As I started learning to generate alpha to make sound, I began experiencing a sensibility to sound and its production different from that of other musics based on ideas of tension, contrast, conflict and other notions of drama. To release alpha, one has to attain a quasi-meditative state while at the same time monitoring its flow. One has to give up control to get it. In making *Music for Solo Performer* (1965), I had to learn to give up performing to make the performance happen. By allowing alpha to flow naturally from mind to space without intermediate processing, it was possible to create a music without compositional manipulation or purposeful performance.

In the spring of 1968, with Pauline Oliveros, I began picking up images for a new work. The ocean suggested sea shells, and a nearby canyon offered itself as a large resonant environment in which they could be sounded. I designed a performance of a new work, *Chambers*, in which several shell players, starting from a small circle, spread out through the La Jolla landscape, describing the outdoor space in terms of their sounding shells. Later I expanded the idea to include any small or large resonant chambers that could be made to sound. I thought of them as rooms within rooms which impinge their acoustic characteristics upon each other.

I then made several works that articulated spaces in more specific ways. *Vespers* (1968), based on the principle of echolocation [the use of sound to locate objects or navigate], uses pulsed sounds, such as those used in acoustic testing to make acoustic signatures of enclosed spaces. As reverberation times are measured, the quality of the surrounding environment is described by comparing the timbre of the outgoing pulses with those that return as echoes. Time and space are directly related; durations are proportional to distances between sound sources and reflective surfaces. In *I am sitting in a room* (1970), several paragraphs of human speech are used to expose sets of resonant frequencies implied by the architectural dimensions of various sized rooms. By means of a pair of tape recorders, the sound materials are recycled through a room to amplify by repetition those frequencies common to both the original recording and those implied by the room. As the repetitive process continues and segments accumulate, the resonant frequencies are reinforced, the others gradually eliminated. The space acts as a filter. We discover that each room has its own set of resonant frequencies in the same way that musical sounds have overtones. And in *Quasimodo the Great Lover* (1970) sounds sent over very long distances, by

means of relays of microphone-amplifier-loudspeaker systems if necessary, capture and carry the acoustic characteristics of the spaces through which they travel. Total distance is determined by the amount of space necessary to modify the original material to a point of unrecognizability.

Recent works have been more concerned with the properties of sound itself than with how it acts in space. *Still and Moving Lines of Silence in Families of Hyperbolas* (1973–74) is an exploration of standing waves and related phenomena. If a pure wave emanated from two sources, or one source and a reflective wall, standing waves will form in symmetrical hyperbolic curves equidistant and either side of an imaginary axis between the sources. If two closely tuned waves emanate from two different sources, beating patterns will cause the crests and troughs of sound to spin in elliptical patterns toward the lower-frequency source. Changes in intonation will cause changes in speed of beating and, if unison nulls are crossed, direction of movement. In this work, dancers search for and move in troughs of audible beats which move out to listeners as ripples on a pond, and players of electronic and acoustic instruments spin crests of sound in polyrhythmic figures through space.

In *Outlines of Persons and Things* (1975), sound waves are used to create diffractive patterns around opaque objects, producing silhouettes which may be perceived directly with one's ears, or loudspeakers which shift, enlarge and amplify the images. If either the object or the listener moves, slight phase changes will cause perceptible variations in the resulting fields. If the illuminating sounds consist of two or more closely tuned frequencies, temporary speed-ups and slowdowns of the rhythmic patterns will occur.

Often it is necessary to provide visual clues as to the overall sound situation. You may be sitting in the trough of a standing wave or on the edge of a sound shadow, but since you cannot be everywhere at once, you hear only what is available to your location in space. Your focus is oblique. In *Directions of Sounds from the Bridge* (1978), for example, sound-sensitive lights are stationed around an oscillator-driven cello to sample the changing volume shapes caused by the directional characteristics of the instrument. Stringed instruments cast sound shadows around themselves in shapes determined by their resonant characteristics. In small spaces or in situations where amplification is possible, the shapes that flow from the tops, bottoms and sides of instruments are apparent to listeners. And in *Bird and Person Dyning* (1975), a work in which phantom images seem to appear in various places in space because of the apparent locative properties of acoustic heterodyning [the generation of new frequencies by mixing two oscillating waveforms], a performer wearing miniature microphones in his/her ears, dips, turns and tilts his/her head, altering pitches of strands of feedback created between the microphones and pairs of loudspeakers. In this

insert quotation:

I often dream of performance spaces specially designed for works based on the three-dimensional characteristics of sound. Paraboloids, spheroids and other similarly shaped rooms with movable walls could be constructed to position, move and modulate sounds. Walls, floors and ceilings could be thought of as acoustic lenses whose focal points are determined by reflective time.

Alvin Lucier, 'Careful Listening is More Important than Making Sounds Happen', c. 1979

work as in several others, performing is more a matter of careful listening than of making sounds happen.

I often dream of performance spaces specially designed for works based on the three-dimensional characteristics of sound. Paraboloids, spheroids and other similarly shaped rooms with movable walls could be constructed to position, move and modulate sounds. Walls, floors and ceilings could be thought of as acoustic lenses whose focal points are determined by reflective time. It is also possible to create imaginary spaces by means of computer simulation. In *RMSIM 1* (1972), a digital computer drives a configuration of analogue modules into which is fed a live microphone placed in an enclosed space. Changing values of resonant filters, amplifiers and reverberation units suggest changes in the size and structure of simulated rooms. And in *Clocker* (1978) a galvanic skin-response detector controls the speed of a ticking clock at several separate time delays, creating reflected sound from appropriately positioned loudspeakers so as to suggest changes in size and shape of memory-triggered rooms. Given enough delay lines and loudspeakers, any real or imagined rooms may be simulated.

I am now working on a series of solar sound systems for public places. Solar panels of various types, sizes, configurations and energy collecting capabilities are deployed at onsite locations, facing various compass directions relative to apparent daily sunrise and sunset. As sunlight falls on the panels at different intensities at different times of the day and year in various weather conditions, varying amounts of voltage are collected which drive packages of electronic music modules, amplifiers and loudspeakers, creating a continually changing music. Nearby trees and shrubbery, corners of adjacent buildings, passing people and cars may cast shadows or absorb enough sunlight to bring about further changes in the music.

Each installation will be unique. The number and size of the panels will be determined by the complexity of the sound system and size of the installation. In most cases, the basic sound source will be a pulse wave, chosen for its low power consumption – for example, it may be on duty for only ten per cent of a given cycle. Filters will be used for timbre control. All systems, however, will be completely solar powered. The generation, propagation and quality of the music will be determined by the intensity of the sun's rays at any given moment in time.

Alvin Lucier, 'Careful listening is more important than making sounds happen: The propagation of sound in space' (*c.* 1979), in Lucier, *Reflections: Interviews, Scores, Writings* (Cologne: MusikTexte, 1995) 430–38.

Bernhard Leitner
Acoustic Space//1985

[…] Modern building technology and building economics have indeed shown almost total disregard for the fact that human beings need rooms with good, 'live' acoustic qualities. I am not talking about technical means of soundproofing and the like. Take the following solutions which are typical for our civilization: people are buried in rooms built out of concrete, and at the same time we are developing highly sophisticated stereo and quadrophonic hi fi technologies to allow some sounds to come alive in these spaces. In all the theory of modern architecture we find very little or nothing about the relationship of sound, space and body. The main concern has been, as we all know, to use architecture and town planning as a means of resolving social conflicts and problems. But even this effort was essentially dominated by the powerful hostility with which the Enlightenment regarded the human body. […]

Bernhard Leitner, statement from 'Acoustic Space: A Conversation between Bernhard Leitner and Ulrich Conrads', *Daidalos*, no. 17 (Berlin, September 1985).

Emily Ann Thompson
Sound, Modernity and History//2002

[…] By identifying a soundscape as the primary subject of [*The Soundscape of Modernity*, 2002], I pursue a way of thinking about sound first developed by the musician R. Murray Schafer about twenty-five years ago. Schafer defined a soundscape as a sonic environment, a definition that reflected his engagement with the environmental movements of the 1970s and emphasized his ecologically based concern about the 'polluted' nature of the soundscape of that era).[1] While Schafer's work remains socially and intellectually relevant today, the issues that influenced it are not what has motivated my own historical study, and I use the idea of a soundscape somewhat differently. Here, following the work of Alain Corbin, I define the soundscape as an auditory or aural landscape. Like a landscape, a soundscape is simultaneously a physical environment and a way of perceiving that environment; it is both a world and a culture constructed to make sense of

that world.[2] The physical aspects of a soundscape consist not only of the sounds themselves, the waves of acoustical energy permeating the atmosphere in which people live, but also the material objects that create, and sometimes destroy, those sounds. A soundscape's cultural aspects incorporate scientific and aesthetic ways of listening, a listener's relationship to his or her environment, and the social circumstances that dictate who gets to hear what.[3] A soundscape, like a landscape, ultimately has more to do with civilization than with nature, and as such, it is constantly under construction and always undergoing change. The American soundscape underwent a particularly dramatic transformation in the years after 1900. By 1933, both the nature of sound and the culture of listening were unlike anything that had come before.

The sounds themselves were increasingly the result of technological mediation. Scientists and engineers discovered ways to manipulate traditional materials of architectural construction in order to control the behaviour of sound in space. New kinds of materials specifically designed to control sound were developed, and were soon followed by new electro-acoustic devices that effected even greater results by converting sounds into electrical signals. Some of the sounds that resulted from these mediations were objects of scientific scrutiny; others were the unintended consequences – the noises – of an ever more mechanized society; others, like musical concerts, radio broadcasts and motion picture soundtracks were commodities consumed by an acoustically ravenous public. The contours of change were the same for all.

Accompanying these changes in the nature of sound were equally new trends in the culture of listening. A fundamental compulsion to control the behaviour of sound drove technological developments in architectural acoustics, and this imperative stimulated auditors to listen more critically, to determine whether that control had been accomplished. This desire for control stemmed partly from new worries about noise, as traditionally bothersome sources of sound like animals, peddlers and musicians were increasingly drowned out by the technological crescendo of the modern city. It was also driven by a preoccupation with efficiency that demanded the elimination of all things unnecessary, including unnecessary sounds. Finally, control was a means by which to exercise choice in a market filled with aural commodities; it allowed producers and consumers alike to identify what constituted 'good sound', and to evaluate whether particular products achieved it.

Perhaps the most significant result of these physical and cultural changes was the reformulation of the relationship between sound and space. Indeed, as the new soundscape took shape, sound was gradually dissociated from space until the relationship ceased to exist. The dissociation began with the technological manipulations of sound-absorbing building materials, and the severance was made complete when electro-acoustic devices claimed sound as their own. As scientists and engineers engaged increasingly with electronic representations of acoustic phenomena, sounds became indistinguishable from the circuits that produced them. When electro-acoustic instruments like microphones and loudspeakers moved out of the laboratory and into the world, this new way of thinking migrated with them, and the result was that sounds were re-conceived as signals.

When sounds became signals, a new criterion by which to evaluate them was established, one whose origins, like the sounds themselves, were located in the new electrical technologies. Electrical systems were evaluated by measuring the strength of their signals against the inevitable encroachments of electrical noise, and this measure now became the means by which to judge all sounds. The desire for clear, controlled, signal-like sound became pervasive, and anything that interfered with this goal was now engineered out of existence.

Reverberation, the lingering over time of residual sound in a space, had always been a direct result of the architecture that created it, a function of both the size of a room and the materials that constituted its surfaces. As such, it sounded the acoustic signature of each particular place, representing the unique character (for better or worse) of the space in which it was heard. With the rise of the modern soundscape this would no longer be the case. Reverberation now became just another kind of noise, unnecessary and best eliminated.

As the new, non-reverberant criterion gained hold, and as the architectural and electro-acoustic technologies designed to achieve it were more widely deployed, the sound that those technologies produced now prevailed. The result was that the many different places that made up the modern soundscape began to sound alike. From concert halls to corporate offices, from acoustic laboratories to the sound stages of motion picture studios, the new sound rang out for all to hear. Clear, direct, and non-reverberant, this modern sound was easy to understand, but it had little to say about the places in which it was produced and consumed.

This new sound was modern for a number of reasons. First, it was modern because it was efficient. It physically embodied the idea of efficiency by being stripped of all elements now deemed unnecessary, and it exemplified an aesthetic of efficiency in its resultant signal-like clarity. It additionally fostered efficient behaviour in those who heard it, as the connection between minimized noise and maximized productivity was convincingly demonstrated. Second, it was modern because it was a product. It constituted a commodity in a culture increasingly defined by the act of consumption, and was evaluated by listeners who tuned their ears to the sounds of the market. Finally, it was modern because it was perceived to demonstrate man's technical mastery over his physical environment, and it did so in a way that transformed traditional relationships

between sound, space and time. Technical mastery over nature and the annihilation of time and space have long been recognized as definitive aspects of modern culture. From cubist art and Einsteinian physics to Joycean stream-of-consciousness story-telling, modern artists and thinkers were united by their desire to challenge the traditional bounds of space and time. Modern acousticians shared this desire, as well as the ability to fulfil it. By doing so, they made the soundscape modern. […]

1 R. Murray Schafer, *The Soundscape: Our Sonic Environment and the Tuning of the World* (Rochester, Vermont: Destiny Books, 1994), definition on 274–5. This edition is a largely unrevised version of material originally written in the 1960s and 1970s. See also Schafer, *The New Soundscape* (Scarborough, Ontario: Berandol Music/New York: Associated Music Publishers, 1969); and *The Book of Noise* (Wellington, New Zealand: Price Milburn, 1970). Equally stimulating in more theoretical ways is Jacques Attali, *Noise: The Political Economy of Music* (1977); trans. Brian Massumi (Minneapolis: University of Minnesota Press, 1985).

2 Alain Corbin, *Village Bells: Sound and Meaning in the Nineteenth-Century French Countryside*, trans. Martin Thom (1994; New York: Columbia University Press, 1998), ix.

3 See Barry Truax, *Acoustic Communication* (Norwood, New Jersey: Ablex, 1984), for a similarly contextualized study of the contemporary soundscape.

Emily Ann Thompson, extract from *The Soundscape of Modernity: Architectural Acoustics and the Culture of Listening in America, 1900–1933* (Cambridge, Massachusetts: The MIT Press, 2002) 1–4.

Steven Shaviro
Bilinda Butcher//1997

It's loud, very loud. Swirling, churning guitars, aggressive distortion and feedback. Endlessly repeated, not-quite-tonal riffs. Blinding strobe lights. Noise approaching the threshold of pain, even of ruptured eardrums. This music doesn't just assault your ears; it invests your entire body. It grasps you in a physical embrace, sliding over your skin, penetrating your orifices, slipping inside you and squeezing your internal organs. You're brutalized by the assault – or maybe not quite. For beyond the aggression of its sheer noise, this music is somehow welcoming, inviting, even caressing. 'After about thirty seconds the adrenaline sets in; people are screaming and shaking their fists.' (Mark Kemp.) But then something clicks and quietly shifts, in your body and in your brain. 'After about four minutes, a calm takes over. The noise continues. After five minutes, a feeling of utter peace takes over. Or violence.' It could be either, it could be both: you can no longer make sense of such a gross opposition. It's like a Zen illumination, perhaps; or an endorphin high, at the moment just before death. By taking noise 'way past the point of acceptedness', My Bloody Valentine guitarist Kevin Shields says, 'it takes on a meaning in itself', even if 'I don't know exactly what it means …' This isn't just a case of being overwhelmed by the sublime. You can't stand it, and you can't see beyond it; but for that very reason you get used to it after a while, and you never want it to end. As with psychedelic drugs – at least sometimes – sensory overload is only the beginning. There's a whole new world out there, beyond the experience of shock. You enter a realm of 'microperceptions', as Deleuze and Guattari put it: 'micro-intervals between matters, colours and sounds engulfing lines of flight, world lines, lines of transparency and intersection'. Things rush up on you, suddenly, in waves, and then slip ever-so-slightly out of focus. Densely articulated textures fade in and out. You pick up on subtleties you didn't notice before: wavering rhythms, minor chords, muddily shifting tonalities, synthesized special effects, Bilinda Butcher's floating vocal lines buried deep within the mix. You even hear fragments of pop melodies, tentatively emerging and then quickly dissolving; it's as if they were suspended in a chemical solution. These are the qualities sometimes described as 'dreamy' and 'ethereal' by listeners who haven't played the *Loveless* CD at sufficiently high volume. But such words fail to convey how deeply embodied – how physically attentive, you might say – this music actually is. The sound may be vague, murky, 'miasmatic' (Rachel Felder); but the murk is precisely rendered, a concrete, material presence. It surrounds you, envelops you, enfolds itself around you. This music is indeed 'spacey', in the literal sense that it seems to have a lot of room inside: room to wander about and to get lost in. Everything blurs, as in a musical equivalent of soft focus; everything shades into everything else. But no, that's not quite right; rather, you're stunned by the realization that there are so many types of ambiguity, so many distinct shades of grey. Your nerves and your viscera are tingling, as they register the tiniest differences, the most minute alterations. These are changes beyond, or beneath, the threshold of ordinary perception. Your sensory organs are being stretched or contracted far outside their usual range. In such altered states, as Deleuze and Guattari say, 'the imperceptible is perceived'.

Of course, you don't figure all this out until afterwards. You begin to make sense of it only as it slips away. The concert is over, and now it's the relative silence of the street that hits you with the force of a shock. You feel at once exhilarated and drained. The ringing in your ears takes quite a while to subside. Everything in the world has returned more or less to its proper place, but in an eerie state of abeyance. My Bloody Valentine's music leaves you with a strange