AES-DC meeting — Barry Blesser Builds on Aural Architecture

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On 22 June 2009 approximately 50 AES members, ASA (Acoustical Society of America) members and guests gathered at NPR headquarters to hear Dr. Barry Blesser discuss his work on spatial acoustics based on his recent book *Spaces Speak, Are You Listening? Experiencing Aural Architecture* (MIT Press), co-authored with Linda-Ruth Salter.

Throughout his 45-year career Blesser has researched the experience of hearing space and developed equipment to create spatial experiences for listeners, including the first commercial digital audio reverberation system.

His personal passion, which culminated in the book, was to correlate and consolidate information from various architectural, audio and acoustic disciplines into a more unified description of the relationship between people and spaces, including speculative explanations of the evolutionary sources for how we came to hear and perceive sound and space. In other words, “fuse together all the fragments of hearing, acoustics, and perception into a minimalist construct of aural architecture that hangs together, but is not itself a proof.” Each audio and architectural specialty has its own perspective and approach — every profession has its hammer, and sees everything as a nail. He has been working to help broaden and unify that hammer, and redefine the nail to be more culturally relevant.

Publication of the book has brought him contact and discussion with many diverse experts who have helped expand his understanding of aural architecture and the epistemology of hearing.

Epistemology — how do we know what we know — is the central question among cognitive scientists: “You can’t make any assertions without knowing how we know what we know and the scope of the assertion that therefore can be supported.”

Acoustic science has many equations to calculate physical truths, but these equations are based on sets of assumptions, and only in some cases are the assumptions true, or even testable, for the space to which the equations are applied.

For example, around 1900 Wallace Clement Sabine (of Harvard University and Boston Symphony Hall fame) discussed the aural consequences of thermal waves, which are always present in a large space (Sabine, *Collected Papers on Acoustics*, Harvard University Press, 1922; viewable at http://books.google.com/books?id=G25LAAAAMAAJ&dq=sabine+%22collected+papers+on+acoustics%22&printsec=frontcover&source=bn&hl=en&ei=XYdbSoKqHILCNuXjiEM&sa=X&oi=book_result&ct=result&resnum=5; also Peninsula Publishers, 1993; available for purchase at Amazon.com). Thermal instability results in varying sound velocity, making it impossible to accurately extract the late pulse response of a concert hall at high frequencies.

Blesser challenged attendees to think about how to describe sound, pointing out how limited our language is to describe sound itself, apart from describing the event that caused the sound (such as: I hear the baby crying; I hear the tires screeching, etc).

He posed the questions: As a species, why do we have eyelids but not earlids? Why do we have two ears? The short answers to both questions are because the creatures we evolved from were like that. But the more complete answer is because *they* needed to be always alert to dangers and to quickly determine the location of possible predators they might not see — survival.

“Sound is one of the few sensory connections that requires energy to create it; it flows around objects and into openings; it reveals the interior state (tap on an object and get a sense of its insides); it’s slow-moving — never static; you can use it for broadcasting over relatively large distances; you share it with other people and other species; you share it in time, frequency and direction; and it has no respect for private property.”

In response to a question about the brain’s ability to focus on certain sounds while rejecting others, Blesser described the human ability to discriminate based on localization, also using cues such as male vs female, time delays, language, head shadowing, speaking style, etc.

The human brain is a powerful signal processor; however it can be overloaded, resulting in the need to tune-out by putting on headphones, which puts us in an alternate and less complex aural space. On the other hand, each human is a social animal, and can’t function without connections to the world outside itself: “You can’t exist in a spaceless environment.”

We can hear the environment even though the environment itself makes no sound. An example is our ability to sense an open doorway or the nearness of a wall by hearing the changes in the sounds within the environment as we approach it, which might include our own footsteps. The sounds reflecting from the wall and not reflecting from the open doorway are clues that enable a blind or blindfolded person to safely navigate the environment. Blesser remarked on the sound-absorptive rear wall of the NPR meeting room, which changes our sense of the space.

By way of illustrating how well the navigational ability can be developed, he noted that musician Ray Charles never used a cane, relying totally on his ears and reflected sound. Charles’ ability also illustrates the brain’s “plasticity,” which enables senses to be greatly enhanced when needed. All of us have the ability to some degree, but few of us develop it, or need to.

Blesser summarized his presentation: “We connect to the external physical and social environment by using our senses, and hearing is one of the more important means by which we experience our location. Sound is more than music and speech. Whereas vision primarily provides an awareness of static objects and geometries, hearing provides an intimate connection to the dynamic events of life. Listeners are involuntarily connected to those events that are audible regardless of their location. The sound of an event is always changed by the spatial acoustics of the environment.”

“Aural architecture results from the influence of objects that don’t produce sound. Aural architecture is different from acoustic engineering; it is the answer to what properties humans in the space want for their personal well-being. The aural architect translates those human needs into physical/virtual requirements. Then the acoustic engineers and

audio engineers determine how to achieve that set of requirements; they are the implementers."

Blesser further defined aural architecture as "the composite of those spatial attributes that have an audible manifestation, which can change the behavior response and emotional state of the inhabitants of either real or virtual space. The principles of aural architecture are directly relevant to architects who design physical spaces as well as to sound artists who create the experience of space using media technology."

An example of an alternate aural space is that created by the recording engineer, which might be a space that never physically existed. This led to questions on the art of mixing, and whether to include earbud monitoring and deliberate mixing using small speakers. One audience member noted that future media might routinely include many choices for playback of a given program, including headphones, automobiles, binaural, plus 5.1 and 7.1 surround.

Blesser explained the concept of spatiality: "There are at least five types of spatiality: musical, social, navigational, aesthetic, and symbolic. Reverberation is a good example of a process that has one physical explanation but can manifest different spatiality. As musical spatiality, it merges note sequences into chords; as social spatiality, it changes the distance between people in restaurants; as navigational spatiality, it permits moving through a dark space by echolocation; as aesthetic spatiality, it can provide a pleasing aural texture, thereby avoiding monotony; and as symbolic spatiality, it can be associated with religious meaning in the context of a cathedral."

He elaborated on the concepts of aural architecture and spatiality. Regarding musical spatiality, Blesser noted that the enclosed space of a concert hall produces reverberation that results in both temporal and spatial spreading of the music. This can be overdone for symphonic music in a cathedral, but this same long reverberation time has given rise to music that was composed for those spaces and that would not sound appropriate in Boston Symphony Hall, which also is not the optimum venue for chamber ensembles or pop/jazz music, which is preferred in spaces that have less reverberation.

Blesser talked of spaces that are created to enhance the aural experience of music: The acclaimed Boston Symphony Hall was criticized when first it opened, only becoming appreciated over time. The many music performances and the hall's later endorsement as a preferred space illustrate the idea of "association leads to appreciation." However, humans were not the first creatures to exploit the sonic qualities of spaces: Blesser played a recording of an African baboon that places itself in the mouth of a cave to enhance the quality of its vocalizations — its "sonic broadcasting."

Blesser claimed that audio professionals are in the event transport, or soundscape, business. We bring a sonic representation of an event to the listener. He gave what he termed academic definitions: "An aural event is a natural, intentional or accidental conversion of mechanical energy into sound that is then broadcast [using the broadest definition of the word] to the inhabitants of the space. An event space is the composite of temporal and spatial distributed dynamic events that are transported to the listener. When we add the acoustics of the space to our sense of the events, you realize that the

acoustics (whether virtual or actual) are part of the transport and modification of the events."

Blesser is a passionate advocate of the social consequences of corrosive acoustics, which he explains as acoustics that interfere with interpersonal communications: "I want to change the world's attitude toward sound; other than that I have modest goals. I've been more successful than I would have thought." The AES and ASA are proactive in their efforts to improve the aural quality of life, and we are fortunate to have the opportunity to learn from Dr. Barry Blesser. Articles, papers and sonic examples are accessible at www.Blesser.net and at www.SpacesSpeak.com.