

Music at MIT Oral History Project

Leo Beranek

Interviewed

by

Forrest Larson

October 9, 2008

Interview no. 2

**Massachusetts Institute of Technology
Lewis Music Library**

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Note on timing notations:

Recording of this interview can be found either as one continuous file or as split up over two audio CDs. Timings are designated in chapter headings in both formats, with the timing on the full file preceding the timing on the CD version.

Contributors

Leo Beranek (b.1914) was MIT Associate Professor of Communications Engineering 1947-1958, a founding partner of Bolt, Beranek and Newman, Inc., and is an internationally respected authority on concert hall acoustics. He worked on the original acoustical design of MIT's Kresge Auditorium in 1955, and has consulted on concert halls and opera houses throughout the world. He was a founding member of the Council for the Arts at MIT. His musical background includes work as a dance band drummer in the late 1930s and as an orchestral timpanist in the 1940s.

Forrest Larson, Library Assistant at the Lewis Music Library, has received training in oral history methodology and practice at Simmons College and by the Society of American Archivists, and is a member of the Oral History Association. He is also an active composer and violist.

Interview conducted by Forrest Larson on October 9, 2008 in the MIT Lewis Music Library. Duration of the audio recording is 1:33:33. Second of two interviews. First interview: September 30, 2008.

Music at MIT Oral History Project

The Lewis Music Library's *Music at MIT Oral History Project* was established in 1999 to document the history of music at MIT. For over 100 years, music has been a vibrant part of the culture at the Massachusetts Institute of Technology. This history covers a wide variety of genres, including orchestral, chamber, and choral musical groups, as well as jazz, musical theater, popular and world music. Establishment of a formal music program in 1947 met the growing needs for professional leadership in many of the performing groups. Shortly thereafter, an academic course curriculum within the Division of Humanities was created. Over the years, the music faculty and alumni have included many distinguished performers, composers and scholars.

Through in-depth recorded audio interviews with current and retired MIT music faculty, staff, former students, and visiting artists, the *Music at MIT Oral History Project* is preserving this valuable legacy for the historical record. These individuals provide a wealth of information about MIT. Furthermore, their professional lives and activities are often historically important to the world at large. Audio recordings of all interviews are available in the MIT Lewis Music Library.

1. Cedar Rapids Symphony Orchestra (00:18—CD1 00:18)

FORREST LARSON: It's my honor and privilege to have Leo Beranek back for a second interview. It's October 9th, 2008. And Leo was Associate Professor of Communications Engineering at MIT from 1947 through 1958, and continued as a lecturer from 1958 to 1981. He was also founding partner of Bolt, Beranek, and Newman, Incorporated, from 1948 through 1983. And he's been an internationally respected acoustical design consultant. Thank you again for coming. It's a real pleasure to have you.

LEO BERANEK: It's a pleasure to be here.

FL: When we were speaking last time, you mentioned that you had played with the Cedar Rapids Symphony at the [Antonín] Dvořák centennial celebration in Spillville, Iowa, in 1941. Can you tell me about what the event was like? And did the Cedar Rapids Symphony play other Dvořák pieces as well, at that event? Do you remember?

LB: I don't remember the program. I remember, of course, the *New World Symphony* [Symphony No. 9 in E Minor (*From the New World*) Op. 95]. That was the thing they'd have to play. I remember this was an outdoor—it was summer time. I would judge it was August; I don't know exactly. And it was an outdoor kind of pavilion. I mean, it was under cover, but it was like the Shed at Tanglewood for the Boston Symphony, it's opened to the surroundings. And I remember the stage being rather steep, and it seemed to me that I was up at the highest level in the back. And the weather was good; we didn't have any rain. And I remember how careful and how hard I was concentrating not to make any false entries—

FL: [laughs]

LB: Because that was probably the most prestigious symphony thing that I ever played in!

FL: Yeah!

LB: And I got through it without any mistakes!

FL: Fantastic! At this festival, do you remember what other groups and soloists might have played? Were there other orchestras, chamber groups?

LB: I have no memory of what else took place there.

FL: Uh-huh. I was trying to find some historical documentation of the event, and I just didn't have time to go further, and I was just wondering if you knew. Were there any other particular memories of this event you want to share?

LB: Not really. I only remember playing. I don't even remember where we stayed. I must have stayed somewhere overnight that night; we didn't certainly drive back to Cedar Rapids [Iowa] that night, but we could have. Come to think about it, that's close enough. We might have driven back that night. And because it'd be a big group to put up somewhere, and there probably was not facilities to do it. I know that we went up on a bus, and we certainly came back on a bus. And the—I knew only a few of the orchestra members. I was with them only that one period, that one year,

that I was working at Collins Radio, and I only got acquainted with a few of players because I would come in, rehearse with them, and leave.

And the orchestra, to me, was, I think, as good as the Harvard-Radcliffe Orchestra. It might have been better; I don't know. Certainly it was—I mean, today's Harvard-Radcliffe Orchestra. It certainly sounded good to me at the time, but not as good as the Chicago Symphony. I told you about hearing, opening the doors, and hearing the finest music I had ever dreamed of, when the Chicago Symphony played at Cornell College in Iowa. [See previous interview, September 30, 2008.]

FL: Right. Well, at the time when you played with Cedar Rapids Symphony, they were becoming a professional orchestra. And now they seem to be a highly regarded regional orchestra.

LB: That's good.

2. Science and art (04:40—CD1 04:40)

FL: So, to change topics, and this next thing, you could obviously write a book, and we could spend the rest of the afternoon talking about it. But I'm going to take a crack at it, and so forgive me if I'm asking a huge—asking you to talk about a huge subject that's hard to talk about. There's this mistaken assumption by many that there's an inherent conflict between science and the arts. But as you know, many scientists have been musicians and artists. For example, the astronomer William Herschel, who discovered Uranus, was a well-regarded composer of symphonies and concertos. Albert Einstein was a violinist. In your work with concert hall acoustics, art and science really come together. From this vantage point, do you have any thoughts on the similarities and differences between scientific and artistic creativity? [laughs]

LB: Well, that's very difficult to answer. I feel that creativity is in people, and some people can be creative, and others just never have it in them to do that. And I've thought about this creativity. In fact, I wrote an article on artists and scientists rubbed together.

FL: Really? Do you remember what publication that was in?

LB: I think it's probably in the *Journal of the Audio Engineering Society*.

FL: Okay.

LB: But I'm not sure on that. I have copies of it, somewhere.

FL: Oh, I'd like to see that very much! Wow!

LB: And this was encouraging some people to both, to major in music and in physics, and see if there was some way that one could stimulate the other. And this was my encouragement. And one student wrote me and said that he'd followed what this was suggesting. He'd now been trained, and he can't get a job.

FL: [laughs]

LB: And so he was not exactly sure this was a good path I led him into.

FL: Uh-huh. Do you know what he ended up doing?

LB: I don't know what his eventual job was.

FL: Uh-huh, and was this an MIT student?

LB: Yes, mm-hm.

FL: What instrument or music did they do, do you remember? You said he was bringing physics and music together. Do you remember—

LB: Well, he was majoring in music, and majoring in physics, both.

FL: Yeah, right. Do you know what his instrument was?

LB: No, I don't anymore. It's too long ago.

FL: Yeah, yeah. But, you've probably had conversations about this topic with lots of your professional colleagues over the years, or with other musicians?

LB: Well, one doesn't really find that doing music has helped you do better physics. I think that it enriches one's life. He feels more complete with enjoying music, whether it's playing—and playing is the best way—or whether it's listening to concerts and taking part maybe in student, if you are a student, taking part in student groups. I feel that this is a good way to make one feel better. It makes your life more complete.

FL: Mm-hm.

LB: You just feel that this is a good thing to continue through your life: go to concerts, enjoy music. And, but I can't see any evidence that having done something in music has helped you be a better physicist.

FL: Mm-hm. Can you say that science helps the creative aspect? Do you think an artist's life is more enriched if they have a background in science?

LB: Well, I don't know the answer to that. I have no evidence that their life is enriched. In fact, there's one student that wrote me was sort of feeling I'd led him down a bad path. He had too much of each, and they didn't make enough of either.

FL: Mm-hm. Do you think in some ways, particularly from the creative as opposed to the performing aspect of music, that artistic discovery can inform scientific inquiry?

LB: I don't see how I can remark on that.

FL: Okay. That's a tough question.

LB: It's a tough—I don't have any evidence that I can add.

FL: Yeah.

3. Council for the Arts at MIT (09:39—CD1 09:39)

FL: So, I'll have some more questions about music at MIT later in the interview. But the topic that we were just discussing is a nice lead-in to questions of music and arts at

MIT, and particularly the MIT Council for the Arts [Editor's note: correct name Council for the Arts at MIT], which you were a founding member of in 1972. Just a little bit of historical background for the record, and this interview: [reads from notes] "The MIT Council for the Arts was founded in November, 1971, by MIT President [from 1971–1980] Jerome ["Jerry"] Wiesner, but the efforts of his predecessor Howard Johnson really helped pave the way. And at the time, Professor Roy Lamson [MIT Professor of English] was appointed Special Assistant to the President for the Arts." So there was a working committee that organized the Council for the Arts, but then in the spring of 1972, when you joined, that was what became of the founding council, so just for the historical record.

In May, 1971, Howard Johnson [MIT President from 1966–1971] wrote the following: [reads] "At MIT, we have long disagreed with those who think that the culture of the arts and the culture of the sciences are separate and immiscible. We find a positive value in an educational program that seeks to give the student an opportunity to understand, appreciate, and in fact, perform something substantial in the arts as well as the sciences." [Lamson, Roy: *A Short History of the Council for the Arts at MIT 1971-1981*, p.8. (December 1985) (MIT Archives AC230, Box 8, folder 26)] And from what you were saying earlier, you obviously don't have any disagreements with that.

When I was reading some archival information about the organization of the MIT Council for the Arts, they talked about humanizing scientists and engineers, and broadening their world view. Do you have any more comments about that? And then I want to ask the reverse: do you think that people who are trained as artists and musicians need science in order to really be, you know, well-rounded people?

LB: Well, I think any time that you broaden your field, and understand some other things, you've made yourself a more rounded person, you can contribute better in a society. And so I think that knowing music and knowing science is a good way to sort of meet new people, new fields, new things you can talk about. You have an interest in maybe traveling to hear music in other places, so you've sort of broadened your world culture. And I think that either being a musician or a scientist, being in the other one broadens your contacts, broadens your point of view, makes you better understand what's going on in the world.

Now, talking about Roy Lamson: Roy Lamson got to know me because I was very interested in the Cambridge Society for Early Music, and in fact I became its president for a number of years. And I hired Iva Dee Hiatt as the Music Director of the Cambridge Society for Early Music. And we put on concerts in Sanders Theater at Harvard, usually three or four a year, and we got the top artists in early music in the country. And she went to Europe and brought over a group each year from Europe that was a top performing group in early music. And so I got to know Roy Lamson from that.

So when this talk started, of the Council for the Arts, I guess it was under Howard Johnson. He had some let's get together and talk about it, before anything was formally formed. I remember Jerry Wiesner being at at least one of those meetings. I went to at least two meetings; I can remember only two. And we talked

about whether it would be a good idea for a Council on the Arts to get together, try to raise some money, and help support student groups, in particular, do something in the arts, like music or other kinds of artistic performance. and, so how this would be formed, who would be invited to join, and would they join, would they contribute—we talked about for a year or two before the formal founding of it. And if was for this, and I felt that it would be possible to get the financial aid from a number of people so we could make a difference at MIT.

FL: Wow! So you were in on some of those early discussions?

LB: I sure was.

FL: Yeah. Was there—were you feeling any pushback from some other people at MIT, as far as increasing the artistic presence?

LB: Well, my main contacts, from memory, were, of course, Roy Lamson and Jerry Wiesner. Jerry Wiesner was always a close friend of mine, because he was kind of an audio guy, whether you know that or not. During World War Two, he did recording.

FL: Right, he worked with Alan Lomax, the folklorist. He did some field recording for him.

LB: Right. And doing recordings. And in fact, we wrote a joint paper one time. The joint paper was on the sound system that we put in at the field auditorium at MIT here, the big outdoor—indoor auditorium. I forget what it's called. [Editor's note: the subject is most likely speaking about either Johnson Athletics Center or du Pont Athletics Center.]

FL: Which auditorium?

LB: Well, it's not an auditorium. It's a playing field that's indoors.

FL: Uh-huh.

LB: And they put in chairs and things for Commencement, always.

FL: Oh, yes, right. Yeah.

LB: What's the name?

FL: Yeah, what do they call it? It's got that bubble over it?

LB: Right, the bubble over it.

FL: Yeah.

LB: I'm forgetting the name, but anyhow, we wrote a joint paper on that sound system.

FL: Wow! Wow, interesting. That must have been a challenge! [laughs] So, you alluded to this earlier, but there's this question about: do arts need justification? And there was lots of talk in the organizing of the MIT Council for the Arts for that. But, an analog in a scientific world, a fundamental—there's lots of fundamental scientific research that doesn't have an obvious, practical application. Theoretical physics is a great example. It also doesn't need justification in that way that, it seems to me similarly, that the arts don't. Do you want to talk about that a little bit? Just this—

people wanting to justify the arts? And often times, you know, they would talk about humanizing and all these other things, but just on their merits?

LB: Well, it's very difficult to put this in kind of a philosophical context, because I never thought much about it in that thing. I've really thought about scientists being in music as a way of just broadening his life, making life more enjoyable, meeting other people, and broadening your acquaintances that way. And in fact, my getting into the Cambridge Society for Early Music was a way in which I broadened my interests. I wasn't just dealing with technical groups who were talking about the acoustics of some kind of a building or something. Now I'm talking about music, about—and being with people who enjoyed music, enjoyed creating music performances.

And my being president of the Cambridge Society for Early Music was an example where we really put on first-class performances, brought in people that were famous, and that hall was filled every time we gave a concert. The Sanders Theater at Harvard was filled every time we gave a concert. Because people felt they were enjoying something; they were getting some contact with genius, because we were bringing in great players and composers who appeared on those programs.

FL: So getting back to the Council for the Arts, at the time, what was your understanding of the mission of the Council for the Arts? You were talking about supporting student groups and initiatives like that. What basic need was really being filled by the formation of this? Because there was academic courses in music. There were performing groups, both musical and theater, and stuff like that. But what need was being filled by the Council for the Arts?

LB: Of course, I was made chairman of the Grants Committee. And near as I could tell, and the way I felt about it was we collected money from the membership of the Council, and that made a pool of money that we could respond to grants. People responded to, made proposals for special concerts, a special kind of activity at MIT; it might be a poet, it might be music, it might be lighting. We'd get these requests of a group of students who wanted to do something, and they needed some money. And we could have small amounts. I mean, the amount we were giving were numbers in the thousand, or two thousand, or three thousand dollar level.

And I was on the Grants Committee, and these people would come in with their proposals. We'd meet with them and talk, and decide whether it would be something that enough students, and there'd be alumni and professors at MIT, would be interested in, we'd support what they student wanted to do. And one of the places we spent more money than anywhere else was in trying to figure out how to house the arts at MIT. And this sort of ended up with the Wiesner Building [Building E15, most famous for housing the MIT Media Lab].

FL: Right.

LB: That was not our original thought—we didn't think there would be a building. But we put money into studying how else we could put music into MIT, and it looked as though there'd be some of it maybe here, in this building [Building 14], in the Killian Auditorium [correct name: Killian Hall], some of it would be in another part of the Institute. There'd be sort of different centers that would build up, small centers, for music. And we put money, then, into looking at whether it's feasible to develop those

centers. Then when the Wiesner Building was proposed, and the President felt we could raise the money, the Institute could raise the money for it, then that whole thing was unnecessary, because we came into one place.

FL: Mm-hm, and as you know, it's now being expanded, finally.

LB: Right.

4. Music at MIT (21:42—CD1 21:42)

FL: When you were teaching at MIT, did you go to many concerts here on campus?

LB: Well, I used to go to the MIT Symphony [Orchestra] concerts, and particularly after Kresge was available.

FL: Mm-hm. Any memorable concerts that you can think of?

LB: Not really, in terms of—I can remember, [laughs] I remember things, yes, I remember one that to me always stuck out as being very interesting. I think the Acoustical Society of America was having meetings in Boston. And MIT group had the idea, well, why don't we get players to come with old instruments, Stradivarius type of instrument, Guarnerius, and then we'd compare them with some modern instruments? And we would have these people perform on them, and have the audience judge whether they were hearing an old instrument or a new instrument.

And so we got together a group of performers and instrumentalists, and they played, in Kresge, to an audience, and the audience had checklists that they were given, with pencils, to indicate whether they thought it was an old instrument or a new one. Well, it turned out that the audience did judge the old instruments more, fairly often, that is, they would pick them seventy percent of the time right. The only trouble with that is I think they could tell by looking at the instrument that it was old.

FL: [laughs]

LB: And it seemed to me the musicians didn't think of that. When I saw the results, and I had been in audience, and I went up afterwards and talked with a couple of them, I said it seemed to me that we could tell which was the old ones by the way they looked. They didn't think of that!

FL: Wow. There was also a concert series called the Humanities Series Concerts. There was string quartets and other chamber groups. Did you get to any of those concerts here?

LB: Well, I did from time to time, but I don't remember any particular one.

FL: Mm-hm. Did you know any of the music faculty: Klaus Liepmann, Gregory Tucker, or Ernst Levy [artist-in-residence, 1954-1959]?

LB: Well, I knew Klaus Liepmann, yes, yes.

FL: Uh-huh. Any particular thoughts or impressions of him?

LB: No. We talked sometimes about Kresge's acoustics! [laughs]

FL: Uh-huh.

LB: And nothing I can remember that's very interesting.

FL: When we, later in the interview when we get to talking about Kresge, I have a quote that you have in your book from Klaus Liepmann about Kresge acoustics. So, we'll talk about that then. So you mentioned Roy Lamson. As you know, he was also an accomplished jazz clarinetist. Did you ever hear him play any jazz?

LB: No. He used to play—gosh, it runs in my mind that he played clarinet in the Harvard Band, even. [laughs]

FL: Oh, no kidding! Wow!

LB: He certainly enjoyed playing, and he did play in music groups.

FL: Right. There was a group at MIT here called the Intermission Trio—

LB: Right.

FL: —with Warren Rohsenow [Associate Professor of Metallurgy, MIT] and Art Lichtfield [MIT Purchasing Department]. Rohsenow played piano and Lichtfield played drums. You never heard them play?

LB: I don't remember this. I don't remember this one.

FL: Because from what I hear, Roy was quite a jazz clarinetist, and I just wondered.

LB: He certainly was an interesting man!

FL: Mm-hm. Also, as I'm sure you know, he was a scholar of early English music, and must have been a recorder player, because he edited some editions of some English recorder music.

LB: And this is why he was interested in the Cambridge Society for Early Music, also.

FL: Right, right. Did you ever hear him play recorder?

LB: It strikes me that I went to his house one time, a party he and his wife gave. And my wife was there with me, and he played the recorder that night. So I did hear him play it. And then, there's something else running through my mind. Was it Liepmann, or somebody before him, was making recordings of recorder music? And I was asked to come and help with the making of the recordings, to make sure they were done right.

FL: Huh!

LB: And so those things went on.

FL: Do you know—I'd never heard about this project. Do you know who—was this sponsored by the MIT Music Department?

LB: I thought so. I thought so.

FL: Hm. Wow, that's the first I've ever heard.

LB: It could be, of course, it could be that this was centered at Harvard. These things were—many things were sort of joint. It could be in my mind, coming back now, that the Music Department at Harvard was sponsoring this.

FL: Uh-huh. And they were—?

LB: Recordings. This was now about 1937, '38, when the recordings were being made.

FL: Uh-huh. So what kind of music? Obviously, you said it was recorder music. But was it, like, small groups with recorder, or was it solo recorder?

LB: Well, they were doing both. The whole idea was they were recording some early music, and using early instruments to do it.

FL: Yeah, okay. I'll have to look into that.

LB: I think this could have been done by the Music Department at Harvard. I might be crossing these up.

FL: Uh-huh, because there was a whole—there was Willi Apel [Professor of Music, Harvard University], and people like that, at Harvard, were publishing editions of early music. There was that book that I even used in college called *The Harvard Anthology of Early Music* [Editor's note: correct name *Harvard Anthology of Music*]. And so, it might have been something at Harvard.

LB: I don't know what ever happened to those recordings. The trouble was, the early recording media were not very good, and so they may just not exist anymore.

FL: Mm-hm. I'll have to check over at the Harvard Music Library to see if they know about those.

LB: See, one reason I got involved in this, I tell in my book, was that I worked with Professor [Frederick "Ted" V.] Hunt [Professor of Physics at Harvard University] in the invention of this very lightweight pickup that would play on vinyl records. And so I think I was brought into this picture there because I'd worked with Hunt, and knew how to handle these lightweight pickups, which were brand new.

FL: Mm-hm. That's a big topic. I wish we had time to go more into that.

5. Kresge Auditorium design and acoustics (29:06—CD1 29:06)

FL: Just for the record here, you were a founding member of Bolt, Beranek, and Newman [Inc.] in 1948. And your two colleagues: Richard Bolt was an electrical engineer, and—

LB: No, no, he was a physicist.

FL: Oh!

LB: I was the electrical engineer.

FL: That's interesting! Okay, I got that—I don't know where I got that. Okay. and Robert Newman was an architect?

LB: Architect.

FL: Yeah. And all three of you were MIT professors at the time.

LB: Not at the time. Newman had just gotten—when we founded the thing, Newman had just gotten his architectural degree, in graduate school. And we wanted to have an architect in our group. Then afterwards, he was appointed to various things.

FL: I see, okay.

LB: But at the time we took him, he'd just received his—whatever you call it, his architectural degree.

FL: Right, and that was from MIT, though, right?

LB: That's correct. It was from MIT.

FL: Right, right. And it seems like BBN, as the firm was known, started out as an architectural acoustical firm, basically, but then as we all know, it went in many directions: communications, computer science. But for you personally, later on in your career, then you really came back to concert hall acoustics. There are at least three books on concert hall design, and many professional journal publications.

So, getting to talk about MIT Kresge Auditorium: it was dedicated May 8th, 1955, and it was designed by Eero Saarinen. I was looking at some planning documents and reports from various committees that were planning for Kresge Auditorium, and I found an interesting quote from MIT President James Killian, talking about acoustical design. It was a letter to Robert Kimball [Director of Business Administration at MIT], who was chair of the Kresge Building Committee. The letter was dated October 3rd, 1950. He says, [reads] "In anticipation of Mr. Saarinen's visit, may I give you such thoughts as I have about the auditorium? It should be designed to be acoustically right, and not have the acoustical treatment as an afterthought, or a correction to some architectural design." [laughs]

So, Saarinen's innovative dome design presented a real challenge for the hall acoustics. And on this point, Saarinen is quoted in *Technology Review* from June of 1955. He says, [reads] "I have been asked why the auditorium did not have the so-called perfect acoustical shape. Acoustics seems to me, and our acoustical engineers Bolt, Beranek, and Newman would agree, is a modifying factor, but not a science with the authority to impose a basic shape on an auditorium."

LB: No study had been made of what constituted good design. We knew—[aside] I wish this chair didn't make so much noise. It probably gets in on the microphone.

FL: Yeah.

LB: We knew, of course, that there were good halls in the world, but nobody had ever tried to pull together a story about what would be a good shape. And in fact, everybody sort of believed, and even believed up until almost modern times, that acoustics is a guessing game. It's not a science, and therefore there must not be anything perfect about it. You could sort of make something else, and you guess and it would probably be okay.

And it wasn't until I did my study [see Beranek, Leo: *Music, Acoustics & Architecture* (New York: Wiley, 1962)], interviewing of all these different conductors and music critics, that I found that there was general agreement, at least on the three older halls that were the great ones of the world: the Musikvereinssaal in Vienna, the

Amsterdam Concertgebouw, and the Boston Symphony Hall—all of them being rectangular, all of them the shoebox-shape, all of them having an audience that was not too steeply raked on the floor, so that there was space around the upper part of the auditorium for sound to bounce around, and create good reverberation. The halls were not too big, although Boston was the biggest of the three.

And the only other thing that was common was that they had good orchestras in them. And I think, too, that part of the reason that those three were chosen was nobody ever heard bad music in those halls, and so that also makes a hall be great. And on the other hand, there was always good music being played in Carnegie in New York, which was an older hall than the Boston hall, but nobody thought that its acoustics—and even today—are as good as Boston's acoustics.

FL: Mm-hm. So getting back to Kresge, and you were saying that people had this idea that acoustics was not a science. But it seemed like even at the time, you, because you had done a study of particularly Boston Symphony Hall, and you obviously had some more scientific basis for what you were doing. When BBN was brought into the Kresge project, was this after Saarinen had come up with the basic design?

LB: I think so. That's the way I was brought in, at least. Whether anybody ever spoke to [Richard] Bolt before that, I don't know. But when I came in the picture, Saarinen had already decided on having what I called half a grapefruit on stilts. And so, what Bolt and I knew right away, from both physics and electrical engineering, was that anything that has that round shape is going to have some very unusual resonances in it, and they're not going to be—they're going to be more pronounced, and more troublesome, than the kind of resonance that you get in a shoebox hall. And so we figured that we had to do something to break up those fundamental resonances which were going to be very troublesome, and that's why we developed a cloud system that we put in.

FL: Right.

LB: Now, that cloud system has been modernized recently, and it's better than the ones that we did originally, because there's been a lot more experience, and a lot more studies, on clouds. But this was a way of breaking up the resonances so that they were not objectionable, in the sense they would have been without the clouds. Now, there's always been a problem, and that is because the front part of the hall, where the stage is, gets to be fairly low ceiling height, that you are really, if you put a whole symphony orchestra in there, you're putting a lot of power going out from that low ceiling. And you don't get this reverberation that you get in an open upper hall, that you get in Boston Symphony Hall, so that it is not as great for symphonic music as you would like, although for chamber groups it works out quite well.

And of course, when it opened, they had to get the Boston Symphony to come in and dedicate it, and invited all the music critics from New York to come. And the music critics of New York said it wasn't a good hall acoustically. On the other hand, the [Boston] *Globe* and the *Christian Science Monitor*, and a couple others reported on the good acoustics for chamber groups. So we had a mixed reception for it. But as far as the nation knew, because the New York critics had been here, it was a failure acoustically.

FL: I have some quotes from some various people about that. Getting back to some of the planning matters, Richard Bolt was the chair of the “Committee On Requirements For the Proposed Kresge Hall.” I found a document dated 1951. Do you know, did he have any—he must not have had some input as far as being able to talk with Saarinen about the challenges for that shape. Was that just really imposed on him, and he didn’t have any say about that?

LB: I don’t know. I don’t know what the earliest conversations were between Saarinen and Bolt, because I think Bolt did talk to Saarinen before I got in the picture. But I don’t know what they talked about.

FL: Uh-huh.

LB: Now I do know that all of us got very concerned about rain noise, and noise from airplanes coming into that hall. And so this hall was planned with the covering on the outside that was designed to reduce the possibility of airplane noise coming in, and also of any rain noise that might come from pounding on the roof during a big rainstorm. So there was a big covering that was put over it, at quite a large expense. That covering got old in time, and got giving trouble, and was breaking up. And so they took it off, and never put it back again. So they decided that maybe there was not a serious problem with airplane noise, and with rain. So we sort of misled them, you might say, into doing an extra thing on the roof that was not necessary.

FL: Uh-huh. So, as you mentioned, there were varied opinions about Kresge when it opened. Some were quite positive, and others not so. You did an interview with Charles Munch, the Boston Symphony Orchestra conductor. This was October, 1955. And he was saying that the hall reproduces the desired tonal qualities very well. He said it was a good hall for Haydn and Mozart, and it would be a good hall to record in. And then he says, to quote him exactly, he says, [reads] “It was I who suggested inaugurating the new season, the BSO season, with a concert by the Boston Symphony, in the new auditorium.” So on one hand, he seemed to like it for some kinds of repertoire.

And then—oh! I’m sorry. The interview, the stuff I was quoting from was from a *MIT Tech*—interview with a [MIT] student newspaper. Your interview with him in 1959, seems like he has a little different take on it. He says that he likes the sound on stage, but it is sometimes too loud. And then Thomas D. Perry, the BSO manager, says, [reads] “When the sound of a member or a section of the orchestra focuses off the overhead panels onto a listener, that section is emphasized too much.”

LB: Yeah. Well this comes about because of the low ceiling.

FL: Mm-hm.

LB: And in the Boston Symphony Hall, that ceiling over the stage is high, and the front of the hall is high, and so the orchestra sound can sort of go up and expand into it, without being thrown directly in the face of the people who are in the audience. And the trouble with this low ceiling is that anything that’s played there sort of gets focused and thrown right at the listeners in the hall. And it becomes too loud for a big group, and that’s why he’s saying that even sections playing separately sound too loud.

- FL: Mm-hm.
- LB: But if you put a smaller group in there, it seems to me the hall does very well by it.
- FL: So that's why he was saying it works well for Haydn and Mozart, and stuff like that. Here's a quote from Klaus Liepmann, the music director of—he had the title of Director of Music at MIT.
- LB: Right.
- FL: And this is from your book on music architecture.
- LB: The first book. [Beranek, Leo: *Music, Acoustics & Architecture* (New York: Wiley, 1962)]
- FL: Yeah, right. And he says here—he calls it Kresge Hall, as opposed to Kresge Auditorium, but—he says here, [reads] “Kresge Hall has proved ideal in many respects. The tone is clear and clean. The reverberation period might seem short for the repertoire of the romantics. This clarity is a decided advantage when it comes to solo recitals, chamber music, and music of the Baroque.” And that seems to agree with what you said. You mentioned earlier in this interview, you had conversations with Klaus about the acoustics. Is there anything else you want to talk about his view on the Kresge acoustics? Anything else that you can remember from your conversations with him?
- LB: Well, there was always discussion about the organ. And I can't quite recall how that went. The organ, as you know, is put on one side. And they had an organ concert very early in the history of Kresge, and there was quite mixed reviews on that. Some people thought it was excellent, and some thought it was not. Of course, again there, if you tried to compare how the organ sounded in that hall with what you'd hear in a big cathedral, there'd be no comparison, because the long reverberation time that organists like is just nonexistent there. It's a short reverberation time. And so I think the organists all felt that there was not enough reverberation time, but some of the audience thought if you picked the right pieces to play in there, it came over very well, and therefore it was an acceptable instrument.
- FL: Mm-hm. I was struck by reading your comments about organists wanting longer reverberation times. I've often been frustrated, particularly with baroque music, and you've got long contrapuntal lines, and sometimes that detail seems to get lost.
- LB: Oh, yes.
- FL: In a hall that had less reverberation, it seems to me that that stuff would be clearer, but you were saying that the organists like this longer reverberation time?
- LB: They—I don't know whether they think about individual pieces, or just think about the whole repertoire they may play there. But so much of the whole repertoire was composed for performance in spaces with longer reverberation time. In fact, even some of the Bach organ pieces, he would make stops and would expect the time space right after it to be filled in by reverberation.
- FL: Right.
- LB: And this meant that even in composing, he expected the reverberation to help.

FL: Right.

LB: But you're right. If you go to Saint Thomas Church in New York, where they have three or four organs, and they play anything with a lot of detail in it, it just gets lost in the general muddle that goes on. So there's certain music pieces, compositions in there, which are slower, and have more stops in them and so on, that come off better than these very intricate, finely-played things.

FL: Right, right. Just a couple more quotes about Kresge. John Kessler, who was Executive Officer of the MIT Acoustics Laboratory, in 1955, wrote a letter to Richard Bolt, and he says, [reads] "The auditorium seemed to me to be a magnificent instrument of a stature comparable to the greatest music." That really struck me. Do you have any comments about that, just, particularly given some, particularly some of your later observations about the hall?

LB: Well I'm not quite—why he wrote a piece that lauding! [laughs]

FL: Yeah.

LB: John, of course, was really an employee of Bolt and me at the Acoustics Lab. He was called the—he was the next person in line after the two of us, there. And John went to all the Boston Symphony concerts; he was a great fan of the Boston Symphony. And I saw him even a few years back, just before his death, at a symphony concert there. And I'm not sure why he made that laudatory statement. He never spoke to me about it. I almost felt as though that was unnecessary, [laughs] as though he'd put it on for some kind of personal benefit. I don't know.

FL: Uh-huh. Yeah, that just jumped out at me.

LB: Yeah, it doesn't sound right.

FL: You had done an interview with the conductor Izler Solomon, and this was from 1959. He says, [reads] "I found the hall very exciting. It was alive, and I liked the quality. However, I have a feeling that a full symphony would be too much," which seems to agree with other people.

LB: Yeah.

FL: You did an interview with Jack Purcell—is that how you pronounce his last name? [Editors note: Jack Purcell was a noted acoustician with the firm Purcell, Noppe Associates, Inc.]

LB: Purr-cell.

FL: Purcell, okay, in 1989 [correct date: 1998], and you seem to express—not just seem—you were expressing some of your frustrations with architectural shape. And then you say, taking a quote exactly, it says, [reads] "Kresge Auditorium at MIT acoustics are not very good for concert music." Were you being caught in maybe a more kind of cynical moment there? Because you were saying that you think that it's good for chamber music and smaller groups. Do you still feel that way, or are you having—?

LB: Well, I do. But I think when I said for concert music, I was really thinking a full orchestra.

FL: For full orchestra.

LB: I don't think that's clear, but I think that's what I meant.

FL: Okay, okay. I wondered.

LB: Concert music—the word concert, I think, in my mind, was full orchestra.

FL: Okay. Well, that's good, to clarify that, because I wondered if maybe you had kind of soured on your view of the hall?

LB: No, no.

FL: No. Well that's good for the historical record, to have that. So, soon after Kresge opened, were there any acoustical modifications that you did to the hall? Or was it pretty much left until 1989, when—?

LB: Well, there was a lot of talk along the way about doing things. I think that we did do some tinkering with the angles of the panels after it opened. But there was no change in the number of panels, or how they look, really. Just some of the angles were changed to give it a little better uniform coverage in the hall. But it was always recognized that this half a grapefruit with the panels is no Symphony Hall! [laughs]

FL: Uh-huh, uh-huh. So, in—I think I gave the wrong date a little bit ago. In 1998, there were some acoustical modifications to Kresge by a company, Acentech [Consultants, Inc.], which was a successor to BBN's Architectural Acoustics Division.

LB: Right.

FL: And they used these overhead panels by RPG Diffusor Systems.

LB: Right, mm-hm.

FL: What's your view of the results from that?

LB: Well, it's better, no question about it. It's still going to be a loud hall! [laughs] And the fact that it has to be lower in height over the performing group means that you're getting a lot of energy out of a big orchestra that's thrown quickly to the audience. And it doesn't have time to sort of expand upward and modify itself before it gets to the audience, which you would have if it had a high ceiling.

FL: Right. And that probably also explains why the acoustics are best back at the rear of the hall.

LB: Right. Well, they're loud there, too! [laughs]

FL: Yeah, but I can hear details really well, even in the back of the hall.

LB: Oh, yeah, yes, yes.

FL: So, I was talking with one of the former conductors of the MIT Symphony, Dante Anzolini, who conducted from 1998 to 2006. I was asking him about Kresge acoustics. He also felt that the sound was too loud. This was even after the 1998 modifications. He still found that there was great acoustical variation on the stage, among the musicians. Is that a problem that just because of the design of the hall that really can't be fixed? I mean, I can remember playing on—sitting in the viola section, can't hear the person next to me, but I could hear the French horns just fine, or the cello section. Is that just a problem?

- LB: Well, I don't know quite what he's, of course, talking about, but it is true, again, with the low ceiling, you're going to hear a full orchestra differently than if you have a chance for that to expand above you, and mix and reverberate above you. You see, I conducted the Boston Symphony Orchestra at Pops. Actually, it was "The Stars and Stripes Forever," except I conducted it, I didn't just stand there, and—
- FL: Well, you're a musician, yeah!
- LB: And I changed tempos, and I turned around and listened to the sound coming back from the hall, which no conductor ever does! [laughs]
- FL: Yeah!
- LB: And was able to get a feel for what happens there. What interested me about my feeling when I was conducting was that the sound that I was hearing was all produced on stage—I mean, above and around, and from the orchestra itself, directly to me. I was not hearing the sound augmented from something behind me. In other words, this whole business of the height of the ceiling over the orchestra, the fact that there's a chance for it to mix and reverberate immediately there, gave me the feeling of what the orchestra sounded like. At Kresge, with that low ceiling, you cannot get that mixture, you see.
- FL: I see. I have some questions about that a little bit later, which we'll get to, but I'm really glad you brought that up. So, BBN also did the acoustics work in Kresge Chapel.
- LB: That's right.
- FL: What are your view of the acoustics in there?
- LB: Well, I've always enjoyed [laughs] the chapel. We had an impossible shape there. Any time you take a cylinder, of all things, and try to make it useful for anything, was a challenge. And we sure worked hard on getting the slope, these irregularities into it, and getting the thing to, getting so we killed off the basic resonances in that kind of shape, and left it with fairly good sound, you know. And we feel that was really a success.
- FL: Mm-hm. Were you thinking, kind of primarily, acoustics that helped the organ in the hall, or were you also thinking about other instrumental groups playing in there?
- LB: We were always thinking about small instrumental groups, and the organ, both, really. In fact, in my mind, it was more important we make it right for the instrumental groups than the organ, because I figured that people would know this is not a cathedral, and the organ players always want their music to sound as though it was in a cathedral. And I figured it would always be a disappointment there. But for chamber groups, and small groups, we could make it beautiful, and I think we did.
- FL: It's a longer acoustic, or, the reverberation, is longer than lots of places that are that small, but it is a remarkable sound.
- LB: It's a good sound.
- FL: Yeah. So, Kresge Auditorium was dedicated May 8th, 1955, and there was a bunch of concerts and stuff even prior to that. Like, earlier that week, I guess I didn't put the

date, but before the actual formal dedication ceremony, the MIT Choral Society, with members of the Boston Symphony, played the Haydn *Creation*. And then on May 8th, at the formal dedication, there was remarks from President James Killian, the United Nations General Assembly President Elco van Kleffans, and Sebastian Kresge [philanthropist, Kresge Auditorium named in his honor], and others. And there was a new piece that was commissioned for that by Aaron Copland called *Canticle of Freedom*. Were you at that dedication ceremony? And do you remember hearing the Copland piece? It was a piece for chorus and orchestra.

LB: Well, I don't really remember detail. I just don't. What I remember, of course, was Kresge himself was there.

FL: Right.

LB: And this was on a separate—not one of these big musical evenings, but it was daytime, probably the same dedication day; it was a daytime thing. And people gave speeches.

FL: Right.

LB: And he finally stood up and threw his hands up over, and he says, "How am I doing?" [laughs]

FL: [laughs] Wow!

LB: He brought the house down! [laughs]

FL: [laughs]

LB: So he was very proud of this all!

FL: Absolutely. Do you remember the Copland piece at all?

LB: No, I don't, for some reason.

FL: Yeah, that's okay.

LB: I don't know why.

FL: The Boston Symphony concert that you probably remember, that was kind of a dedication, actually happened in October of that year.

LB: Was that the one where they brought the New York critics in?

FL: Yes, right.

LB: Yes, well that would be the one I remember.

FL: Right, right. That was October of that year, and that's where the *MIT Tech* interviewed Charles Munch, in the quotes that I brought from that earlier.

When you were teaching at MIT, did you know about the Music Library, and did you ever use it? Was it something you kind of knew about?

LB: Well, I knew it was there. I don't know as I used it in teaching. My course didn't feature music as a performance thing. In fact, what we put into *Architectural Acoustics* was relatively short in the whole course, because the big interest in my day, the thing I was teaching, was sound reproduction: loudspeakers, and getting sound to

be right that was reproduced. And see, this whole business of sound in the home was just getting to be started now, and we were trying to give it the right push.

FL: Speaking of sound systems, the Music Library at the time, during the noon hour, played music for people over loudspeakers. Did you have any hand in the design of that sound system?

LB: Well, probably. I would think they would have spoken with me.

FL: Uh-huh.

LB: I don't remember any discussion, though. I'm sorry.

FL: That's okay. That's okay.

6. Further discussion of concert hall acoustics (59:13—CD2 01:24)

FL: So, a few more questions about concert hall acoustics. Much of this is covered in your books, so pardon me if I'm asking you to summarize what is really a complicated topic. And you've gone to eloquent detail on these issues. In your memoir, you mention seven essential attributes of good concert hall acoustics: reverberance, loudness, spaciousness, clarity, intimacy, warmth, and hearing on stage.

From a musician's standpoint, somebody who isn't going to read your books, but wants to know some practical things to take with them as far as when they go into a hall, what do they need to listen for, so they can be a better performer, in the context of some of these attributes. If a musician showed up on your door and said, "I'm playing in this hall tomorrow night. Can you help me with learning more about what to listen for, acoustics?"

LB: I don't know as any musician has ever asked me that question before he performed in a hall! [laughs]

FL: Uh-huh.

LB: They usually are willing to talk about a hall after they've performed in it, but they don't ask for any advice. And of course, each musician feels that he's going to adapt what he does to what he hears. He doesn't think that his playing will remain the same as he goes from one hall to another. So he feels he has to adapt on the run, so to speak. He adapts as he hears it going out. And I think that was emphasized, in effect, with my talking with what's his name? The great violin player, later on when I talked to—

FL: Jascha Heifetz?

LB: Jascha Heifetz, when he talked about playing in India, on an aluminum violin? [See previous interview, September 30 2008.]

FL: Right.

- LB: And he had to correct each of his notes, almost, to compensate for the deficiencies in the violin, and make it sound better, so the audience, in the end, thought it sounded good.
- FL: Right.
- LB: But he had to work very much harder with it. He felt that it was a very difficult thing to play on.
- FL: Right, but that's with an instrument, as opposed to the hall acoustics.
- LB: Right. But the musicians that I've talked to talked in terms of, "We will adapt what we're doing to what we hear in the hall." And there is that feeling. But they don't ask me, in the past, how should they adapt! [laughs]
- FL: Uh-huh, because that might be an interesting conversation, for you to work with them, so they can better understand what they're actually listening for in the hall. Because your book on concert hall acoustics has some very practical things, as far as: what are these different attributes? And as you mentioned, musicians kind of focus on reverberation time, as though that's the primary thing to listen for. And you suggest that there's much more that they should be listening for.
- LB: Mm-hm. Well, I haven't had many long talks with musicians. It's interesting, I have these interviews with the conductors and all. They talk about the different halls which they like and they don't like, and they do make some general remarks about why they like them—maybe the bass is strong, the reverberation seems right, the stage acoustics, "We hear each other well." But they don't talk about the subject in a broad way, and it's very difficult to get them to even think that way.
- FL: Mm-hm. But it seems like musicians could be really well served by doing that, and your book, obviously, is attempting to do that.
- LB: What I don't know is how many musicians read that book. I just have no idea.
- FL: Yeah. Talking to my musician friends, I'm certainly going to encourage them to do that. Because I have these conversations about acoustics, and there's a certain point when an intuitive awareness of acoustics can help to a certain point, but some of this other stuff that you're talking about—because you're putting it in musician's language.
- LB: Well, all I can say is a few musicians I know who've looked in the book consider it a way of getting ready to go into a hall, and they'll read my description on it—that would be a hall they have not been in before. Or they may want to just read about what do I have to say about Carnegie. So they do look at the book, from the standpoint of does it check with their experience? And maybe they're going to go into a new hall, they will look at this, or if they know about the book, they'll read about it in advance. But I don't know as how many people do. I do know that James Levine [current conductor of the Boston Symphony] stopped me in Symphony Hall one day and said, "I've been looking through your book, and it's very interesting."
- FL: Well, good!
- LB: So, I don't know what he found was interesting. [laughs] That's what he said.

FL: So some of the conductors that you've interviewed, I'm thinking particularly of Herbert Von Karajan and Leopold Stokowski, they seem to have a technical understanding of acoustical issues in a way that some musicians don't. Do you know if they actually did any kind of formal study of any scientific aspects of acoustics to get—?

LB: No.

FL: No.

LB: No, they got it all either by listening and talking to acousticians.

FL: Mm-hm, because they even seem to have ideas about ideal stage dimensions, and things like that. But I guess it's just over their—?

LB: Their experience, yeah.

FL: Uh-huh.

LB: And in fact, I think I pointed out in one of my books that—interviewing [Erich] Leinsdorf and I think [Dimitri] Mitropoulos, and asking them just to tell me the half dozen or more halls that they would rank from they don't like to ones they do like. What I found was—and I mean, these are halls in which music is regularly performed, not just any old hall. And they liked the smaller halls better than the big ones. In fact, if you plot their rank orderings against the cubic volume of the hall, it was almost a straight line.

FL: Wow!

LB: They like the smaller halls better than the bigger halls. And that was those two men, Mitropoulos and Leinsdorf.

FL: Interesting. So, concert hall shape—it seems like there's a consensus about the rectangular, shoebox shape being ideal, and Boston Symphony Hall being a good example. Then you talk about three other basic kind of shapes: this fan-shaped, one you call vineyard, and then arena. Can you talk about the others, and just the differences between those, and how they're maybe not as ideal as the rectangular shape, but why these other halls, other shapes might be used?

LB: Well of course, the whole reason for the other shapes are the architects want to do something different. And maybe the owners are encouraging them. And in fact, I point out in some of my publications that the first of these halls of unusual shape, the vineyard sort of thing, was the Berlin Philharmonie, and Von Karajan was the Music Director at that time of the Berlin orchestra. And [Hans] Scharoun wanted to have something different; he did not want a shoebox hall.

FL: This is the architect, yeah.

LB: Yeah, Scharoun was the architect. And he hired the best acoustician in Germany, Lothar Cremer, to come and consult with him. Lothar Cremer said, "You're making a big mistake. Don't build a hall this way. I recommend you stick with classic rectangular-shaped halls." And Scharoun said—well, he talked with Von Karajan, and Von Karajan said, "Well, maybe the orchestra will like being surrounded by people, rather than having them all in front of them. So it's worth a try." And

Scharoun then said, “I just don’t want to do anything conventional. It’s got to be unusual!”

And then he asked Cremer to take this unusual shaped hall, with the vineyards in it, and make it as good acoustically as he could. Now, Cremer then did influence him into making these vineyard fronts such that they would send the reflections better around the hall. He got the cubic volume right so the reverberation is equal to that in the best halls. He made sure there were no echoes. He made sure there was relative uniform distribution of sound in the hall, so that people wouldn’t think that some parts were really very different from other parts. So he did have a big influence on that unusual shape, and making it good as he could.

But he still was very worried. He went public with this, and it got in the newspapers. The orchestra got so worried that they rented another hall that year, in case the objections to this hall were so great that they would have to go with another performing venue. Now, it turned out the hall was a great success, but because architecturally it’s an exciting hall. And there are many good seats in that hall; I would say that two-thirds of them are good seats. And they sound a little different from Boston, but remember, Cremer got some things near to Boston as he could. Reverberation time and some of those early reflections are pretty well planned. And so Cremer did enough good things to make it approach, in two-thirds of the seats, what you hear in Boston.

- FL: Wow! Can you help me a little bit more with this term vineyard shaped? What exactly is that referring to?
- LB: Well, the word vineyard came about because it meant you were putting the audience in little separate boxes around the hall. And in the Berlin Philharmonie, you actually see them as separate little boxes—little trays, you might say, of people.
- FL: Uh-huh.
- LB: And that led to the expression they’re vineyards, because they’re separate sort of trays.
- FL: [laughs] Yeah.
- LB: Now, the surround hall is more like a term today, where audience is seated all around; the orchestra’s more in the center. And the Walt Disney [Concert] Hall in Los Angeles is the best example, in this country, of the concept of a surround hall.
- FL: Mm-hm. So it sounds like with good acoustical engineering, those halls can be made to work reasonably well?
- LB: At least two-thirds of the seats you can be pretty good.
- FL: Yeah, yeah. Then there’s another category you call arena, and that seems to be by far the most problematic?
- LB: Well, the arena is just where you—you take steep seating all around you, and the performing group’s in the center, but there’s not much place for reverberation to develop. There’s no planning of getting reflections proper around the hall, so the reverberation is wrong. The reflections are not very helpful what are there. And the

whole idea is that the audience is seated around the performing group. It's good for prize fights, too.

FL: Right, and you often get actual echoes?

LB: You get echoes in them, of course.

FL: Uh-huh, like the Royal Albert Hall.

LB: [laughs] Well, that's such a big one, of course!

FL: Yeah. In high school, my high school band actually played there, and it was worse than a gymnasium. I couldn't believe the echo that came back!

LB: Well, they've done some things to help that now.

FL: Uh-huh.

LB: They've hung panels in it, and they got absorbing material on the top of the panels. And they've tended to tone down this mayhem that you heard.

FL: Uh-huh. So, getting back to a point that you made earlier, and I was really struck: you were mentioning when you were guest conducting the BSO in "The Stars and Stripes Forever" and you turned around so you could hear the sound that was coming from the stage—

LB: From the hall, back to the stage.

FL: Yeah, right. So, in that situation, the conductor, seems like, can accurately assess what the audience is hearing?

LB: I'm not quite sure that the conductor is hearing what the audience does.

FL: Uh-huh.

LB: And my feeling was that I was not hearing anything bad coming back from the hall—no echoes. My feeling still remained that what principally I was hearing was what developed in the staging house itself, that that was predominating what the players heard, over anything that would come back from the hall. And there was nothing negative coming back from the hall, no echoes, nothing disturbing.

FL: That seems to be the feedback that a conductor might use to assess what's going on. But it might not actually be exactly what the audience is hearing.

LB: That's right.

FL: Have you talked about that problem with conductors, as far as maybe what they can do so they can better assess what the audience is hearing?

LB: Well, you know, I'm not quite sure to put this on the record, or not. But, let's not name a particular conductor! [laughs]

FL: Okay.

LB: One conductor that I know tends to play loud. He practically doesn't seem to know or be interested in playing some music at lower levels, and get bigger ranges than his dynamic range of what the orchestra's doing. So I feel he's always too loud. Then I look at his experience, and a lot of his experience is pit conducting. And in the pit

conducting, the pit tends to quiet things down before it gets to the audience, so that the soloists, for example, the singers, can be heard over the orchestra, because the orchestra is kind of held somewhat into its own surroundings in the pit. If you go on the stage, and this fellow's always conducting from the pit, he kind of wants to hear the same thing he hears in the pit. And it means that it's much of the time too loud, particularly with singers with it.

FL: Uh-huh.

LB: And I've talked with them about that, but they don't seem to make any difference. They are going to play it the way they want to. In fact, one time I spoke to Pierre Monteux about—the things in the percussion were too loud. He said he likes them too loud! But his hearing was bad! And he wanted it louder, because his hearing was lower, and it sounded better if he could make them louder, to compensate for his hearing deficiencies.

FL: So in an ideal situation, if a conductor came to you and wanted advice as far as being able to assess what the audience is hearing, what would be some things you could suggest to a conductor, as far as being able to actually assess what the audience is hearing?

LB: Better have somebody else conduct, and go out and listen.

FL: Uh-huh.

LB: I'd certainly tell him that. And I've done this, with [Erich] Leinsdorf and others, gone out in the orchestra with them, and listen together. And I was always surprised that we did find differences in different parts of the hall, and their comments about what they heard agreed with what I was hearing. In other words, they weren't sort of hearing something else. We seemed to be talking in the same language.

FL: Mm-hm. So even in a hall like Boston Symphony Hall, which seems to have really good acoustics, is there a degree of acoustical uniformity from the audience standpoint, or do you still get pockets where things are quite different?

LB: Well, there are a few places where things are different, but sometimes the people who sit there like it that way. For example, if you sit back far underneath the balcony overhangs, both below the first and below the second balconies, the sound is more, it's quieter back there. There's a less a feeling of the reverberation above you. You're hearing the sound more sort of direct from the orchestra. And a lot of people like that, and they sit there to get that difference. On the other hand, as far as I'm concerned, I like to get out and get the full effect of the hall.

Now, there's something new. They've just taken the covering off of the old windows at the top of Symphony Hall, and there have been a few concerts now, a few weeks of concerts there, two or three—two, I guess, only—of concerts there. And I've gone to two concerts with the new arrangement. Sitting in the front part of the hall, there is a difference with those windows uncovered. Sitting back in the balconies, back away from the stage—I don't mean the balconies on the sides, but back away from—the opposite side from the stage, those things make no difference. And so you would have to assess that by saying if you look at those uncovered things, they're not just windows flush with the wall, they're set back a foot or more from the

surrounding wall, so that there is a surface between the wall and the window that's perpendicular to the front of the window, and perpendicular to the wall, because it's in that space. When the sound comes from the orchestra up to those spaces, those surfaces that are exposed now, and weren't before, are sending back some reflections. But those reflections are only sent back to the front part of the hall. You can't get any reflection from them at other parts of the hall.

FL: Uh-huh.

LB: So there is a difference, but you have to be in the front of the hall to hear it.

FL: Wow! And that might also affect what the conductor is hearing, too?

LB: That's right. In fact, [James] Levine has stated—and I heard him state this—that the hall is now more brilliant than it used to be. And he's hearing those reflections. But if you go back to the middle of the hall, and the back part, there's no difference.

FL: My, interesting! Interesting. There are some concert halls that have various mechanisms to change the shape to deal with various—size of the performing group. And sometimes the ceilings come down, or sometimes there's certain doors and stuff that can be opened. Do you have any thoughts about some of those devices and stuff? And, it seems like these are halls that are used for multiple purposes.

LB: Well that sort of says one thing. Some halls of modern construction, they want to have it be used for conventions, and they want to have it be used for organ music.

FL: Yeah.

LB: And of course, at conventions you want a reverberation time that's 1.2 seconds, and for organ music, you like it to be two to three seconds. And that's a big range. And if you're going to accomplish that, you're going to have to make some changes that are visible. Now, Russell Johnson of Artec [Consultants, Inc.] in New York—Russell Johnson just died earlier this year—he became famous for his doors around the hall, which you opened them up, and you could bring in added cubic volume—make the hall bigger by opening the doors up, compared to closing the doors, you have a smaller hall. And he built a number of halls like that. And some of those halls have worked out to be quite interesting. You do get a big range in reverberation.

But even to get down to convention size, you've got to put curtains in that are pulled out from pockets, usually, that hide them, and they cover the sidewalls, and put a lot of extra absorption in. So if you want to go down to convention level, you've got to put curtains in, in addition. If you want to get up to organ level, you'd better have some extra volume you can bring in the hall by opening doors. Now, this is very expensive, to do all of this variation.

And now what my experience has been, that the—Johnson tries to tell them: well, if you play Bach and some of the earlier music, you want less reverberation. If you want the Romantic period, you want more reverberation. So you ought to change your doors according to your performance that evening. What I found is that the conductor usually has made a few experiments, and said, "Hell, let's leave it a certain way," and it never gets changed after that.

FL: Uh-huh.

LB: And they can still pull the curtains in the convention, but they don't really change anything else. He gets one setting that he thought was okay, and he doesn't change it after that.

FL: Oh.

7. Recording classical music (1:22:51—CD2 25:02)

FL: Moving to a topic that you obviously have some expertise in has to do with recording classical music. From your vantage point, should a recording engineer try to capture the room sound, or does it become a different thing because you're actually recording it, as opposed to it being a live concert?

LB: Well, this, of course is [laughs] a great subject for discussion, because now you're recording this in a big hall; you're playing back maybe in a living room. And a lot of these recording engineers are thinking today about living room size, and with five loudspeaker as a possibility—five or six loudspeakers. So you have one or two up front, one on each side of you, and maybe one in the rear. And this is in your own home, you have the group of loudspeakers. And the recordings are made available with these different things that can be played at once.

FL: Right.

LB: And so, he's trying to put on that disc what he feels is going to sound right in the living room. And it can't be just any location of microphones; it has to be his way of putting this picture together. And so you have the "tonemeisters," as they call them, coming in the picture, because they claim that the recordings they make sound the best in the living room. But there is an element of they're part of the music, in this.

FL: Right. What's your feeling about multiple microphones, and spot microphones, as opposed to a stereo pair, recording, that kind of thing?

LB: Well, that gets down, again, to how you're going to play this back. And of course, one thing about spot microphones is that the "tonemeister" can bring up a section when it plays solo. Or where there are singers, he can bring them up a little louder, compared to the orchestra. And that gives him a chance to sort of monkey with things, where he thinks he can improve it by making the singer easier to hear, or the words more transparent. Or, even wanting to bring the sound of maybe the English horn or the oboe out a little clearer, he can meddle with this, and he does!

FL: Right. So what's your feeling about that, as far as from your vantage point?

LB: Well, of course, I tend to listen to a recording and decide whether I like it or not! [laughs] And I haven't really spent much time trying to dissect how they made the recording. I tell in my autobiography this story about being in the recording house in Moscow, and how they—with David Oistrakh [violinist]—how they had me judge two ways of doing the microphones. And the way that I picked, that I liked, is what Oistrakh liked! [laughs]

- FL: Yeah. You know, this whole issue of, you know, multiple microphones, and how the recording engineers can even do things that are very different from what the conductor, the choices, might have made. So some of these recordings, we don't know if the end result is really the final—
- LB: Now, wait a minute. What they do—and I've been to some of these big recording sessions—they will do only a part of the composition, and all of them will go down the listening room and assemble, and listen to it. And so then they may go back and do it again, with the recording engineer saying, "We're going to make some changes in how we do it." So there is some interplay as it goes on, which may mean they will re-record a part of the composition, after the conductor hears it, this conductor plus the singing group that's involved hears it.
- FL: Mm-hm.
- LB: And I've seen this interplay.
- FL: So yeah, I know some of that. But you hear sometimes of some recording engineers who really want to put their, kind of, personal stamp on it.
- LB: They sure do! They sure do.
- FL: Yeah, yeah.

8. Personal musical tastes (1:27:33—CD2 29:44)

- FL: A final question: you know, you're a very musical person; we've been talking lots about music. Can you talk about some of your own kind of personal musical tastes: particular favorite composers, pieces, and things, so we get more of a sense about, kind of, where you come from, musically?
- LB: Well, of course, one is always influenced by what he's heard a lot of, and what he's enjoyed in the past. He likes to rehear it again. Maybe not too often, but you want to hear it again. So you look forward to hearing Beethoven's *Ninth* [Symphony No. 9 in D minor, Op. 125] in a good performance, even though you've heard it umpteen times before. And so, there's no doubt but what the odd-numbered Beethoven symphonies, I'm always going to enjoy. Or Brahms' *First* [Symphony No. 1 in C minor, Op. 68] and *Second* [Symphony No. 2 in D, Op. 73] I'm always going to enjoy. These are things I've heard often; they resonate well with me, and I like it. Then you come to the things that we're hearing, that James Levine is putting on in Symphony Hall, more modern conductors, as he mixes—
- FL: You mean, more modern composers?
- LB: Composers.
- FL: Yeah.
- LB: Composers, I meant, that he's mixing in. And my wife and I disagree greatly. She hears one of these; she says, "I want to go home. I can't hum anything. There's no melody to it afterwards. I can't remember anything to sort of play over in my mind."

My feeling is a little bit that this sounds like a mathematical puzzle. And I enjoy the interplay of the instruments, the unraveling of the piece as it goes along. I feel that there is almost a game going with the music, and I enjoy that sequence. And I think that Levine and some others do, too. It's the whole effect, the interplay of the instruments, the lines that interplay with each other, the different tonal effects that come out. And they enjoy this unveiling, this sequence, and I do, too. But my wife can't stand it, so! And I think that's what you find with listeners in music, because you put some of these modern things on, and half the audience goes home.

FL: Yeah.

LB: In Symphony Hall!

FL: So you were, when you came to Boston, there were some premieres of symphonies by Walter Piston. Did you ever know him? He had taught at Harvard. Let's see, he must have been around when you were there.

LB: No. I sent some parts of my book to Walter Piston to read, the first book [*Music, Acoustics & Architecture*], particularly the first couple chapters. And I have a letter back from him in which he says that they're very interesting, and he enjoyed reading them. So I had a little contact with Piston, but I never had any long discussion with him about architectural acoustics, other than he said my book was interesting.

FL: Mm-hm. What did you think of some of his symphonies? I'm sure you've heard the BSO play some of those.

LB: Well, I've never been a great enthusiast of Piston's work. I don't know quite why.

FL: Yeah.

LB: It's interesting. [laughs]

FL: So, any final thoughts? Is there some topic that I've missed, that you want to talk about? Or just some concluding comments?

LB: Well, I might say that my feeling of these surround halls is that if you build a surround hall, you can make it so that part of the seats are very good, can sound practically almost as good as the Boston Symphony Hall. The other seats, you've got to say, are for people who come to the hall to be seen [laughs], and it's a social event, or there's tourism.

In fact, I spoke with the, one of the acoustical consultants in Germany who worked with Lothar Cremer—Lothar Cremer's dead now. And he said that the Philharmonie Hall in Berlin is always full, but it's only always full because the tourists know they should come and see the architectural difference in this hall from anything else they would have seen. So you'd better be in a city if you're going to do something radical—where there's tourists—and make people want to see the hall because it looks different, not sounds different.

FL: Interesting!

LB: And that's one reason Disney Hall [correct name: Walt Disney Concert Hall] is full all the time, there is heavy tourist attendance because that hall, particularly the outside of it, by Gehry—

FL: Yeah, Frank Gehry [architect of Walt Disney Concert Hall].

LB: —is something they kind of come and see.

FL: Mm-hm. This has just been fantastic to talk to you. I think we've—I've certainly learned a lot, and I think for the historical record, it's really valuable.

LB: Well, I hope so. It's been a pleasure being with you, and I'm glad you did your homework before you started questioning me.

FL: Thank you. Thank you.

[End of Interview]