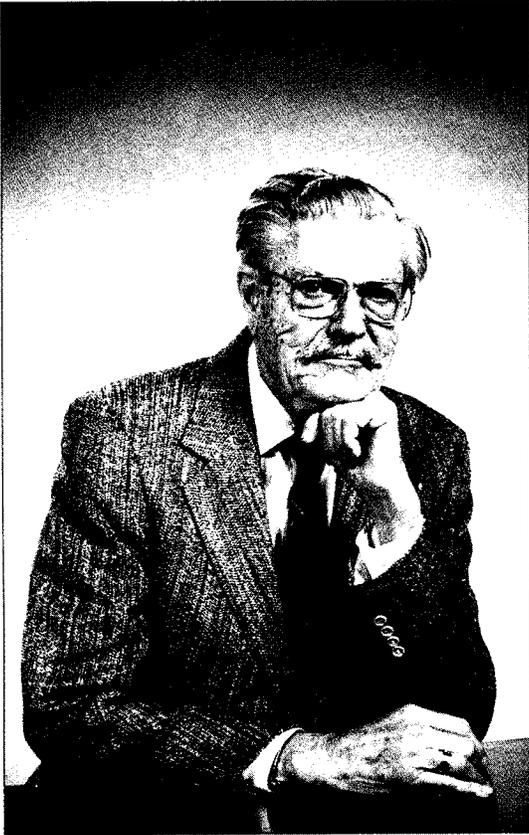


An Afternoon With PAUL KLIPSCH



The *Journal* is pleased to publish another in this series of interviews conducted by the AES Los Angeles Section. These "Afternoon with..." encounters offer spontaneous conversational portrayals of the careers and experiences of major figures in audio history, followed by informal, open-ended exchange with attending guests.

On May 4, 1980, Peter Sutheim moderated this dialogue with Paul Klipsch. Mr. Klipsch, born in 1904 in Elkhart, Indiana, has written papers and holds patents in fields as diverse as geophysics, acoustics, and firearms. He is the recipient of the Audio Engineering Society Silver Medal (1978) for his contributions to loudspeaker design and for the measurement of distortion. In this excerpt from the transcript, Mr. Klipsch offers a retrospective glimpse of a profound, enduring, and distinctive audio career.

Sutheim: Welcome to Paul Klipsch, president of Klipsch and Associates in Hope, Arkansas, manufacturers of loudspeakers. Paul is a Fellow of the AES and the IEEE, a member of the Acoustical Society of America and of Tau Beta Pi and Sigma XI, and he is listed in *Who's Who in Engineering*. Paul is well known for his classic folded horn loudspeaker, for research in the acoustics of loudspeaker radiation, for driver design, and for AES publications on modulation distortion in loudspeakers. He is an advocate of corner placement of loudspeakers and the use of a derived center channel for center fill.

Paul, can you tell us how you became interested in loudspeakers?

Klipsch: I was a radio bug in 1920. My first loudspeaker was a cardboard tube attached to a Brandes earphone. It didn't work very well; it was years later that I found out about exponential horns. At Stanford University one of my classmates invited me to his house one Sunday afternoon, and he said, "You want to hear the radio?" I said no, and he turned in on anyway...

S: Thereby proving himself one of the first audiophiles.

K: Yes, indeed. He had a TRF tuner feeding an M14 Jensen loudspeaker in a real baffle—strange beast in those days. It sounded less like a radio than I had ever heard before. The symphony was playing that afternoon. I had never heard symphonic music, but I decided I liked it, and I put together some boards and a 12-inch loudspeaker fed by a rebuilt radio.

Much later, in Houston, my wife said, "You've been wanting to build loudspeakers. Why don't you use the back room for a laboratory?"—words like a red flag to a bull, and the beginning of the end, I guess. I began with an X-1 woofer and an X-2 squawker. World War II came, Uncle Sam punched my ticket, and I went off to the Southwest Proving Ground.

After the war, I rented a little tin shed behind the laundry where I learned to mold parts we no longer make—the X-5 and X-5 horns—and hired my first employee in 1948. One of us had to back out of that barn before the other could turn around. But we moved out to the

old telephone building at the Proving Ground, which had about 3000 square feet of space. The basement was 12 feet high, so we had plenty of room to swing an eight-foot board around or feed it through a saw. Lloyd used to put things together, and I tried to be a salesman. In 1948, we produced 26 Klipsch horns, one every two weeks. In 1978, something over 2000 Klipsch horns were produced, and that accounted for only ten percent of our total volume. We had many other products—the Heresy, for example, which took care of almost 50 percent of our dollar volume.

S: Paul, how did the Heresy get its name?

K: Back in 1955, I wanted to revive the Bell Telephone Laboratory idea of a bridged center speaker. We were making only corner loudspeakers, and we needed a noncorner speaker. I was sitting there drawing pictures on the backs of envelopes, and my then Philadelphia sales rep, leaning over my shoulder, said, "That's not a corner speaker, Paul." I said no, and told him why. He shook his head and said, "Paul, coming from

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you that would be heresy.” The lights came on and I said, “That’s what we’ll call it.”

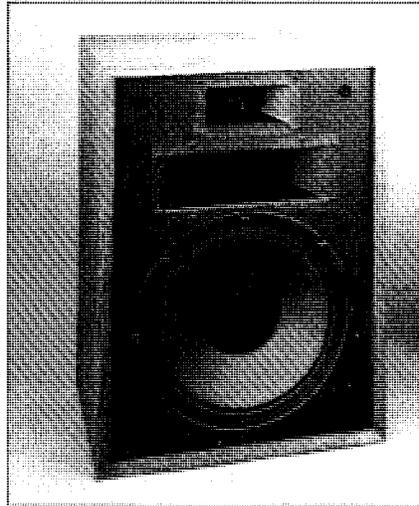
S: The current preference for direct-radiator loudspeakers seems to have eclipsed the horn approach except where very large sound pressures are needed. I’m curious to know the reasons behind that drift away from horns. Vented boxes have come back in the last five years or so, but horns are not popular for home use.

K: True, they never will be. But the trend is toward horns, not away from them. We are growing faster than many of the other manufacturers. We are one of the few manufacturers of horn-loaded treble systems.

S: I’d like to know more about frequency-modulation distortion, an aspect that you seem to have pursued more or less alone. Occasionally I talk to designers of direct-radiator systems, and they tend to pooh-poo its importance. It’s an acoustical phenomenon, not an electrical one, and if it is indeed audible—in music, say—is there any way around it? Is horn loading the only way to prevent it? I know it shows up in your measurements, but how audible is it?

K: Perhaps the first coaxial speaker was described in *Electronics*, about 1938. The objective was to make the woofer and tweeter sounds coincident, as nearly as possible. We rigged one of our speakers with a tweeter mounted in the hollow of the woofer cone. The tweeter was fed a little over 9000 Hz, the woofer 50 Hz. Someone said, “They are different diaphragms; why should any modulation distortion show up?” Think about it. The woofer sound pressure forces the tweeter diaphragm, perhaps generating a little cross-modulation there. And the tweeter sound diffracts around the edges of its motor and bounces off the moving woofer; you could expect frequency modulation, and we found some, down 27 dB. Next, we moved the tweeter to its normal location, about a foot away from the woofer center, and the distortion dropped 13 dB.

In the 1950s I was trying to fasten on why the horn sounded better than the direct radiator, and I knew about the



The legendary “Heresy” loudspeaker, designed in 1955 by Paul Klipsch.

Doppler effect and was reminded that it might occur in loudspeakers. I made an eccentric capstan for an old tape machine. It produced about one percent peak FM, and with a 2 kHz tone made an odd sound. So I knew that FM could produce audible effects. Beers and Belar had published their 1943 paper on FM distortion in loudspeakers, and their comment was that the distortion was hard to describe.

One commentator said that it doesn’t exist, and even if it did, it wouldn’t be audible. I think it is hard to identify the particular oddity of sound from an overloaded direct radiator as due specifically to FM or AM distortion. But if you listen to a typical 12-inch direct radiator at 100 dB SPL and compare it with a good horn at the same output level but with a tenth of the power input, there is a recognizable cleanness in the horn. In our measurements, we find that AM distortion usually exceeds FM in direct radiators. In horns, the FM distortion predominates, but it’s an order of magnitude lower than in direct radiators. I haven’t found out how to conduct a satisfactory listening test to correlate listening impressions with measurements. In other words, I cannot really answer your question. I do know that there is some sort of correlation, and people who listen to good sound over horns recognize the difference.

Question: What is your feeling about multi-amplification compared with passive dividing networks?

K: If you want another dB or two of power output, I guess that is the way to go. But I still like passive crossovers.

Q: Doesn’t that choice also have something to do with intermodulation distortion?

K: Yes, but with present amplifiers, I think overall intermodulation is going to be well below audibility as long as you stay below clipping. We do it. We don’t offer bi-amplification as an option, but the customer can buy our professional models without crossover networks and bi-amplify or tri-amplify as he chooses.

S: Could we talk for a moment about corner placement and your reasons for it? That recommendation puts you at odds with the advice of other manufacturers. The standard nowadays is up off the floor and away from the walls.

K: Let’s look at a corner speaker, not necessarily a corner design, just a speaker in a corner. We have three mirror images, and if we rub out the walls and replace each image with a real speaker, then as far as frequency response is concerned, there is no difference between this array and the one speaker in the corner. For all the frequencies for which these are good walls, the efficiency difference between the corner speaker and the four-speaker, no-wall array, will be very small. I have found, as I’ve put it before, that bass response can be improved out to 10000 Hz. If you analyze it this way, the corner begins to make sense, and the folks opposed to it appear to be a little prejudiced. If you don’t believe the corner will help a box loudspeaker, try it and see. You may have to turn the bass down to get it back in balance, but you will then find the distortion down by about the same amount.

Q: When you have two corner loudspeakers and the third speaker halfway between, is it fed the sum of the two channels or the difference?

K: The sum. In 1957 I published a paper where I said it made no difference. I now have to disagree with the author. The program material I had played up to that time didn’t make a difference. But then I got a particular Nat King Cole

four-track. On one side, the three-speaker setup sounded just fine. Playing the other side, the soloist in the center disappeared. Obviously, phases were different on the two sides.

M: Any parting advice?

K: When you buy a loudspeaker, it is supposed to put out acoustic power. Speakers are advertised that will handle

300, 600, 1000 watts input. It's output that matters. Bragging about input power is a little like bragging about how much gasoline your car can burn. The second important characteristic is distortion. The two go together; distortion (to a first approximation) is proportional to power input in any loudspeaker. It follows that distortion is inversely proportional to efficiency. Horn speakers are inherently more efficient. And the third

is polar pattern. There are times when you want to project the sound tightly, but usually you want to cover a fairly wide area. Last in importance is amplitude-frequency response.

John Prose: Let me introduce myself. I am chairman of the section, and I want to thank you very much for coming and for this particular opportunity we have had to be with you.