Henry Kloss

DISTILLING THE ELEMENTS

DAVID LANDER

Henry Kloss is a builder, and he looks the part. The white hair surrounding his naked crown is long, pulled back, and twisted into a knot at his nape. He commonly wears khaki trousers and oxford-cloth shirts, sleeves rolled up to his elbows, button-down collars unbuttoned. For a long time, this utilitarian image extended to his cars. Kloss has owned two Checkers, one for 13 years, the other for 14. When the company, best known as a supplier of taxis, went out of business, he let himself be talked into buying a Mercedes diesel station wagon. This is now about 10 years old, and Kloss hopes it will serve him for at least another decade.

The fact that Kloss is so colorful a character has often led writers to put as much emphasis on his personal traits (his manner of referring to himself in the third person, for example) as on his many significant accomplishments. Of course, these attainments—first in high fidelity and later in projection television—have been the reason I and so many other journalists have called and visited him so often, first at Acoustic Research, KLH, and Advent, later at Kloss Video and Cambridge SoundWorks. In the nearly four decades since AR's startup, Kloss has repeatedly demonstrated a rare talent for spotting important new concepts and incorporating them into readily affordable consumer products. More than mere line extensions, his new models have stemmed from a deeply rooted desire to move audio technology forward and provide buyers with previously unavailable benefits.

Henry Esplin Kloss (pronounced with a long "o") was born on February 21, 1929 in Tyrone, Pennsylvania, a small town in upper Appalachia founded by his great grandfather. When Henry was eight weeks old, his family left for Sebastopol, California, chicken-farming country north of San Francisco, where he spent his first six years on a farm. His father, Daniel, a civil engineer by training, held a variety of construction jobs, including one on the Hoover Dam project as a foreman in earth moving and heavy construction. In the early 1930s, while working on a Pacific Gas & Electric project, Daniel Kloss was hit by a boulder that broke his back. His recovery took years, and because there was no workman's compensation at the time, the Depression years were particularly difficult for the Kloss family.

Just before Henry entered first grade, he returned to Tyrone with his mother, Gloria, and his two sisters. At first, they lived in town, later a couple of miles outside it in a log cabin. Henry went to a one-room schoolhouse there and spent much of his free time working around his home, building and plumbing a bathroom for the cabin and adding on a room for himself.

In fact, Henry Kloss has been building one thing or another ever since—most notably for *Audio*'s readers, the hi-fi products discussed in the following conversation. *D.L.*

PHOTOGRAPH: ROBERT LEWIS

ACOUSTIC RESEARCH AR-1

The first acoustic-suspension loudspeaker, a full-range, bookshelf model.

KLH MODEL SIX

A "seminal" loudspeaker: "Here one had control of every element."

KLH MODEL EIGHT

The first FM radio with a high-selectivity tuner.

What enthusiasms led you to MIT, and how did they develop?

Just liked learning about how things worked.

Electronic things in particular?

Well, yes. In the last year of high school in Tyrone, there was a particular program to teach people about electronics to prepare them for the service. And some of us got together and persuaded the school to keep it one year after the war so we wouldn't have to take fourth-year Latin.

Did you have an interest in music?

No, just what I could hear on the radio from one available station. "Firestone Hour." Now and then a visiting orchestra, Paul Whiteman or neighbor townsperson Fred Waring, would come to the big town nearby, Altoona. A record player at that time was a rarefied kind of thing. I remember visiting somebody in Philadelphia who had probably a Capehart and the Tchaikovsky First Piano Concerto all on 78. I had a chance to sit down and listen to it the whole way through. That experience was a real treasure.

Why MIT?

It was one of the two names I knew in engineering, MIT and Rensselaer Polytechnic Institute. I got accepted to both, got a small scholarship at MIT, so that was decided. It was easier in those days than it would be today. Then I spent a year living with relatives in California trying to get enough money to get through the first year, working in the building trades—remodelling, plumbing, wiring, all that sort of stuff. The first person I found needed that work done, and I pretended I could do all that. "Yeah, I can plaster." Which is only one of many operations I've waded into to learn quickly how to do this or that. You do what you have to at the moment.

When did you finally get to college?

'48? Yes, it was Class of '52. I never got through with that class, but it was 1948. I attended full-time for two years, then part-time for two years. Maybe I completed three years. Then dropped out, yanked into the service.

You were drafted?

Impressed. [Laughter.] Well, that's the proper term. It turned out okay. And I didn't like school that much either. Lab work with a pre-known result has never interested me much.

Even before you went into the service, you were in businèss building speakers. How did that come about?

While I was a student, I regularly worked, first around Harvard Square for a contractor, cutting nice big old houses into little apartments for students. In one of these houses, I said, "Look, let me fix up the basement myself and have it rent-free." So I had a rent-free apartment, nice place. I was not going to go out and buy furniture—I went out and bought woodworking tools that I could make furniture with. And then got this contract to make furniture parts and never did get my furniture made. Then what happened is somebody needed a particular box made, and that's what started the modern chapter.

The box being an enclosure for the Baruch-Lang speaker, designed by Jordan Baruch, an MIT professor, and Henry Lang, one of his graduate students. Do you know what led to its development?

WGBH was broadcasting the Boston Symphony Orchestra live on FM, a relatively new medium. The idea of broadcasting live was an exciting kind of thing. And there were some decent FM radios, particularly from Zenith, with absolutely miserable speakers—which offended an idealistic professor at MIT, Lawrence Arguimbau, who wrote a very literate text on vacuum tubes. Arguimbau went to the acoustics lab at MIT and said, "Look, why can't you guys make a good speaker available to more people to listen to this wonderful music that's being broadcast? What these radios need is a good speaker."

Was the Baruch-Lang indeed a good speaker?

It wasn't that dramatic a kind of thing, but the loudspeaker had enough incidental merit and was the best loudspeaker a lot of people had then. So I made cabinets for that. And then later on, I would buy drivers, too, and put them in the cabinets. I actually sold those direct in the beginning, and later then sold through dealers. Sold as

many one way as the other, $20 direct and $30 through dealers. That was under the name Kloss Industries.

You had employees even then?

Yeah, graduate students in English at Harvard, and several people at MIT, who would come in at night.

You managed to keep this operation running during your time in the service. Where were you stationed?

Fort Monmouth, New Jersey, which was the Signal Corps Center. I instructed in basic electronics, sometimes 40 hours a week. I also absented myself every weekend. I'd dash out of there on Friday, grab a train at Red Bank, take the Hoboken Ferry to New York, and catch the train to Boston. I had transferred from my basement to a 2,000-foot loft in Harvard Square and was making and selling loudspeakers with part-time help, MIT students at that time.

You also took an evening course in high fidelity at New York University during that period—taught by Edgar Villchur, who became your partner at Acoustic Research. What did Ed do for a living then?

He was a very good technical writer and had repaired radios at an earlier time. He'd written a couple of good handbooks on sound reproduction and, as such, was a student of the business.

Enough so to develop a radically new speaker based on the principle of acoustic suspension. When did you learn about it?

We went out one evening, and he told me in a few simple sentences what it was. I said I would very much like to implement that in a commercial form. "No, this is for the big boys," he said. And he was right, and he tried Bozak, Altec Lansing, University. I knew what the answer would be—I knew what happened when inventors went to companies. There's a very strong syndrome of not wanting to acknowledge something from the outside in a large company—which he met.

I'd given Ed my name and address just in case it didn't work. And we met later and said, "Okay, let's give it a try." I had two friends—one army buddy, Malcolm Low, who was in the same teaching unit at Fort Monmouth, and Tony Hofmann, who was a solid-state physicist, a neighbor in Cambridge—who had $2,500 to put in. These two friends with $2,500 each, me with the beginning of a manufacturing establishment, and Ed with his idea, became Acoustic Research, which actually got formed, I think, when I was still in the army. I got out three months early by going back to school. I went to Boston University for two days.

Two days? [Laughter.]

I wanted to get back to work, which I did. Ed did later contribute some money himself, but the company was formed so he was half the ownership and control and we three were the other half.

When did the differences begin between you, Malcolm, and Tony on the one hand and Ed on the other?

Actually, there were philosophical differences from the beginning. I wanted to build a speaker from scratch. Ed wanted to buy speakers from a company called Best and cut off their suspensions and replace this and do that. I had to really go back to first principles and build a whole new speaker, which, okay, I did. Sketch out little drawings for a sand casting and get that made, get the machine shop to turn out some pole-pieces. That first magnet was magnetized on a great big two-story-high generator. Tony, in solid-state physics, acquainted with the magnet lab at MIT, carried the magnet over there. I did design studies by playing with areas, weights, and motors. Had a variable magnet, first used an electromagnet. The suspension was pool-table felt, and the piston was blocks of Styrofoam. At very low frequencies, anything works like a piston. So it was trying to optimize low-frequency response and efficiency and minimize box size, of course. That's when Tony, who has a very good analytical mind, systematized the whole thing about closed-box, low-frequency design. Volume of box, low-frequency response, and efficiency are necessarily tied together. You can increase one and decrease the other. So I wasn't missing anything. [*Author's Note:* Kloss delineated this in "Loudspeaker Design: Hofmann's Iron Law," published in the March 1971 issue of *Audio*.]

How many models did you work on in your three years at AR?

The AR-1, a self-contained, full-range, so-called bookshelf speaker. The AR-1W, which was the AR-1 minus the high-frequency driver, intended specifically to go with this very fine four-panel high-frequency speaker, the Janszen electrostatic—unquestionably the best high-frequency speaker built then. I did the engineering on the AR-2, and that coincided with the time of Malcolm, Tony, and me leaving. The AR-2 was first delivered on the day I left.

I understand the AR-1 employed an 8-inch tweeter with the lows rolled off.

One had used in the AR-1 this quite expensive Western Electric design then made by Altec, the 755, which was an 8-inch, full-range speaker. It had a better high frequency than the Bozak tweeter, regarded as the best hi-fi tweeter, which Ed had in mind using. I showed him there was a better high end on this 8-inch speaker. The high-frequency speaker had its own box [within the AR-1's enclosure], which was open to the front and stuffed with wool. Strange way to get a tweeter—just happened to be the best highs you could get.

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What improvements did the AR-2 represent over the 1?

Economy. It was a $96 rather than a $185 speaker. Still using the acoustic suspension but with a smaller woofer smaller box. And for the high frequencies, a pair of low-cost 4-inch drivers. Mechanically damped. I stuffed fiberglass in them. And then electrically equalized in the crossover. You could get a lot of output from some small, cheap speakers at high frequencies. You had far too much output at 3,000 cycles—horrible screechy little things. By electrical compensation, you could get the high end of a very low-cost, full-range dynamic speaker. You could get just the right amount of high frequencies for the rather low-efficiency low end. So the idea of using electrical tailoring of the frequency response, which is a key ingredient in any speaker I've done since, was first discovered there. I really used that to great advantage in the Model Six, which was a very important loudspeaker a bit later on from KLH.

You've said that electrical tailoring can make a cheap speaker sound like a much better one.

While at KLH, I ran an experiment with salespeople, who were musically knowledgeable people at that time.

KLH MODEL ELEVEN FM

An early portable system, with Garrard changer and Pickering cartridge.

KLH MODEL FORTY

The first consumer tape deck with Dolby noise reduction. The front panel and mechanism were designed by Kloss at Advent and then sold to KLH, which made the electronics.

ADVENT MODEL 100

The first consumer Dolby processor.

Did an A/B, with a lot of different records, between two speakers, and got people universally to choose A over B. B was the Model Six, A was a cheap Radio Shack speaker with a graphic equalizer that I could make sound more like the Model Six than the Model Six, literally, just by depressing that center octave.

Why did you, Low, and Hofmann leave Acoustic Research?

Each [faction] was convinced the other was psychologically unstable. It was that simple. Ed lived in Woodstock [New York] and did a great job of publicity. In three years, we were selling at a rate of $750,000 per year, quite profitable. Things were obviously happening fast. You had to fire this supervisor, you had to rent this building. Ed did not like to see those decisions being made by somebody else. I thought these decisions had to be made by somebody on the premises. From the beginning, it was agreed that, whichever faction left, they had a right unto the patent, a license to make the speaker. Each of us was sure the other half would never be any competition. So things went back and forth for some time. It was uncertain who was going to leave until the very end. And I had more to lose by staying in a company which couldn't take any positive action. You needed a majority of the board of directors. The board of directors was split, even, and a company like that could never take a positive action. Ed got $55,000 together and bought the three of us out. Well, $56,000; our attorney, at the last minute, just couldn't resist putting an extra thousand in there.

What goals did you have for KLH when it was started in 1957?

Didn't have anything specific in mind except make better speakers. In particular, the high end of the low-frequency speaker, always a difficult part to engineer. When that piston, no matter what it's made of, stops working like a piston—around 1,000 or 2,000 cycles—one tends to get a highly irregular response. The AR-1 was such a dramatic advance, details like that didn't matter much—what that blob of paper I bought from a cone manufacturer behaved like. So the first thing KLH did was use the consulting services of a paper chemist and set up a paper-making laboratory, get the beater and vacuum equipment to make paper cones.

How do you make paper? What material do you begin with?

You use all different kinds of fibers—wool, cotton, leather. Almost any fibrous thing can get beaten up in the presence of water.

Did you ever use leather as a basis for cones?

Not in the cones finally, but in experimental ones. We got the cycle down to where I could make a cone and test it in a speaker in two hours. So one just turned out a tremendous quantity of different kinds of things. I remember one time I was using that pure cotton stock, the way they used to make paper out of vegetable fiber rather than wood. And before that, I had been using wool in a mixture, just as Bozak had done. Came out as this nice white paper sheet with these little, fine red and blue threads embedded in it. I was about ready to make money the old-fashioned way. [Laughs.] This is the sticky part for a counterfeiter, to get this nice white sheet of paper with the little threads embedded in it. Here it came out accidentally while making loudspeaker cones. I was tempted. Maybe I should have succumbed.

In any case, you did produce a woofer with a better top end.

We made a low-frequency cone that was well behaved at high frequencies. Then made a dumb mistake, marketing products intimately tied to the product of another manufacturer. Here we had the world's best woofer that combined acoustic suspension and a cone built to behave properly at the higher frequencies. And the world's best tweeter then was the Janszen electrostatic. So the first products of KLH—Models One, Two, and Three—were woofer-only models made to go with the product of another company, Janszen.

How did the three woofer-only units differ from one another?

The first thing one did was a big two-woofer thing with a shelf at the appropriate height. Quickly thereafter, we did a single bookshelf box you could put the tweeter on top of, and then a single speaker on legs, dumb-looking thing, that you could put the tweeter on top of. Malcolm Low liked birch and ordered a whole bunch of birch Model Two cabinets that just sat there for a long time.

The Model Four was KLH's first full-range speaker.

CBS Records adopted it as their monitor speaker. The high-frequency driver was not one that we made. It was made by GE, of all places—just happened to be the best tweeter I could find at that time. So there's the first full-range KLH speaker, more expensive than the AR-1 and widely competitive with it. I think it was $224.

That speaker coincided with the first

stereo components. Did people buy the Fours in pairs?

The speakers were still always priced and described singly, but people frequently bought two of them. Back in the mono days when you were buying a system, the rule of thumb for spending used to be half the money for the speaker and the other half for the rest. We speaker makers should have kept that rule going. But that was how important the speaker was regarded in some quarters.

I understand KLH designated two different speakers as Model Five, one that came before the Six and one some time afterward.

The first one, the chronological Model Five, was an array of dynamic high-frequency speakers, a functional replacement for the Janszen. It wasn't a major product, except that what you could do with an array of high-frequency speakers, it did well. At a later time, I addressed the widely expressed desire for a three-way system. Another feature [of the second Model Five that] I thought was important, having worked with crossovers, was a highly flexible crossover network with, I think, two switches and three positions each on the back of the cabinet. These were not simple resistors or pots. They were a reconfiguration of the frequency contouring of the whole middle range of the speaker, which is what's important.

You've called the KLH Model Six "seminal." What made it such an important speaker?

It was the high-frequency speaker that was made in a way that it had substantial excursion. It could respond very effectively down to 1,500 cycles or below, and it was good at high frequencies because it was a one-piece cone; it wasn't a cone speaker with a dust cap on it. And the voice-coil was held with epoxy right on the apex. So one had very close coupling between the voice-coil and the speaker, enough area so the speaker could operate down low, and use of only a small portion of the radiating surface for high frequencies. And one had the freedom to tailor the speaker, play with the paper and the magnet and everything to make, for the very first time, our own real wide-range, high-frequency loudspeaker that could put out a lot of power down low.

Then it's the time spent with a live music source and the speaker itself. I borrowed a rather elaborate nickelodeon from Bearskin Neck Country Store here in Rockport [Massachusetts] and set that up with a microphone with a tape recorder and the speaker nearby—you could switch between the two. We did that one time at the New York Audio Fair; I thought it would be an impressive demonstration, and nobody even noticed. But it was a handy tool to have.

Before, I was making a low-frequency speaker only, or a high-frequency array that sounded like the Janszen, but here one had control of every element. And realizing that most speakers had too much output in the 800 to 1,600-cycle octave was an important discovery, just learning what it should sound like. By that time, one had a fair amount of experience. We started to get a lot of field experience about what something should sound like. Did a lot of listening—one would just sit there flipping records. There were about 13 bands you'd just cycle through all the time. Sum up field experience, do a lot of listening, and do the objective measurements—you know, you don't want any sharp discontinuity in the frequency response. There's no measurement that tells you how much energy should be in this octave compared with that octave. That's what takes field experience and final judgment.

So after you've got one set of requirements down, there's a second set of essentials you have to deal with.

You've got to have bandwidth. Okay, you get that. You've got to have no sharp discontinuities between adjacent frequencies. And you have to have low distortion. After you get those objective things that nobody can argue about, then what completely dominates the sound of a speaker is this octave-to-octave or half-octave-to-half-octave amount of energy that you put into it. And the Model Six had that more right than anything before. What it really had was this proper sound with respect to not having too much output in the particular octaves in the midrange or the middle highs. So that was the Model Six. It had the most right sound of any speaker made up to then.

The Model Six was very successful commercially.

Right from the beginning. The price was right, and the performance was spectacular, and it immediately started selling in what to us was very large quantities. Even many years later, you wanted any new speaker to sound like the Model Six. And some other people in the speaker business also recognized that.

Your KLH Model Eight was the first high-fidelity radio. How did that come about?

We were becoming a visible company, successfully selling speakers. Comes in through the door, as there has through the years, an inventor, a would-be consultant. This chap had a tuner which was better than the then very highly regarded McIntosh tuner. One engaged him. He went through his study. It was then noticed he did just one thing to make his product a better tuner than existed—put adequate selectivity up front. If you did that and made a very simple tuner, you could have high quality without being high priced. Even the component tuners of the time largely had front-ends from Germany, and they had no selectivity because they were designed in a country which had only three FM stations. The same thing, unfortunately, happened with McIntosh. Lawrence Arguimbau, who also did important FM work at MIT, was actually involved in the design of that tuner, but he was out in the country in Binghamton [New York, where McIntosh has its headquarters] and didn't realize the importance of the high selectivity you need in a real urban environment.

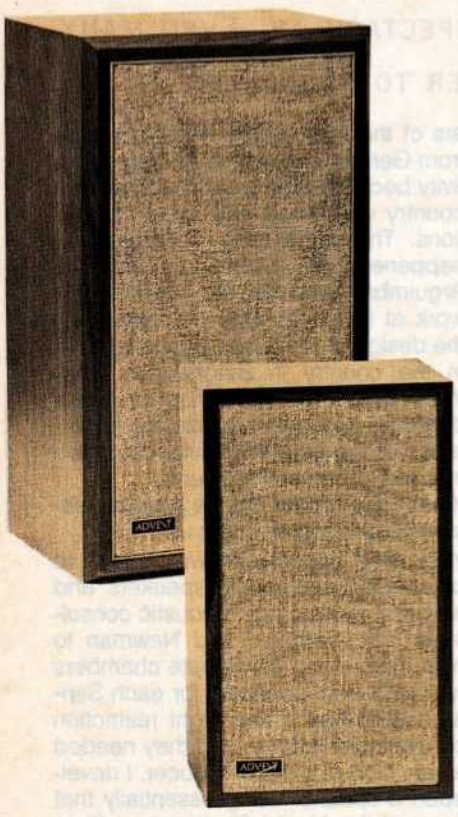
Wasn't the Model Eight's speaker designed for another purpose?

Yes. We'd become known enough to be able to make special speakers, and we got a request from acoustic consultants Bolt, Beranek, and Newman to help them equip the Senate chambers with individual speakers for each Senator. BBN had a very tight restriction on available volume, and they needed a very high-quality reproducer. I developed a speaker using essentially that cone of the Model Six tweeter with a very free suspension on it. So I had a very good high-frequency speaker that I allowed to move far enough so it could be a reasonable low-frequency speaker. I don't know what ever happened to the Senate project; the

THE KLH MODEL SIX'S PERFORMANCE WAS SPECTACULAR. EVEN MANY YEARS LATER, YOU WANTED ANY NEW SPEAKER TO SOUND LIKE IT.

ADVENT MODELS 200 AND 201

The 200, with a Nakamichi transport, was the first cassette deck with Dolby noise reduction. A Wollensak transport was substituted in the 201.



ADVENT LOUDSPEAKER AND SMALLER ADVENT

The Advent had a better low end than the KLH Model Six. And its brother, says Kloss, was not a "lesser" Advent.

speaker never was used for that application. But put two of these in a little box, and you have a great music reproducer, for the first time a sub-shoebox-sized speaker for serious music listening.

So one knew how to make a tuner, one had this great little speaker. It defined a radio. That was the product that first got us into the system business, the Model Eight. It was built with solid walnut cabinets, vacuum tubes—that was the end of the vacuum tube business. We made the transformers, had somebody else make the cases, handwired all the circuitry, made the chassis. And it was because one had learned to make a better tuner and a better speaker for other reasons.

How much did the Eight sell for?

$160. A lot of money for a radio. A lot of radio for the money. Many of them are still in use, I find. One of the problems with FM at the beginning was drift. Each Model Eight had an individual recording made for about two hours to measure frequency drift—an individual chart recording on every one that was produced. We did stuff like that. Those were exciting times because, with each of these new product developments, one was doing things that were very much different from what people had done before.

And the Model Nine?

Then Arthur Janszen joined KLH as a fourth member, with his Janszen Laboratories and his product, and proceeded to develop the low-frequency panels that resulted in a full-range electrostatic speaker. That was the Model Nine. It's the one speaker I didn't have anything to do with. A great speaker.

Then you developed the portable Model Eleven compact stereo record-playing system. Could you tell me about its genesis?

Joseph Horn, a big, old-line department store in Pittsburgh, inquired about a proprietary version of the Model Eight. Literally while talking to them on the phone, it dawned on me. That wasn't the product. What you really ought to have is a record-playing stereo music system. You had a good, reliable source of stereo in records at that time. Stereo broadcasting and the decoders were highly imperfect devices at that time, real problems. You had a really good library of records. Garrard was by then making a good changer. There was a good, low-cost cartridge, the Pickering, which had previously been very stiff. I had learned about this material that you could form, on low-cost molds, into a suitcase structure and matching speaker enclosures. And we'd already gotten into making a transistor amplifier by that time. It was these things falling together that became the Model Eleven.

Frequency contouring of the speaker was also important, wasn't it?

Oh, yes. In any product I've ever done since the AR-2.

The Model Eleven FM added a tuner section.

The Eleven FM, interestingly, was going to be FM/AM, and the front panel was designed for two circular dials. It was noticed that AM really isn't that important. In the meantime, the panel had this extra hole. So we kindly gave people a place to store the 45-rpm spindle and finessed it very neatly. [Laughter.] A later product, Model 24, was built with an AM tuner.

It's been said that the Eleven was the first successful industry product to employ transistors.

Slightly earlier, by a month or two, Magnavox did a similar kind of thing in a somewhat bigger wooden box. Not a product that one remembers, but it did have transistors and was a phonograph that could be packaged together and carried around. So technically we really weren't the first. We did affect the industry, though. Harman Kardon made one not because Magnavox did, but because we did. There were several follow-ons.

You introduced the Model Eleven in 1960. Four years later, I understand, it was selling at the rate of 10,000 units a year, an enormous quantity for a hi-fi product. Part of the reason had to be that it lowered the price of good sound by at least 50%. How did you manage to get the price down to $200?

Cleverness in the tooling, vertical integration of the manufacturing. And selling it for less than it should have been sold for. Like all the other products made by KLH.

Some people feel you weren't making the margins you should have at KLH. Were you?

No. First of all, the margins were low to start with. And the products stayed in the line for many, many years at a fixed price. The $200 price of the Model Eleven stayed $200. The same with the Model Six. For 10 years, it wasn't changed. The starting prices of the products were lower than they should have been, and they never went up.

Why didn't you raise prices?

Idealism, quest for volume. A combination of those two things.

Singer bought KLH in 1964. Why did you sell?

KLH was now a sizable company. Malcolm Low had always been interested in doing new kinds of things. High fidelity was new, he was in there, did an important part of that. Tony Hofmann had always been in solid-state physics through that time—40 hours a week in solid-state physics, 40 hours a week taking care of financial matters at KLH. He's got to make a choice. And he doesn't want to leave solid-state physics. I mean, the three of us had just worked together perfectly, all the flexibility of one person, the wisdom of the three of us. We couldn't have been a more ideal and tranquil combination, but they didn't want to devote their full lives to it. It was my life, making product. A friend of Malcolm Low's in the financial world introduced us to Singer. They had all these stores, could sell a lot of sewing machines, and thought they could sell another consumer product. The sale, incidentally, affected nothing in product development for the next three years. Manufacturing was still my responsibility. There were no manufacturing or product development people infused.

One product you developed during the Singer years was the KLH Model Twenty, also a complete compact system. What was the rationale behind that product?

It was, for the first time, a chance to address the broader question of what the customers wanted in an integrated package. The idea saved people from the rather difficult task of learning about components. We thought it would be much more efficient to present people with a single-choice purchase most could live happily with for tens of years. That was the Model Twenty, very popular because it was both more economic and a safer kind of decision. It never became a department store item; it was a little bit removed from that. But it was very easy for people to decide to buy and use.

That system's tuner later got spun off as the Model Eighteen. I understand you skipped model numbers when conferring a designation on the Twenty because you thought it was such an important product.

The Model Twenty was largely responsible for doubling again the sales of the company. Then that tuner was noted to be better than other component tuners, and it became a separate product. Unfortunately, the Model Eighteen was presented in a physical form that did not look like a serious component: It had a nice wooden box but a melamine front panel and, of course, this strange concentric planetary dial and tuning knob, which is so accurate and I think so easy to use but didn't play by the rules. Not your slide-rule dial.

You used the same configuration years later on the Advent Model 400 two-piece radio.

I always used that. Any tuner I've made has taken that form. And receivers. The KLH Model Twenty-Seven had two of those, AM and FM side by side. Looked strange.

What led to your leaving KLH?

I didn't see important new things to do in audio. It was perfectly obvious how you make good stuff, anybody could make that speaker, anybody could make a tuner like that, nothing proprietary. And I thought audio was going to be a much bigger business, large enough to revert to the majors—the Zeniths, RCAs, Stromberg-Carlsons—who had the efficiency of manufacture and distribution. I was very right in one thing: It did become a much larger business. And I was wrong in another: It did not revert to the majors.

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I introduced the idea of television to Singer, and they understandably weren't interested. So I made my plans to leave and work in television, in presenting it in a living format. Advent was started to make projection television.

Didn't you hear about Dolby noise reduction at that time?

It was in the last weeks of my tenure at KLH that I heard about a form of noise reduction not detectable to a sensitive ear. Seymour Solomon of Vanguard Records claimed it did nothing to disturb the music. That was good enough for me—that guy really knew what things sounded like. I called Ray Dolby in London—he preferred to operate in London—and said I wanted to talk to him about it. He didn't encourage me in any way, but allowed the visit.

Ray remembers that you called him on a Friday and arrived in London the following day.

There was no need for any particular time to elapse. I wasn't deeply busy at anything. And getting reservations at that time happened to be pretty easy. Sargent Shriver, in an article in *The New Yorker* magazine, described how he would stretch out and sleep on those flights. He discovered that, if you get the cooperation of the person in back of you and get under two seats, you can stretch out and sleep on the widebody planes. Caused great consternation when I was thought to be missing. [Chuckles.]

You slept on the floor?

Slept on the floor, under the seats. It's noisy down there, but it's comfortable.

So you went over to see Ray.

And told him Dolby noise reduction ought to be used in consumer products. He said, "In the fullness of time it will be, after being used more extensively in professional equipment." You know Ray—quite conservative, careful kind of chap. And I said, "At least in audio now, it doesn't happen that way. If there's a commercial advantage to some particular technique, somebody's going to take it and run with it. I would suggest that it be you and me, Ray."

He was coming to visit this country, so we'd meet again, which we did a few weeks later. By that time, I had gone to a consulting engineer with a description of Ray's elaborate, four-band, £2,000 machine and identified the band that's important and used FETs instead of diodes for compression. I'm not really a design engineer, but I knew a little bit about what circuit operation could be executed at a reasonable enough cost to make a consumer version of the system. So by the time Ray arrived, I had a slow-speed tape machine, a Roberts 1⅞-ips machine, with that circuitry and showed what could be done with the tape speed being used for the Philips Compact Cassette.

Even after you left KLH, you wanted to see a consumer tape deck with Dolby produced, so you actually helped develop it. What, specifically, did you work on?

The mechanism of the deck, the drive. And sold it to KLH, where they would develop the electronics. Designing the front panel and making the whole mechanism was a first project of Ad-

vent as something supporting the plan of making projection television. It happened to be a drain on the activities at Advent, but that was my mistake.

That was the KLH Forty.

Yes. Open-reel, two 8-inch reels with Dolby. Very easy to load, a lot of very nice features. Then we got Advent into the first stand-alone Dolby processor. The Model A301 was the professional model, and then one had a very cleverly packaged, simple, but again strange-looking 100, which was a low-cost way for anybody to wrap Dolby around the recording or playback end of their existing deck. People don't do things that way. The idea of adaptors never works, no matter how well they work mechanically.

Then you produced your own Dolby deck, the Advent Model 200, which was the first to combine Dolby with the cassette.

That was using a Nakamichi-built deck and the Dolby circuitry. We had to do extensive work on modifying those units to overcome the insufficiencies of the early Nakamichi decks, a very expensive, unhappy experience. We had to pay an awful lot in air freight to get them in a timely way, and then electrically had to adjust and change components inside.

You very quickly came out with a successor, the Model 201. Didn't that use a transport from Wollensak?

Oh, yes. The 200 was mechanically insufficient, like a lot of Japanese products made then. It was really annoyingly underdesigned. In fact, the mechanism we thought we were getting had been changed to save 34 parts. Nakamichi had the reputation of building a reasonable machine, but the designer got in there and simplified it. The world at large hadn't learned how to make cassette machines then. So we noticed this good, rugged audio/visual mechanism made by the Wollensak division of 3M for language labs. And they agreed to supply us.

Another factor in the equation was chrome tape, so Advent introduced a line of blank chromium-dioxide cassettes.

Integral to my belief that the cassette would surpass the vinyl record were these two things: Dolby noise reduction and chromium-dioxide tape. I had read about chrome tape years before in *The Wall Street Journal* and noted this fact. Then we began looking at the cassette, and I remembered this and called DuPont to find out about chromium dioxide and learned that, yes, they had made some, had been trying to sell it to duplicators, had sold none of it in four years. We said we would like to market the tape. We spent quite some time talking to Memorex and were to jointly market the first chrome tape. Then Memorex decided not to pursue it. Fine. We said to DuPont, "Let us do this ourselves." Then we got a tape packager that was making cassettes for different OEM [original equipment manufacturer] uses. DuPont would supply them the tape, and they would package the cassettes. DuPont was very helpful in this.

You also marketed a line of prerecorded chrome cassettes.

We wanted to carry this process further, so we built tape duplicators that ran at only four times the 1⅞-ips playing speed, as opposed to the normal 32 times, and got access to musical material. We sold blank tape and prerecorded tape successfully. It could never be a major contributor to total volume, but it made people know about Advent.

You've said that your importance to hi-fi has been as a synthesizer rather than an inventor.

You learn about these elements and you put them together.

Advent had a playback-only deck in its line for a while.

Yes, we did. We thought the cassette—widely replacing the vinyl record, especially for library use—was a more durable playback medium. We hoped the deck might get wider use as an institutional if not home unit.

Did it?

No. Recording capability was so widely expected that a playback-only unit shouldn't have been produced.

You started Advent in 1967 to build projection TV, yet two years later you put the company into the loudspeaker business.

Work in projection television is far more expensive than work in audio. Money runs out after a while. And the world wasn't flooded with good speakers. Again, the audio business did not revert to the majors; it still belonged to the small specialty companies. KLH management was not the same as the old management, and there was nobody else filling that particular high-value niche. Fine. We'll go back and make loudspeakers, and we did—and sold more among our particular audience for at least a couple of years in a row than we'd ever done. That was the Advent Loudspeaker.

With that speaker, you once again proved your ability to lower the price of good-sounding audio equipment. The original Advent Loudspeaker had a better low end than the KLH Model Six and underpriced it by more than 15%. How did you accomplish that?

The Model Six's price had stayed the same, but it was introduced at a time when there weren't that many made. We could immediately assume a higher quantity when we priced the Advent. Fortunately the bigger quantity happened. It would have been a wrong price if it had been a minor product.

Then one did an interesting variant of it and made something that sounded exactly the same, 3 dB less efficient. As the laws of physics tell you, in one-half the volume, you can do this. You save a lot of money on the cabinet. But performance can be exactly the same, and it was. That was the Smaller Advent. It was thought by many people to be a lesser Advent, which it never was. It should have been far more successful because it cost a whole lot less. It's a product of some importance. I still listen to it.

You've played a seminal role in at least four of hi-fi's major advances—the acoustic suspension speaker, transistorized equipment, Dolby B noise reduction, and the cassette. What are your feelings about this?

Some of the particular things I have done so obviously could have and should have been done before. Chromium-dioxide tape is one example. It was sitting there, publicized. There were people in the tape business. Why nobody would pick that up when they were making tape every day is something I don't understand. A

I BELIEVED THE CASSETTE WOULD SURPASS THE VINYL RECORD WITH THE USE OF DOLBY NOISE REDUCTION AND CHROME TAPE.

Author's Note: For his time and recollections, special thanks go to Andy Petite, who worked at both KLH and Advent under Henry Kloss for many years and then went on to co-found Boston Acoustics.