

Cable Design

Acoustic Zen's founder and chief engineer, Robert Lee, is among a small but elite group of innovative cable-design researchers. His three-plus decades of pace-setting work has brought him to a scientific understanding of materials and design structures. Lee views cables as inherently musical instruments.

Cables often function as "tone controls," as many people in the audiophile press insist. But Lee views cables as integral to audio networks. Cables are intrinsic to the structure of recording networks and of reproduction (stereo and surround sound) networks, as well. Without cables, no music.

Comprehending the complex nature of the integration between cables and sound systems has been one of Lee's primary research objectives.

Robert Lee's goal, as a research engineer, is to understand the material and design properties of low-level signal transmission. His aim is to create the most accurate possible delivery of musical information. Lee believes that sonic accuracy is innately musical.

In his research work, Lee has pursued variables that determine the signal-delivery characteristics of cables. Five variables in cable design are fundamental: the choice of materials; the internal structure of materials; their amenability to design configurations; cable and network (or system) interaction; and the "bundling" of first order sonic signals alongside associated, internal cable reflections.

Lee's first Acoustic Zen White Paper outlines a number of insights and technical outcomes that follow from his research to frame his evolving design philosophy.

As an independent research consultant extraordinaire across twenty five years on three continents, Robert Lee, created advanced cable designs for several high-profile audiophile cable manufacturers.

In 1998, Lee launched Harmonic Technology, a cable manufacturer that quickly shot toward the head of the pack, earning inclusion in STEREOPHILE's coveted "recommended components."

With the inauguration of Acoustic Zen Technologies, Lee brings his design-knowledge to the creation of an innovative, state-of-the-art series of fine-tunable cables and power cords.

Lee's training as a pianist and a violinist has consistently played a role in his cable-design work. His objective at an early professional age was to create the

most musically accurate, sonically-glorious audio components possible within 'real world' retail prices. That ambition to enlarge and enhance the sonic envelope without exaggerated price tags has been constant. Lee's first audiophile product was a self-assembled [DIY] Mosfet amplifier for an overseas market. Lee's aim was to create, at minimum cost, a maximum of class A amplification neutrality and power.

His now classic "True Image" amplifier received critical praise from discerning listeners such as Dick Olsher. It remains, twenty years beyond its first appearance, among the most tube-like solid state amplifiers ever made. Soon after, Lee's "Hologram" speakers amazed dozens of reviewers because of their unrivaled seamless coherence across the sonic spectrum, achieving what many speaker manufacturers have long sought: invisibility and an utterly convincing depiction of music in space.

"I always wanted to create a full-scale concert hall in my listening room," Lee asserts, "and that's what I want to help Acoustic Zen customers build, too."

To that end, Acoustic Zen cables extend the range of sonic accuracy and dynamic impact. They are as tonally perfect as analog and digital interconnects can be at present. Each Acoustic Zen cable is assembled by hand. Each pair is aurally inspected, listened to carefully and critically before it goes out into the world. Acoustic Zen cables are handcrafted to be state of the art instruments for the delivery of music.

"Cable design is an art," Lee believes. "Cables are the physical pathways that deliver music to each of us. There is no other way to make music come alive in the absence of an on stage live concert performance. Each music lover is completely dependent upon cables, many feet of interconnect and speaker cables, in order to hear what a musician works hard to perfect. Cables are also pathways for extremely spiritual events since music, especially great and beautiful music, is spiritual ...something beyond wood and metal, flesh and bone. Therefore, my job - as a musician, as a cable designer, as a lover of great sound and magnificent music - is to create works of cable art that deliver the delicate signals we know as music!"

Lee's objective is to reward the critical listener with "cable art." He declares himself to be an objectivist who is also subjective in his craftsmanship. "I must be very precise in my work because I am an engineer. But I am a romantic, too, because I believe in the power of art to give technology a soul. I named my cable and sound research company ACOUSTIC ZEN because it names my own musical and design values.

"Music at its best," Lee continues, "has an indefinable character of soulfulness ...I call it 'sound afloat.' When music is right, when it is perfect, it seems to soar and dart like children playing on a big, green, open lawn. Music takes you with it. Music gathers us inside itself. It changes our lives. Great music makes us high on nothing but itself. It lets us be as elevated as we truly are, at our best, inside our souls. And so I think that the most perfect music is like zen. And the most beautiful and accurate sound is like acoustic zen.

"That is my belief," Lee insists, "and this is my objective as a romantically-inspired and hard-headed engineer: to be a partner for anyone who deeply loves music. I want to help people experience a sense of inner height and personal enlightenment. I know that seems eccentric because everything in our world is number-oriented. Nevertheless, I want to do my work, which I believe is a form of art, for people who know how to let my cables move them closer to the truth of music's mysterious happiness."

The Design and Fine-Tuning of Audio Cable

Among the audiophile community, few topics elicit more discussion and debate than differences in interconnects and speaker cables. The reason for this interest and disagreement is easy to understand.

Only in the 1990s, after decades of "high-end audio" growth, did sustained attention focus on the inconspicuous but wholly important role that interconnect wires and speaker cables play in the transmission and enjoyment of music. Only the most complete audio cynic today believes that speaker cables and interconnect wiring is insignificant or irrelevant. Anyone with good ears can hear, first hand, how system-dependent are most cables that operate in a stereo or surround sound system. Even a fledgling audiophile can discern differences in audio presentation constructed from various cable designs, materials and wiring networks.

For several years, before I created Acoustic Zen Technologies, I explored the use of pure, continuous cast "single-crystal" wire. Research into its superior signal integrity and transmission characteristics convinced me of its benefit for digital and analog interconnect cables. Subsequently I have moved to exclusive use of "zero crystal" (extremely long-grained) pure and unextruded, continuous-cast wire. Pragmatic experience as well as theoretical research led me to some-what unconventional cable design techniques, cable structures that maximize coherent signal delivery.

The purpose of any interconnect or speaker cable is to deliver the most absolutely coherent musical signal possible. That goal is more complex than it may appear.

Musical signals are combinations of interacting and overlapping signal frequencies at varying levels of magnitude. Such rising and falling acoustical dynamics contain phase-based information as well as low-level harmonic "strands" or sonic "fabrics" that are fragile and easy to deform. These minute signals can be blurred and, in the time and space through which musical energy travels among pieces of audio equipment, obscured, degraded or, worse, obliterated utterly.

The notion of "obliteration" here points to an important feature of the work that cables carry out.

Cables literally "read" and transfer delicate musical signals that flow through them with an almost infinite variety of electronic characteristics. Each cable design, each set of cable materials, interprets the signals it delivers. Cables are not like plumbing. They are not tubes that allow music to pour like water through hollow cavities. Acoustic cables receive, interpret, and discharge extremely small amounts of precisely aligned musical energy. Because this temporal sequence is "music itself," existing as a flowing bundle of minute electrical signals in motion within acoustic cables, it is obvious why cable design and cable material is important. Cables capture music at the point of recording. Cables carry and dispense recorded music in mono, stereo and surround sound reproduction.

Cables, in brief, are at the heart of the musical experience. They sit at the core of the music-making enterprise. In a very concrete sense, cables and the wires that deliver sound shape the image of music from beginning to end.

Music is not only a set of organized sounds moving through air in ambient space. Music is a network of infinitely braided micro-level sonic energy that carries highly-refined and extraordinarily delicate signals that contain vast amounts of acoustic and electronic information.

And there is the perplexity of the work that cables do. They must "read" minute electrical patterns that are subject to alteration in delivery as if those signals were the original and subsequently successful recreation of acoustic sound in three-dimensional space. Without confusing an already difficult issue, acoustic sound occurs in time and, therefore, adds its fourth dimension to the three dimensions of height and depth and width that construct the "staging" and "imagery" of convincing acoustical reproduction.

Music is "all about the sound." And cables are "all about music" when they achieve refined clarity and timbral delicacy. I regard my work with cable design to be an art as much as a technologically-based engineering practice defined by measurements and decisions based on verifiable performance evidence. The choice of materials used in cables is of great importance. Design structures chosen to craft those materials is not a jot less important.

For me and for Acoustic Zen, cables are seen to be enmeshed in all phases of music- creation. Our aim, thus, is to create inherently "musical" cables . cables that are physically sympathetic to musical signals. A quick look at how central cable-design and cable crafting are to the world of music is revealing.

At the moment of creation, microphone cables receive music as it is recorded. Cables through-out the recording chain preserve and transmit (or, alas, unwittingly degrade) signals captured at the microphone interface. Ultimately, post-production delivery of a completed recording depends upon all the cables and interconnects that transmit music from its reproductive source (a DVD/CD player, a turntable, or a tape machine) across pre-amplification and amplification and on to speakers that divulge musical provocation, power, and engagement.

Cables, in sum, are everywhere music is at stake and that is why research into the design of cables -- and into materials that comprise them -- is crucial to improving the creation of music from its source to its end result as listening enjoyment.