

Rethinking the science of sound: Is anyone listening?

(A review of Barry Truax (2001). *Acoustic Communication*, 2nd edition, Ablex Publishing, Written by Valeriy Shafiro – valeriy_shafiro@rush.edu)

Surprising as it may seem, in a world characterized by an ever increasing proliferation of audio technology and a steadily growing body of knowledge about specific aspects of acoustic and auditory phenomena, little systematic attention has been paid to the general communicational role played by sound in the lives of individual listeners or society at large. Barry Truax's book, titled *Acoustic Communication*, attempts to fulfill this intellectual void by presenting an original and provocative, if highly controversial, account of the function of sound in listener – environment interactions. It crosses the boundaries of several disciplines including history, anthropology, sociology, psychology, acoustics and signal processing in order to underscore the need for an integrated approach to the study of acoustic communication.

Several points, often reiterated throughout the text, demonstrate the need for a new approach. From the very beginning, the reader is reminded of dramatic and pervasive changes that have taken place in listening environments throughout the world since the Industrial Revolution and the advent of electroacoustic technology. These changes have not only led to marked increases in ambient noise levels, but have also introduced a variety of new types of sound characterized by limited information value and high predictability. Hums and drones of machinery, by now highly familiar to most listeners, dominate listening environments in industrialized countries. According to Truax, the consequences of these changes extend beyond the risk of hearing damage,

decreased job performance or elevated stress levels which are among the better known negative effects of noise pollution. The prevalence of low information high predictability sound may, says the author, have also resulted in diminished listening skills of individuals living in these environments and may have altered the patterns of acoustic communications in the society. Furthermore, the ability to record and reproduce any sound at an arbitrary energy level and, typically, with an altered spectrum has changed the communicational significance of many sounds, as well as people's listening habits and attitudes towards them.

Sound has changed from being a unique temporal event to a serializable spatial object that can be reproduced countless times and at any distance, stored, bought and sold. Recorded sound has thus become a commodity, while listeners have become consumers in a market place dominated by several big media companies and shaped by self-serving commercial interests. On the other hand, the contemporary science of sound, divided into a number of narrowly focused and methodologically fragmented disciplines, is described as being mostly concerned with the physical aspects of sound represented as an objectified signal, rather than with its broader and more ecologically relevant communicational functions. Therefore, Truax argues, in its present form, science cannot provide solutions to many negative effects that the use and misuse of technology has on individual listening experiences or general patterns of acoustic communication.

At the core of the problem, Truax identifies the lack of a systematic and profound understanding of how sound functions positively as the medium of information exchange between the listener and the environment. He stipulates that counteracting negative effects of noise pollution, no matter how effectively, can only provide partial ad hoc

solutions to communication problems, unless more effort is invested in understanding the cognitive and social processes that underlie acoustic communication itself. To that end, he proposes a comprehensive communicational approach to the study of sound, which emphasizes listening as an active cognitive process and constitutes a framework for exploring “the functional relationships within the listener – environment system.”

Within the communicational approach, sounds are imagined as positioned left to right along a continuum comprising three major systems of acoustic communication: speech, music, and soundscape (which includes all other sounds in the environment). Truax justifies this ordering of sound systems on the continuum by noting that across these subdivisions (a) sound variety increases from left to right, (b) the rule governed perceptual structure is most apparent for speech, less so for music, and least of all for environmental sounds, (c) the temporal density of information is the highest on the left and lowest on the right, and (d) the specificity of meaning communicated also decreases from left to right. The meaning of any sound, in turn, is always understood based on both the sound itself and the environmental context in which it is perceived.

The author further claims that listening can be characterized by three different levels of attention. First, there is “listening-in-search” which is “listening at its most active, involving a conscious search of the environment for cues”. Second, there is “listening-in-readiness” defined as “...readiness to receive significant information, but where the focus of one’s attention is probably directed elsewhere”. Third, there is “background listening” when sounds “remain in the background of our attention...[and have] no special or immediate significance to us.” (p.22) This categorization of listening is exemplified by several case studies, and rationalized through references to a diverse set

of theoretical notions and experimental findings from linguistics, neuroscience, and cognitive psychology.

In addition to cognitive processes underlying the auditory perception of individual listeners, Truax's communicational approach also considers the patterns of acoustic communication operating in an "acoustic community" within which acoustic information is exchanged. The totality of sounds within "a successfully functioning acoustic community" is said to exhibit (a) variety in the kinds of sounds present, (b) complexity "in the types and levels of information they represent," and (c) balance or "functional equilibrium" of sounds based on the geographic layout of the environment, long-term rhythms and cycles of specific sounds, as well as social and cultural constraints of the community. A community has good "acoustic definition" when sounds are heard clearly, reflect community life, and can be easily identified and detailed by members of the community. These positive features are derived from considering natural listening environments and acoustic communications in non-industrialized societies. On the other hand, the balancing forces are upset, and traditional constraints on sound behavior are broken, by the contemporary wide-spread use of electroacoustic technology.

According to Truax, the ability to change the form of sound energy from mechanical to electric and back to mechanical has redefined the fundamental rules underlying acoustic communication. The audibility of recorded sounds is no longer limited by space and time. Sounds can be transmitted over great distances and played long after they were originally produced in an environmental context different from the original one. However, the communicational approach distinguishes between the meaning of an original sound and a reproduced sound based on the differences in their

contexts. While Truax does not specify exactly what the differences in meaning might be, it is stated that "...the environmental sound signal ... *only* acquires meaning through its context, that is, its complete relationship to the environment." (pp.52 – 53). Therefore, sounds presented out of their original context (e.g., a hundred piece orchestra in an elevator) are not understood in the same way as when they are initially produced. Furthermore, electroacoustic sound is credited with the ability to dominate the environment acoustically and psychologically, suppressing the traditional acoustic patterns of communication "and replaces them with artificial ones mediated by technology" (p.135).

The redundancy and uniformity of continuously present sounds of electrically driven machinery combined with the typically poor quality of electroacoustic reproductions are claimed to have negative effects on listening environments, in general, and cognitive processes involved in listening, in particular. The rise in ambient noise levels impedes the perception of less intense, but potentially important sounds, and makes interpersonal communication more difficult. As a consequence, it leads to increases in the levels of sounds of interest (e.g., people speak louder in noisy settings) or disrupts the exchange of information altogether. In addition, repeated listening to the same sound transforms listening from a process that seeks information about the environment to a process that seeks information about the sound itself. On the other hand, continuous repetition of the same sounds, whether recorded or produced by machinery, distracted listening. Unlike in traditional background listening, in distracted listening the listener can usually choose the background sound (e.g., which radio station), while the sounds listened to are usually those that would require higher levels of attention if produced

originally (e.g., speech). Distracted listening is further encouraged by commercial radio stations that intersperse background sounds with commercial messages and manipulate the acoustic signal to ensure their perceptual salience. In the long-term, the mainstream forms of electroacoustic technology are said to have progressively forced listeners to rely less and less on sound as a source of new information about the environment.

Importantly, Truax does not blame electroacoustic technology for the negative effects that he claims it has had on listening and acoustic communications. Instead, he presents it as a tool, which, when used creatively, can promote new and effective forms of communication and can lead to a higher degree of environmental awareness. First among the steps required for bringing about such positive changes, Truax identifies educating listeners to critically evaluate their own listening habits, and recognize the communicational value of sounds in their environment. Second, Truax calls for preservation and protection of existing successfully functioning acoustic environments. Finally, the knowledge accumulated by systematically exploring and understanding the patterns of communication that exist in balanced acoustic environments can be used to offset the negative effects of technology and provide a basis for the design of well-functioning acoustic communities.

For obvious reasons, this short review cannot reflect on all aspects of Truax's highly elaborate communicational approach. Nor can it convey the full breadth or remarkable wealth of information Truax uses to support his ideas. Overall, the author succeeds in making a very strong case for the necessity of an integrated interdisciplinary approach to acoustic communication with an emphasis on the listener and community, rather than the acoustic signal. Some of his concerns, however, are not entirely unique.

Over the last couple of decades there has been a growing body of research under the general heading of “ecological acoustics” that investigates the acoustic signal and its properties within the context of information it contains for the listener (cf.-- Carello, C., Wagman, J.B. & Turvey, M.T. (2003). Acoustic specifications of object properties. In J. Anderson & B. Anderson (Eds). *Moving Image Theory: Ecological Considerations*. Carbondale, IL: University of Southern Illinois Press). Although the scope of Truax’s approach is substantially broader than that addressed by researchers so far, it is unfortunate that he does not make use of this highly relevant literature.

The conceptual constructs of the communicational approach provide a further challenge for cognitive psychologists. Chief among those is the notion of context and the effects it might have on the perception of individual sounds. For instance, how does the communicational significance of an original environmental sound differ from that of a recorded one presented in a different context? Obviously, gun shots heard in a radio commercial do not have the same ecological significance to the listener as when they are heard “live” on the street, even if the acoustic signal reaching the listener is very similar in both cases. However, developing experimental methods to explore possible perceptual differences requires ingenuity as well as expertise on behalf of researchers. Similarly, no direct empirical support has been provided in the book for the different kinds of listening described nor for the claim that there is a general decline in the listening skills of individuals living in industrialized societies. While it is very reasonable to expect that differences in attention levels during listening affect the nature and the amount of information perceived, unless these differences are studied more rigorously, it is, perhaps, too early to speculate about their implications for cognitive and social processes.

Bringing the claims expressed in the book under a close scrutiny is not an easy task. Some of the difficulties are due to the novelty, originality, and broad scope of the questions posed by Truax's communicational approach, while others result from the challenges associated with formally defining individual sounds and listening environments in terms of their information value or esthetic qualities. Nevertheless, these tasks are worth pursuing. Given the magnitude and pervasiveness of the changes in acoustic environments that have been brought by technology throughout the world, the time seems ripe to investigate what the consequences of these changes might be for the individual listener and the acoustic community.