



Industry Watch

By Vance Dickason

Chris N. Strahm Gone Too Soon
It is with great sadness that I announce Chris N. Strahm, founder and president of LinearX, died on November 25, 2016, of natural causes.

Of all the obituaries I have had to write for *Voice Coil* magazine, this is one of the hardest for me. For anyone who has read *Voice Coil*, or either of my books (*The Loudspeaker Design Cookbook* and *Loudspeaker Recipes*), it was obvious that I was enthusiastic about LEAP and LMS as primary tools for loudspeaker design. In fact, I am sure many members of the industry assumed I was on Chris Strahm's payroll, but that was certainly not the case.

I was originally introduced to Chris through his first and only Audio Engineering Society (AES) paper that was presented at the 81st AES Convention, November 1986. Paper #2419 was titled "Complete Analysis of Single and Multiple Loudspeaker Enclosures," and was so advanced over the current Thiele-Small (T-S) standard model, I was, in the vernacular of the day, blown away. When I found out Chris lived in the same city as me (Portland, OR), I contacted him and we became immediate friends.

Among Chris' accomplishments were his founding of Audio Technology, Inc. (ATI) in 1988 with partners Larry Droppa (currently CEO of API—Automated Processes, Inc. and former monitor engineer for Stevie Wonder) and Richard Irwin (the mix engineer for both the Eagles and Heart). This company was formed to manufacture a very high-performance live touring mix console, the ATI Paragon. Besides the Paragon (a 100-channel version was installed in the Grand Ole Opry), ATI saw the development of LEAP 4 and LMS. However, the most impressive product Chris designed at ATI was the Electroformer, a monolithic IC high CMRR input and output device that performed about as well as an expensive Jensen transformer at the time.

When the console business was dissolved, Chris formed LinearX in 1993. The company saw the release of LEAP 5, further improvements in LMS, the VIBox, the LT360 measurement turntable, and a host of other products for loudspeaker engineers. LMS was probably one of the most used analyzers in the industry at that time, selling more than 4,000 systems to loudspeaker companies and engineers worldwide.

Chris was one of the best hardware and software engineers (a rare combination, incidentally) I have had the privilege to know. People who knew Chris invariably applied the words brilliant and genius to his analytic ability and his engineering acumen. It is a



Chris N. Strahm (November 20, 1956–November 25, 2016)

severe understatement to say he will be missed.

I have asked three noted engineering personalities who knew Chris well to comment in this tribute to his career. Mark Gander (a transducer engineer at James B. Lansing, JBL VP Engineering, and currently Director of JBL Technology); Dr. Richard Cabot (a project engineer at Tektronix, founder, VP and CTO at Audio Precision, and current president of XFRMR); and Cal Perkins (one of the more prolific product development engineers in the industry, designing for Marrantz, JBL, Northwest Sound, BiAmp, Mackie, and Loud) all graciously agreed to my request.

Chris Strahm was a brilliant engineer who made significant and lasting contributions to audio electronics and

loudspeaker electro-acoustics. Starting out at touring sound reinforcement company and manufacturer Northwest Sound, under co-founders Bob Sterne and Richard Irwin along with audio designer and colleague Cal Perkins, Chris would gain practical skills to accompany his intellectual and theoretical background. It was there he began development of what would become his first masterwork, the Paragon mixing console, which eventually gained public visibility as the ATI Paragon. With a unique circuit topology and advanced layout for its time, it became an industry benchmark for performance and innovation.

Chris' most broadly impactful contributions are development of the modeling programs marketed by his LinearX Systems company. The LEAP speaker program has been a landmark in sophisticated analysis of the interaction and performance of speakers and enclosures. FilterShop addressed analog and digital filter modeling with similar rigor. Along with the LMS measurement system, all have become essential tools for audio designers worldwide.

Taking inspiration from the work of Bart Locanthi, longtime VP of Engineering at JBL, Chris had the mathematical acumen together with the focused tenacity to not only model the primary factors, but also to the secondary influences and interactions, and be able to provide incredibly thorough tools that provide extreme accuracy.

His twin daughters, family, and all those who knew him experienced an unusual and unique individual who touched our lives personally and professionally. The work he produced will continue to broaden its reach far into the future.

— Mark Gander

Chris Strahm was a brilliant engineer who easily transcended the boundaries of electrical, mechanical, acoustical, and software engineering. Products like

LEAP, which demonstrates a mastery of mechanical modeling and acoustics, as well as FilterShop which covers both analog and digital filtering are also testaments' to Chris's mastery of programming. The LinearX LT360 turntable is a masterful work of mechanical engineering as well as electrical engineering including a hefty dose of embedded software. These products, along with many others from LinearX and prior companies are the work of Chris Strahm alone, all the way down to the packaging and the manuals. Few individuals have the breadth of skill required to develop these and fewer still could do so to the high standards he always maintained.

Chris was also an astute observer of things outside the technical realm. He followed politics and the economy closely. His comments and insights were well supported and prescient. He was devoted to his family and friends and could always be counted on for advice. He will be missed. — Rich Cabot

I first met Chris Strahm when he applied for an engineering job at Northwest Sound (NWS) in 1978. At that time, I was looking for an assistant engineer, well versed in speaker theory and practice as well as a solid design background in analog circuit design. Early on Chris wanted to apply his knowledge of T-S parameters to new system design. I wished him well,

but attempted to suggest that the basic analytical model was incomplete and his detailed analysis was useless for the large arrays commonly used. I told him that he was missing the concept of mutual coupling as mentioned in Bart Locanthe's seminal Institute of Electronic and Electrical Engineers (IEEE) invited paper, "Application of Electric Analogies to Loudspeaker Design Problems" (March 1952). Since I did not want to create a science project at that time, I introduced him to Locanthe, and the two men began a long period of collaboration, ending with Locanthe's passing. Chris' research into modeling and analysis resulted in him writing the LEAP 3.0 speaker software.

As a Transducers Papers Chairman of the November 1986 AES convention, I asked Chris to deliver an invited paper to the convention. The title was "Complete Analysis of Single & Multiple Loudspeaker Enclosures." Unfortunately for the audio community, he was verbally attacked in the author's lounge by a member educated way beyond his intelligence because Chris pointed out many of the prior errors in modeling. Sadly, he withdrew from any further AES activities. A story all too familiar in science and medicine when someone challenges the accepted norm.

Leaving NWS in the early 1980s, Chris formed ATI to build a very advanced touring console. It was during the development of the Paragon console, that one evening Chris brought to me a little 4" x 4" vector



20-2257SA



20-2240S



25-2234S



Model
Impedance
Max Input Power
Frequency Response
Sensitivity

Model	25-2234S	20-2240S	20-2257SA
Impedance	4 ohm	4 ohm	4 ohm
Max Input Power	80W	60W	60W
Frequency Response	900Hz-40KHz	1200Hz-40KHz	2700Hz-40KHz
Sensitivity	90 dB	89 dB	90 dB



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board covered with many TO-92 transistors for me to evaluate and witness for a patent. It was the first truly floating and balanced output stage that behaved like an output transformer. Needless to say, it worked far better than anything else that I had seen to date. He incorporated the new circuit design into an Exar custom analog array chip to be used in the Paragon. On September 4, 2008, THAT Corporation announced it purchased the patent rights to use in its own balanced output stage.

The sales of large expensive consoles tanked in the mid 1980s and Chris wrote LEAP and developed the LMS measuring system, perhaps the most user-friendly PC-based speaker measurement system to date. ATI split up and Chris formed LinearX as a test and measurement company producing LMS, measuring turntables, affordable calibrated measurement microphones, and accessories. His last major software package was called FilterShop, which is one of the very best analog and digital filter design software packages available at an affordable price.

At the time of his passing, he had almost completed the LX500 test and measuring replacement for the LMS. Chris was undoubtedly one of the most brilliant people I have had to privilege of knowing. He definitely was the hardest working person I ever met. There was no off switch. The sad irony of life is that we lose so many talented people at a young age—like Chris.

—Cal Perkins

Klippel Seminar Rescheduled

The folks at Klippel GmbH asked me to announce that the three-day "Sound Quality of Audio Systems" seminar dates have been changed to March 13-15, 2017, in Dresden, Germany. Dr. Wolfgang Klippel is the presenter, and will be discussing the latest insights on the measurement and design of transducers. Find out more about loudspeaker simulation, holographic measurement in loudspeaker directivity in 3-D, active control of sound—just to name a few among several interesting topics. For more information, visit the Klippel website at www.klippel.de.

Scan-Speak Offers New OEM Gold Series

Mostly known for its high-end OEM home audio drivers, Scan-Speak is also in the aftermarket car audio transducer business. The company currently has a "Silver Series" of OEM car products, and has added a new "Gold Series" to its extensive product line. The Gold Series features a group of drivers derived from the Scan-Speak home audio transducer line up, but optimized for automotive applications. Five new models are included in the Gold Series:

- 11M/4361G05 Midrange—The 11M is a Revelator inspired 4" midrange, and features a sliced paper cone, low-loss suspension, and a compact neodymium motor structure.



Scan-Speak's new Gold Series features a group of drivers derived from its home audio transducer line up. Pictured here are the 16W/4538G05 midwoofer, the 32W/4878T05 subwoofer, and the R3004/602005 tweeter.

- 16W/4538G05 Midwoofer—The 16W is a Revelator inspired 6" woofer. The 16W/4538G05's features include a sandwich cone with a sliced paper membrane combined with a polycarbonate rear side membrane, which is a new technology that is extremely robust, well dampened, and dramatically suppresses cone breakup modes. This, in combination with low-loss linear suspension and its symmetrical drive high-grade neodymium magnet, offers outstanding sound performance.
- 32W/4878T05 Subwoofer—Modeled after the home audio 13" diameter 32 W subwoofer, this driver features a foam-filled patented sandwich cone, patented symmetrical driver ferrite magnet motor, 14 mm Xmax, and a 3" titanium voice coil former.
- R3004/602005 Tweeter—Derived from the Scan-Speak Illuminator R3004/602000 ring dome tweeter, the automotive version features a 99% pure beryllium dome (from Materion), a large surround roll, a patented SD-2 neodymium magnet structure, a non-resonant aluminum rear chamber, a patented phase plug design, a protective grill, and a die-cast faceplate.
- D3004/604005 Tweeter—Derived from the Scan-Speak Illuminator D3004/602000 26 mm beryllium dome tweeter, the automotive version features a patented SD-2 neodymium magnet structure, a non-resonant aluminum rear chamber, a patented phase plug design, a protective grill, and a die cast faceplate.

For more information about Scan-Speak's new car aftermarket drivers, visit www.scan-speak.dk. VC