

AN AFTERNOON WITH: JOHN K. HILLIARD



The AES Los Angeles Section formation banquet, Hollywood, California, 1951 (left to right): John Frayne, Westrex; John Hilliard, Altec-Lansing; Bob Callen, disk and motion picture sound recordist; Oliver Berliner, Soundesign Engineers; and Richard Ranger, Rangertone. *(Photo courtesy of Oliver Berliner)*

Editor's Note: The Los Angeles Section of the Audio Engineering Society conducts a series of interviews with major figures in audio. This well-known series is called *An Afternoon With*. These living room setting conversations are usually held on Sunday afternoons. The *Journal* is pleased to publish the first of such features, an edited transcript of highlights of the interview, with John Hilliard on October 18, 1981. Bob Rypinski moderated "An Afternoon With" one week before Mr Hilliard's 80th birthday.

Rypinski: We're honored today to have as our guest

John Hilliard, who has a long and important record in the annals of audio. We've invited him to tell us about himself and his work in the field. Tell us how you got your first start in sound?

Hilliard: My adventure began when I went out to Hollywood in 1928, after studying at the University of Minnesota. I was recuperating from an illness when an offer came from Mary Pickford and Douglas Fairbanks at United Artists in Hollywood. My wife and I decided to travel there via boat. When we arrived, there were piles of concrete and piles of Western Electric apparatus waiting to be installed.

Rypinski: How did Pickford and Fairbanks know about you in Minneapolis?

Hilliard: That was through people that I had known in the Western Electric Company. United Artists asked where to find these sound people. A friend of mine in the Western Electric Company working for Electrical Research Products, Inc. (ERPI—who were the licensees for Western Electric and the eight major studios), helped a lot in having the major studios secure people wherever they could find them throughout the United States.



Eleanor Powell tap dances in "Broadway Follies of 1940."
(Photo courtesy of Turner Entertainment Co. © 1988)

I might say, to begin with—as you know—the Vitaphone Corporation was formed in 1926 by Warners and the Western Electric Company, and at that time they formed the Electrical Research Products Division to install the equipment basically and design what was needed. You had Wenthe, who had designed the condenser microphone, which was the type that gave the highest quality at the time. That was the exact transition from the carbon microphone that the broadcasters were using up until 1926. Wenthe's 3-inch condenser microphone was housed in a long tubular can about 18 inches long. There was a one tube and a two tube version as a pre-amplifier, which went into the mainstream of the amplifiers.

Then, as a result of the work of Maxfield and Harrison at the Bell Labs, it was decided that the most expedient approach to adding sound to the picture was to use the disk, (the 16-inch, 33 1/3 rpm, 30-minute playing time record). Warners dived right into that, beginning with Al Jolson in 1927. The recording started in the spring and was released in October of 1927.

It was so successful—largely unanticipated—that the eight major studios signed contracts in April of 1928.

Western Electric had to gear up with all of their telephone manufacturing plants in order to supply these studios. You can imagine the speed with which they had to move because the contract was signed in April and equipment began arriving in July, August, and September.

Rypinski: Can you tell us how MGM developed its loudspeaker system?

Hilliard: In 1933, Bell Labs demonstrated 3-channel stereo between Washington and Philadelphia, using what we called the Fletcher Horn system (the design of Wenthe and Thuras and others). It worked out very well. We were struggling at MGM to improve on our telephone-type system. When MGM heard this we had to act with much dispatch because we were in control of 150 theaters seating between three and five thousand.

We asked Bell Labs, through ERPI, to make a commercial model of the so-called Fletcher horn system. We waited about 18 months, and then asked ERPI how they were doing. ERPI replied that they hadn't done anything and didn't intend to. That was sort of an ultimatum, as you can imagine. My boss, Douglas Shearer, turned to me and said 'what do we do?' I said we should build it.

RCA wanted to get in the picture. They sent John Volkmann and Harry Olson out to Hollywood. Now I get down to the nitty-gritty part of when we received the Fletcher System at MGM. We set it up for music playback almost the day after we turned it on. Eleanor Powell had a dance mat on the floor of the stage, which she was practicing on. When she came to the studio in the afternoon, we decided, 'well gee, here's something that will really show this system off.' So we asked Eleanor if she would—kindly give us a tap-dance rehearsal and we would monitor it. And lo and behold, we got two taps and this was because the Fletcher system had a re-entrant horn that had somewhere between 11 and 12 feet of air column in it.

It had a 36-inch deep multicell horn, and they [the low and hi-frequency horns] were set so that there was an 8-foot differential between the time the sound arrived at the mouths of both horns. When Eleanor Powell did the tap dance, we heard two taps—8 ms apart.

Rypinski: Time-aligned monitoring was born.

Hilliard: Yes! We disconnected the high-frequency unit and listened to her tap from the gut—no problem at all. And then we listened to the high-frequency unit alone, which was excellent; it had good definition. Then we said 'well, what is it?'

We started to move that high-frequency horn back until we got to a point where it jelled and where we had no more echo in the tap, which turned out to be somewhere in the first 2 feet. We gradually got down to 1 millisecond where we thought nobody could detect the difference at that time differential, and that's where we tied it off.

Rypinski: Can you tell us the real story about Nelson Eddy and Jeanette MacDonald?

Hilliard: As you know, Nelson Eddy and Jeanette MacDonald were a screen couple and everybody thought they were lovers. Actually, they hated each other with a vengeance. Nelson Eddy was an operatic tenor with a very large, powerful voice, and Jeanette MacDonald had

a very light voice. We had the problem of how in the world to balance these voices when we had the nondirectional microphones.

We had word from the Foreign Department in Berlin that Sieman's had made a directional microphone, a cardioid. And so we had them immediately send it over, which, in those days, took three or four weeks.

The microphone arrived in the morning. We unwrapped it and tested it out, took it down to the stage, and put it on Jeanette MacDonald because she had the weaker voice. We wanted the cardioid characteristic which would balance her against Nelson Eddy.

At that point Nelson took one look at it and asked what it was. The music mixer explained to him what we were trying to do. Nelson insisted he wanted one just like that. He refused to record until he had the same thing.

It was two o'clock in the afternoon, which was the end of the day. We got in a huddle and decided there was only one thing to do: we would make a case that looked like the Sieman's and put our Western Electric condenser microphone in it.

Next morning, we called in the session. Nelson was very happy because he thought he got his mic: 'I knew you fellows would come through with-it!'

Jeanette MacDonald would sing flat so much of the time that we needed the expertise of a good film editor.

We had Bob Sterling who was skillful enough to insert notes bar by bar. We always had about 10 or 15 takes of Jeanette MacDonald singing a number. We had inserted as many as a hundred single notes in 3 minutes. Then he would go through and select those notes that were on pitch and put those together. You can imagine the job. When Jeanette MacDonald went on concert tour, people heard this little voice, and wondered why her film recording was perfect, and she went flat in concert.

Rypinski: How did you start using reverb at MGM?

Hilliard: H. C. Sonnit at Bell Labs told me about his 100 ms transatlantic tube-delay. I used this design, just lengthened it, and built a 200-foot, 1.5-inch pipe. We put microphones along that take off for various delay times and used that as our first reverberation unit.

And now we go to the fact that Jeanette MacDonald had a lot of work in music, as you know. We had problems with a long shot. You could just barely see her coming into a room, then the camera would dolly right up to a closeup, and here we were with a microphone close in, all the time. We added this reverberation of her in a long shot, and then took the reverberation out as they came in for a closeup.

Well, I had the job of going to the Chinese Theater in the afternoon of the opening of her show. She was to be
(continued on page 628)



Nelson Eddy and Jeanette MacDonald in a scene from "Indian Love Call." (Photo courtesy of Turner Entertainment Co. © 1988)

present, and always had a fader down in the middle of the auditorium so that we could crank in the proper reverb level. Naturally, when people were laughing or something like that, we could temporarily override it or get some effects. When we came to this scene of her where we had the reverberation, the minute it was over, she came running down to me and shouted, "John Hilliard, what have you done to ruin my film?"

That was the beginning of reverberation and, of course, when she got back to the studio and we explained everything, she had a chance to really look at it more objectively and realized the advantage.

Rypinski: How did you get the MGM version of the Fletcher system manufactured?

Hilliard: I knew John Blackburn at Cal Tech. Blackie became a good friend of mine. One day while we were discussing what to do about loudspeaker units, he suggested a fellow by the name of Jim Lansing to do manufacturing. We told Jim we needed a 15-inch loudspeaker with as high a flux density as possible, and great reliability. After several models, he came up with something that was quite acceptable: it had a rectifier tube that hung onto the back of the frame.

The question arose concerning a high-frequency unit. We started out using 555s on an exponential multicell horn. It went up to five or six thousand by itself, and then cut off—it was a sharp dip, I think about 6500. We decided to go beyond that limit. We asked Jim to take the fundamental design of Wente's 594 and reduce it using the same exponentials or the tangential slits to break up the delay between the center of the diaphragm and the outside.

After several trials he came up with a reasonably good unit (up to 10 000), which more than satisfied our immediate goals. It was something that could readily be manufactured because Jim had developed the art of spinning the high-frequency diaphragm with his finger.

Rypinski: John—before you contacted Jim Lansing for this project, what sort of loudspeakers was he involved in making?

Hilliard: He was shipping a 56 cent radio speaker to Chicago.

Rypinski: How did your association with Altec begin?

Hilliard: I was at MGM studios until 1942. My friend, John Blackburn was at MIT working on radar design. He thought more people were needed to work on it, and convinced me that I should join him. After a year, George Carrington, president of All Tech Service Corporation, said that All Tech had received a contract from the government for Magnetic Airborne Detection Device (MADD). Since MADD had the same wartime priority as the work I was doing at MIT, the government would release me to go back home. I moved back home to work with All Tech Lansing.

Rypinski: How did that become All Tech Lansing? Did they buy out All Technical?

Hilliard: Yes. The consent decree was for ERPI to be divested from Bell, forming All Tech Service in 1936. All Tech Service acquired the entire inventory of the Western Electric Company for theater systems. Because they were running out of equipment by 1940 or 41, more had to be manufactured. Carrington came to me at MGM and asked if I knew someone that could manufacture these loudspeakers. I suggested that he talk to Jim Lansing and see what could

be done. In May of 1941, All Tech negotiated the sale with Lansing Manufacturing Company. It was called All Tech Lansing from then on with Jim Lansing as vice president.

Rypinski: Tell us about your work with the Research Council in the mid 30s.

Hilliard: The eight major studios formed the Research Council of the Academy of Motion Picture Arts and Sciences and funded it. Gordon Mitchell was manager of it (today he is a writer with Norman Lear). Gordon organized all the technical people in the studios into the sound committee, which was charged with standardizing a uniform method of reproducing sound on film in the theater.

When I was appointed head of the committee on standardization, our first act was to get at the recording techniques. Each studio agreed to pick what would be a representative product and from that reel we made one composite reel. The Research Council supplied ERPI and RCA with these test reels. After the war, the All Tech and RCA horns were taken out to the RKO ranch in Van Nuys and put up on a 40-foot pole. We measured the azimuth response of the systems. From that a bulletin was published by the Research Council specifying the electrical response that was needed to meet the Academy's specifications. One can see the important role the Research Council played. In addition, we published a series of bulletins on architectural acoustics and electroacoustics.

A foremost Bell Labs filter expert, Harry Kimball, a co-worker of mine pioneered equalization in the early days (around 1930). There was nothing printed on dividing networks before that time. If you will review the Academy Motion Picture engineering book of 1938, you'll find that Harry Kimball outlined all of the basic constant B networks for our use. Kimball should be given the credit for initiating this whole filter and dividing network business.

Rypinski: Would you care to comment about the state of audio connectors at the time you got into the business?

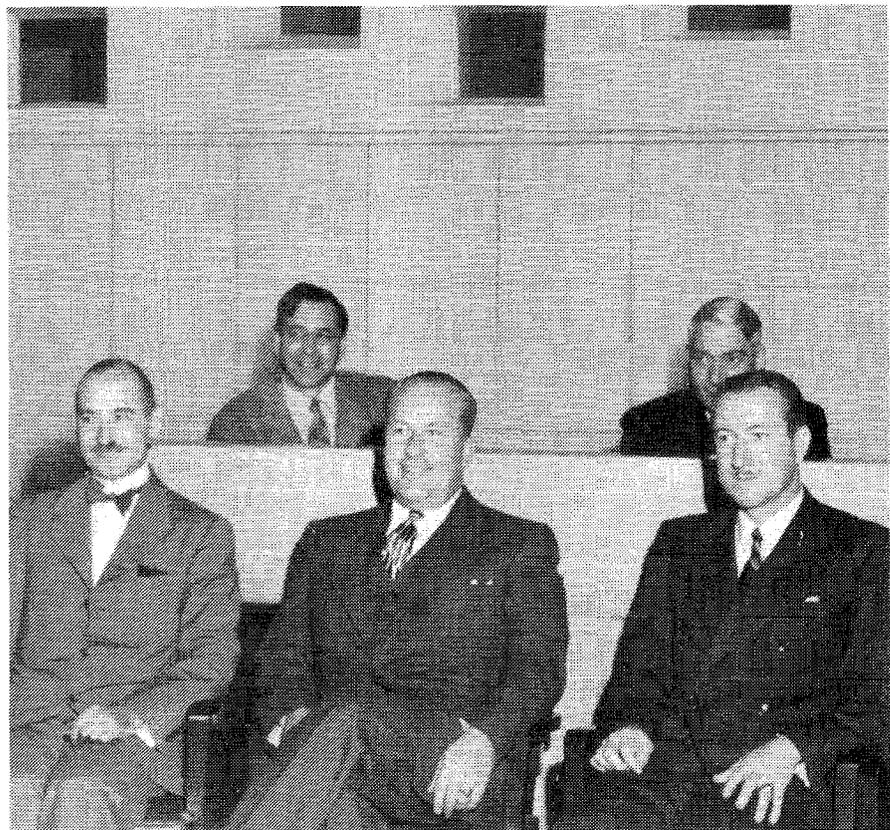
Hilliard: Jim Cannon was making connectors for MGM at the time. We had a problem when we received a truck from Western Electric that had huge marine fittings for the motor and the microphone supply. The fitting weighed about two pounds for the connector for a microphone. And the minute we

drove it off the railroad flatcar, the highway department said, 'you can't use this—it's overweight.'

To make a long story short, we looked for somebody to make a small microphone connector and motor cable connector. I went down to Jim Cannon and I asked if it were possible for him to machine up a connector. He did and the connector—known as the Cannon Connector—became history. Even though Jim was busy during the depression, he couldn't make plugs fast enough. When I told the ITT Cannon people about this, they got quite a kick out of it because they'd never heard of it.

Rypinski: I thank you on behalf of the L.A. section for a most entertaining and informative talk.

AES



At MGM, CA 1938. At recording console, L to R: Hilliard, Lansing. Front: Bessey, Carrington, Ward.

A pioneer passed this way.

John K. Hilliard, 1901-1989

Altec Lansing Corporation
a Mark IV company
Oklahoma City, Oklahoma
U.S.A.