Interview Part 1 REV 03 August 2025

Interview of Harald Bode in his home/studio in North Tonawanda, NY on 13 September 1978 by Thomas L. Rhea: https://www.drtomrhea.com/

Significant additional printed information and audio examples appear in *Electronic Perspectives: Vintage Electronic Musical Instruments* (2023) Tom Rhea's 400 page book with 2 CDs of audio examples: https://www.electronicperspectives.com/

On YouTube: https://www.youtube.com/@electronicperspectives/videos

Significant audio restoration by Matt Traum: https://www.patchmanmusic.com/mattstimemachine.html

Also appreciated are Kim Traum's skills as a German speaker, who cleared up some questions regarding proper names and company relationships that Harald Bode mentioned in this interview (July 2025), thanks Kim!

Gracious thanks to Peter Donhauser, author of *Elektrische Klangmaschinen: Die Pionierzeit in Deutschland and Österreich,* and *Musikmachinen: Die Geschichte der Elektromusik* for guidance during many years regarding developments in German-speaking countries. He served as Curator and then Director at the Vienna Museum of Technology for many years.

This interview and a shorter one on 14 September 1978 were part of my research in anticipation of publication of three articles on Harald Bode's instruments that appeared as part of my monthly "Electronic Perspectives" (1977-1981) columns in *Keyboard* magazine–for December 1979, January 1980, and February 1980. All 52 of those columns appear in the book (2023) mentioned above.

Bode's comments appear in **bold** below. Rhea's in regular font.

Yes. Oh, this is fine.

If you back over there, I'll tell you.

Yeah, this is good enough.

Okay.

So anyway, so this has also a peak limiter.

Oh, I see.

So we cannot overdrive it. Well, the idea incident. Well, let's get back to after the World War [II].

Right.

So everything was kaput in 1945. So now I established myself as a radio repairman. So we lived in a little house out in the country. And so I went on in the attic. And first I had just a table. And a pair of pliers and a screwdriver. A year later, I had a complete workshop and with everything instruments, everything that I had built myself. And things were not done with

money. It was done on the water system, which means you do the sawmill owner a favor.

Right.

And he does you a favor. So the farmer got a small radio from me. So I got some trees from him. Somebody got the gasoline to drive the trees to this lumber mill. And then was so sliced in pieces, you know, and then it went to another place for favors. And finally, I have in the attic, a nice workshop, build out of wood inside and under the roof. Very nice. So, why I really brought up that story that anecdote with the radio repair was because we were talking about this. These things that can happen in the field with service problems.

Yes.

So once a GI comes into me and says, “this radio doesn't work.” Okay, let me look at it. And of course, I was also a little smart aleck. I like if somebody really did work. I didn't tell him I just showed him the bad tube later on. And so he

came back. Yes, I said, well, it works now. And I turned it on. “Oh, yes, wonderful.” And now, just so you know, you have to pull the switch out and then turn it to the right side. “Oh, fine, fine.” That was the whole thing. He didn't know that. Of course, he had swiped that radio. So, therefore, he was not familiar with it. So much for service problems. And now this was in the period of 1945 to 1948. Of course, after a while, I got sick and tired of making radio repairs only. And I already had made some electronic music instruments before that was prior to the war, which was in 1938, mainly.

You had done that?

Oh, yes. Yeah, I had built one organ, which was–I think I told you this, which was a predecessor of the Oberheim Four Voice.

With the geographic determination of the pitch assignment?

Yes, yes. With four oscillators and four envelope shapers and four everything.

Was this done on your own or for a company?

Done on my own. But I had somebody who sponsored it because he had a band and he wanted to use it in his band.

Was this a wind band? Orchestra?

A small orchestra.

And he wanted an organ for special effects.

He wanted to have something special. He was quite . .

Who was that?

Christian Warnke. I mean, no name in history. But he has a little niche in the history by just having done this–as far as my judgment is concerned.

Was that your first instrument?

That was my first electronic organ.

Can you tell me something more about it?

Well, I have written or mentioned it in papers and I also have publications about it. I have no later–late pictures of it. I had to do everything from scratch. I started out with the assignment circuit, which was an intricate switching circuit, which had about 10 or so switches per key. Which of course–at that time was unheard of until I found out about the Hammond organ. And so we call that circuit–it has a name, and we call it staircase circuit. And so . . .

Not meaning a staircase wave shape, but a staircase for triggering?

Yeah, it's a kind of, yes, it's a staircase type of configuration of the circuit. I would have to explain it to you in detail on paper. We call it Treppenschaltung [staircase circuit]. **I don't even know if the name would be applicable in this country. So I thought this was my major invention on the thing, but I found out that and**

then I thought I just resort to anything that is known. Other people have tried it. So it must work. So I used the Trautonium oscillator.

A relaxation oscillator?

Yeah, yes, it was. Yes, a kind of a relaxation oscillator. And so that worked with the thyratron. So I duplicated the Trautonium oscillator. And then I found out why Trautwein didn't have keyboards–but it's a glide band because he could make midstream connections on the pitch.

It would drift in pitch.

But drift, and of course, and this all–of a sudden, I became aware of. So I knew now–oh, I worked like the dickens day and night to get it as stable as possible, but it was still not stable enough. Okay, I had the book of [Bruno] **Helberger and** [Peter] **Lertes on electronic music.**

[Peter Lertes' book *Elektrische Musik: Eine gemeinverständliche Darstellung ihrer Grundlagen, des heutigen Standes der Technik und ihrer*

Zukunftsmöglichkeiten. Verlag Theodor Steinkopff, Dresden und Leipzig (1933).]

Lertes sounded quite believable on his generator for the Hellertion. So I copied that and that worked pretty nicely with the exception that it needed three different power supplies. So I modified the circuit that I could work with one power supply and now it became stable.

This was an LC [inductance-capacitance] oscillator.

However, an LC–not Hartley, but relaxation oscillator because it was overdriven–it had too much feedback. So anyway, I found now that I could make it stable by making it not voltage tuned as it was done by Lertes and Helberger, but by making it resistor tuned. And I needed something that was resistor tuned and not like LC oscillator's capacitor tune because if I would use capacitive tuning, I would run into trouble with the capacitances of the switching circuit. So that would set me off. So, that oscillator, which I then derived from this public domain was very nice and I did build an instrument which was

demonstrated in public. It still left something to be desired because . . .

What was the name of the instrument?

We called it Warbo Formant Orgel. [Christian] **Warnke, the sponsor of Bode, a "Warbo," formant because we had formants.**

W-A-R-B-O?

W-A-R-B-O, yes. And "Formant." And formant because we had formants for tone shaping.

I have heard of it, but I didn't know that's where it came from.

Yes. And now I discovered a number of very interesting things. First of all, the outputs of these four channels I had assigned to two sets of resonance filters or tone shaping circuits, which could be assigned at will to any of the four voices. So I could, for instance, assign voice number one and three to one tone shaping circuit and two and four to another tone shaping circuit. And with

proper voicing, which I called exclusive or excluding formants, I could get very nice friction-free and pleasing sounds. And I do have a paper, then out of reprints, so I would have to duplicate that with Xerox, but I can give you copies of that.

I like that.

So anyway, again, an interesting little footnote of history. This instrument was demonstrated in public in November 1937, and the press was there. The sponsor was very nervous because first I blew a fuse in the amplifier. So the next thing I knew, he disappeared. He just evaporated. And hours later, he showed up. He was drunk by that time because he thought he wouldn't survive that. And the press was there, and I explained everything. The demonstration had started at eight o'clock in the evening. There was a gorgeous girl in the first row watching me, and she was just waiting for me to get through.

Were you single?

I was single, yeah.

Good for you!

But since the demonstration lasted until 1:30 in the morning, she had disappeared.

How long was that? The demonstration?

From all the explanations and the questions and answers, and the press people went out and came again, and they filed briefs in the news, in the editorial room or a city room or whatever.

Who played the instrument?

I played it! I improvised. So anyway, I lost one girlfriend, and I gained fame. Next day, of course, it was all over the papers on the front pages. And now my sponsor was very nervously looking for a report on the blown fuse, but nothing doing. Everything was positive. Now, this went through the press of all Germany and all Europe, as a matter of fact. And then now, he was shooting from the hip. He didn't know all the ramifications that would require to make now a producible . . .

Mass producible . . .

Mass-producible object out of it. So this is where he failed, but we went to Berlin. This wasn't Hamburg, this demonstration. We went to Berlin.

And this instrument, is it gone forever?

Oh, that's gone forever. I mean, that's . . .

What became of it?

It was in the basement of a house which was destroyed by bombs. OK?

The only one?

Oh, yes.

And not even so much as a picture?

Yes, I do have pictures. I do have pictures, but they are reproductions in print.

Out of magazines?

Yes, yes. But I do have, as a matter of fact, I published it in the Communications of the Heinrich Hertz Institute.

Squeeze.

And now, we went to Berlin, the sponsor, and he lost me because now I got hired by the Institute of Schwingungsforschung [Institute for Oscillation Research], **or Heinrich Hertz Institute. I got an Assistantship. So, and one of the other Assistants there was** [Fritz] **Sennheiser.**

Oh, yes.

So, and [Oskar] **Vierling, under whom we worked . . .**

Oscar Vierling? Yes . . .

He was very much interested and Sennheiser was very instrumental to build a second instrument of

this kind, which had three voices, which was very nice and stable, on which I gave a presentation.

When was that?

That was in the spring of 1938. Then . . .

Did that go into the same name?

We didn't really care too much about the name.

Was it more an experimental project?

It was more an experimental project. It still had its instabilities. Yeah, it jumps up by itself, so I think we have half an hour or so. So, because of the instabilities, which are always a problem with a multivoice instrument of this kind, we decided, Vierling and I decided to make a one-note instrument, melody instrument, which came out under the name "Melodium." And this instrument, I then had a place for in the music college of Berlin Music Hochschule [Hochschule für Musik Hanns Eisler Berlin]. **And there was one professor who died in the meantime. He was**

overweight. He very much promoted the Melodium.

Who was that?

[Johann Wolfgang] **Schottländer.**

[From 1936 onward, Schottländer worked as a lecturer in film music at the State Academic Academy of Music in Berlin. He was, in effect, the successor to Paul Hindemith. At the beginning of the 1940s, he received a significant commission from the Reich Ministry of Science, Education, and Public Instruction and the Reich Ministry of Propaganda and Public Enlightenment: the drafting of a memorandum for the establishment of a State Film School in the Third Reich. Among other things, this was to perfect film music for propaganda purposes.]

Tremendous man. 400 pounds, German pounds.

Yeah.

So that's about 450 pounds. He . . . Fantastic personality. And he promoted it, and he had the

connection with all the top-name composers. So now, the Melodium was used in a number of motion pictures, the music, and music was written for it.

This was a keyboard instrument.

Keyboard instrument. Music was written for it, for Berlin Symphony Orchestra and the Melodium.

Wow!

And I tell you, when I heard the first recordings, I really had goosepimples. It was just tremendous.

Do you have any of those recordings?

No. I don't know if they could still be in archives. I know that some things are in archives in Geiselgasteig [Bavaria Filmstadt, Bavaria Filmstadt Bavaria Film GmbH, Bavariafilmplatz 7, 82031 Geiselgasteig near Munich], **which is the movie center in south of Munich. If I really would be**

after it, I possibly could dig them out. You know, sometimes one is not sufficiently history-minded . . .

That's true.

Because one always thinks that "Oh, that's . . . "

It's not important because "I did it."

Possibly, possibly.

Or you're so directly involved in the actual doing of the thing that you don't have time, or really the energy to think of it in those terms–that this could be important. This is a piece of the flow of electronic music instrument history.

So, I didn't realize at that time what value this really had for later times.

Was the Melodium ever . . .

No, it was not. Melodium.

Was not produced?

[Not] produced, however, then, of course, I became very much occupied with already my work in the war.

What kind of an instrument was the Melodium? Was it a preset instrument with tabs like the Solovox or a Clavioline? [See Gordon Reid's excellent article on the Clavioline story in *Sound On Sound* magazine*:* *https://www.soundonsound.com/reviews/story-clavioline*; and in 120 Years of Electronic Music see: https://120years.net/the-claviolinem-constant-martinfrance1947/].

No, no, no. It had levers. It was built very primitively, but it was very good sounding. It had four octaves. It had a rail.

[The role of the *bail* (Repetition Lever) in a typical piano mechanism is the *bail,* or repetition lever, which is part of the double escapement mechanism. It helps reset the hammer for repetition without requiring the key to be fully released. Bode's

instrument, however, did *not* have a typical piano mechanism.]

The keys were seesaw-type keys. So, they had a fulcrum in the middle and the back was lifting up. And any key that went up was lifting a rail that was common to all keys and that was connected to a pressure-sensitive, loudness control. So, you had a very nice . . .

Yes, pressure sensitivity.

Yes, pressure sensitivity. And you had a very nice expression, which was very much liked by the composers.

What kind of technology was it? I mean, as far as . . .

It was two technologies, which, of course, lasted a long time after that. And so, the Melodium was then that for the rest of the war years. And now, getting back to my attic years where I did my radio repairs . . .

One other question.

Sure.

What made this orchestra leader come to you? In other words, had you built an instrument before?

No, the composer.

No, I mean for the Warbo . . .

Warbo Formant Organ or . . . Well, the Warbo Formant Organ, or nobody wrote for it and nobody . . .

But the man who commissioned it, what gave him the idea that you should do it? I mean, had you had experience in musical . . .

Yes, I had made a name for myself in some previous work related to electronic music. Not very much, but . . . So, he wanted to have a little bit of proof.

Well, I'm going to have to hear about that now. If it was before 1938, you were doing something . . .

Oh, yeah. This was before . . . I did work on the Steinway with electronic pickups and in the line of [Benjamin Franklin] **Miessner and** [Oskar] **Vierling . . .**

Yes! With [Walther] Nernst also?

I did not work with Nernst. I just worked directly with Steinway. And I had been asked to reproduce the Steinway tone without using those microphones which were terribly distorting at that time. And I came close to a very, very good Steinway tone.

Was it the typical of the pianos of that . . . electric pianos of that time with a cutaway soundboard and pickups?

No, it was an unaltered Steinway. The objective was different from Nernst and from Miessner and from Vierling.

You were trying to get it to go over the radio . . .

Yeah. Having a good, good Steinway tone that would go over the radio better than what we did with microphones.

There was an instrument in this country, in the US, I think it was called the radio piano or the Radiano, that sought to solve the same problem. Did you have anything to do with that?

I had no connection because . . .

"Adsit" was the man's name. A-D-S-I-T. [it was Fred W. Roehm and Frank W. Adsit in 1926, and it was called the Radiano.]

You see, in the thousand years that lasted from ‘33 to ‘45, we were isolated from the outside. So we did not know what happened.

Right.

So we had to reinvent the wheel if it had to be done and do everything on our own.

So what was the outcome of your interaction with Steinway?

Well, it kind of fizzled away. I did this as a hobby, and I had to work to do a living. And it was in the depression years, it was still the depression, and I just had to subside somehow. That was not the way to subside. At least not in a city like Hamburg. I mean, I don't want to go into this. That's a chapter . . .

Oh, yeah. I'm sure.

I mean, it's not progress-oriented. The way Berlin is, or the way they're thinking at the West Coast, or the way we're thinking at some other centers here in the USA. But I concluded the work, which I did on the Steinway, and I did present a paper on it. And this is how this Warnke got acquainted with me when I spoke about it and made the presentation and had concluded the work in such a way that it looked good. And it was good. It was good. And as a matter of fact, I wrote on the same subject later in an article. That was during the

war years in another publication. It's a really complex story. I mean, it's so many interweaving things. Now, getting back . . .

To the attic . . .

. . . to the attic, and to the aftermath of the Melodium, I felt that if I made not a Melodium, which was a one-voice instrument, I should be able to at least make a two-voice instrument. And my first concept was to use a five-octave keyboard and have the split keyboard, a lower two octaves assigned to one oscillator and the upper three octaves assigned to another oscillator. Now, I did tune these two and the three octaves respectively in such a way that I could make voice-crossings. And now this Melochord had all the features of the Melodium, but everything twice. It had a right-hand set of controls and it had left and set of controls.

What parameters could you vary?

On the first one, I only had touch sensitivity and voicing and . . .

Timbral?

Yes, timbral and vibrato. On the next model, I had also attack, decay, and soft attack, sharp attack, long, short decay times, and so forth. Very, very expressive timbres. And this, with the Melochord, that became quite known, as you know, of course, then . . .

At the Köln Studio [at the NWDR radio station].

Köln ordered one–NWDR, Hamburg ordered one. It was sold to several places. It was not sold in many pieces by long shot. It was still a man-made . . .

Do you think there are any Melochords in the world?

Possibly, possibly. But I would say I built less than ten.

Do you know what happened at Köln? What was your interaction with the people at Köln? How did the order come about?

This came through the initiative of [Fritz] **Enkel and** [Werner] **Meyer-Eppler.**

Who were actually the originators of the studio.

Yeah, yeah. Meyer-Eppler had some very good ideas, and he was very far-sighted. He also had one Melochord. He had one of the Melochords that had the split keyboard. Later then, they were built with two keyboards, one lower and one upper. And I also later changed the tone-generating system from this relaxation oscillator, which I told you about, to an LC oscillator because it was just more stable. But I found that the Melochord building in the long run was a starvation type of enterprise. So I had to look for something better and I knew, of course, I had sensed the taste of the public.

Before we get off the Melochord, though, what happened at the Köln studio? Did people go ahead and use it? Did they compose for it?

It was mainly [Karlheinz] **Stockhausen who used it. I am not too much aware of who else used it.**

> ["But in the case of Karlheinz Stockhausen, a student of Meyer-Eppler at the University of Bonn in 1954–1956, his only use of the melochord was in a failed experiment with a ring modulator." From Wikipedia entry on Harald Bode, footnote #11: *Kurtz, Michael (1992), Stockhausen: A Biography ((cloth) (pbk).), translated by* Toop, Richard*, London and Boston: Faber and Faber, p. 62,* ISBN 0-571-14323-7]

It's possibly also has been used by a number of other composers.

Do you know specifically what works Stockhausen used it for?

No. I did not follow up.

There was something unique about that instrument, though. I remember reading something about "traveling" formants.

Yes. It had, however, different technology and what crude means, something that we now have, of course, in the voltage controlled filter. It had the same performance features of the voltage controlled filter.

Like a bandpass that moves as you play up and down the keyboard?

Right, right, yes.

What was your purpose in doing that?

Well, I envisioned that this would be an attractive sound. And I had a very good vision for the sound and what the traveling formant, which I still could call the sound of the Moog, a tone of a filter. I had a good vision of what it would do and did exactly what it did, you know, of what I had envisioned. It's just a powerful tool. And this was now, of course I could on this particular Melochord; I mean, if you want to go into details . . .

Yes, please.

I could play a melody on one keyboard and play melodies of the formant on the other keyboard, and which you would, now I have to say, have to do with two Moog keyboards if you wanted to. You play a melody and then you play the formant filter on the other. I have a recording here on which I played the melody. Since I don't have two Moog keyboards, I played the melody on the Clavioline keyboard and the formants on the Moog keyboard.

Was that similar to the sound that the Melochord makes?

That was similar to the sound that the Melochord made, and I just wanted to duplicate it many years later, of course.

Are there any extant records of the Melochord, any archival tapes?

There should be. There should be. I have some tapes which I would have to pull out. I wouldn't be able to do it today.

Oh, I understand. Next week?

That's soon!

Well, Sometime.

Yeah. But no, I have duplicated a number of things from memory with later technology instruments, which are qualified to duplicate what I did at that time. I do have recordings of the Melochord. I do have improvisations. I do have things sound on sound.

As early as when? Sound on sound?

Oh, this is very good.

This is side B.

Yeah. Okay. Oh, I can identify it later. So, yes, as I said, I do have documentation of things. It's a little bit sparingly, but I mean, some tapes have noises on them and things like that, you know, which brings me to another thing. It has been

done. There are noise reduction systems, one way noise reduction systems like Burwen [Burwen Research DNF1201A, Noise Reduction Filter] **for instance. Also, I don't want to sidetrack like noise reduction systems, which fill in where there is a spike.**

Right. Where there's dropout on the tape or something like that.

Yes. So, which is very attractive.

So, for computer enhancement, there's a number of things that can be done to resurrect those tapes.

Right.

So, it's most important that we at least get a copy and make sure it's very secure.

Yeah. So, I have thought for the longest time of doctoring up historic tapes or historic recordings. So, they could be . . .

As a project? Have you thought of doing this?

Yes. Yes!

Have you thought about getting it funded–or doing it on your own?

No. I'm funding everything myself. That's it–by the way! When I think of it, Bob Moog, and he has to correct me if I'm wrong, but this is what I understand. He had a project to build a vocoder for UB [SUNY-UB in Buffalo, NY].

Yes.

Which I understand sold for $10,000.

I'm not sure of the price. It was quite high.

Yes. And it cost him more than that in engineering time and outlay. And so, anyway, he had a funding. I built this, my first vocoder, which is not here anymore. That's in Berlin now. I built my first vocoder out of my own funds, which you know, I think I told you. I started with a hardware on October 20th last year [1977]. **I**

had the first model together on December 1st, and it sounded terribly distorted. And I thought, "Well, now there goes this project." And then I worked on it very hard, and then I found what I did wrong. And ten days later I had the most wonderful vocoder.

Yes, you did.

Well, I mean, and this was a predecessor of what you have, because I did recordings with it for weeks and weeks until I found out that I didn't even wire up the lowest channels. I had worked it only with the upper channels.

You said you'd built your first vocoder. When was that? In Berlin?

No, no, no. The first vocoder that I built, that is in Berlin now.

Oh, I see. It's been sold.

Yeah, did I tell you the story about that?

I think you told me that Tangerine [Dream], someone from Tangerine Dream came.

Peter Baumann came, and he came on a weekend, and I couldn't lead him to Polyfusion. So I only had the prototype here, and he said, "I take it." So he looked me and said, "I take it." And so that's the end of the prototype. The only thing being that I have another front panel of the same kind, but I wouldn't want to duplicate the prototype. He can now proudly say that . . .

He owns it!

He owns it, yes.

What did you do? You worked for Wurlitzer, but after the Melochord . . .

After the Melochord, I built the Polychord.

I don't know about that.

Yes. That didn't make many waves. I just built one, single one, with relaxation oscillators. And it

was just an instrument with which I had too much trouble. So I . . .

Was it polyphonic?

Polyphonic, yes.

Completely?

Completely polyphonic.

An oscillator for each key?

Yes, yes. Synchronized. Synchronized oscillators. So as far as that is concerned, the tuning was fine. It was never . . . This is the one.

I see.

And what I had . . .

When was that?

That was around 1950. But then I decided . . .

Were you independent at this time?

I was independent. I was independent until 1952. I was independent from ‘45 when I left the war industry–which was kaput, until ‘52. I did not continue on the Polychord. I had an idea to make an organ, which sounds like the Hammond organ, plays like the Hammond organ, as everything like the Hammond organ, except that it doesn't have any tone wheels. So I used synchronized Hartley oscillators. And that organ concept I brought over to the United States in 1954. And that organ was built by Estey–Estey Organ Company.

Yes, and they had reed organs originally.

And then they built this organ for a while. We built . . . And then they went bankrupt. But they built something like . . .

Was this again one oscillator circuit for each note?

Yeah, it had Hartley oscillators in the highest octave.

And divide down?

Divide down again, with tuned oscillators on which I had a nice sync range. So it was . . . I have an organ downstairs which has oscillators of this kind. It's very deteriorated now. I would have to clean the contacts. It has some special features, which I can show you.

Is that the organ at the top there? Or is that the ball that . . .

No, no. That is a prototype organ, which I built in Germany. And a sister of that one I took over to this country.

Then that became the Estey.

That became the working prototype for the Estey, except that they did other furniture alone.

Right. But it was a 12-oscillator instrument with divide down?

Yeah, 73 tones. And I used the synthesis principle of the Hammond organ, with the exception that I went only up to 4,000 cycles rather than Hammond going up to 6,000 cycles.

So you used sine wave addition?

Yes. And I repeated upper octaves, and it worked out quite nicely.

Did you, as Laurens Hammond did, share keyboard, in other words, share partials with keyboard out there?

Yes.

So that your partials were like his, they were not Pythagorean, they were equal tempered . . .

Yeah, right, right. Exactly.

I guess it would be perfectly expensive.

No, I borrowed the fundamental, the second harmonic, third, fourth, fifth, sixth, eighth out of the tempered scale. Exactly like Hammond did.

There was a great deal of controversy in those days.

Yeah, I know. Now, what the beauty about this organ was that it had a slight harmonic content. They were not pure sine waves. And this way, now you've got the beats of the tempered harmonics with the natural harmonics, and you've got a kind of a chordal tone effect. So this organ sounded very rich.

Did this have a special name at Estey? Was it just the Estey Organ?

The Estey Organ.

And what years was that?

Well, the prototype came in–in 1954. It was shown at the NAMM show in July '54, I think it was, Chicago. And then it was built through 1958.

So there are a number of those around?

Oh yeah, there are a number, and hundreds of them around. And we improved the models, and eventually we had a very good model. And the only thing that made it fail was a poor purchasing agent who paid about three times as much for the transformers, actually than he should have paid. And things like that, you know, what you call, put under the heading of mismanagement. But I stayed with the Estey organ company after they merged with one company in California, Magna. I brought out another model of the Estey organ because I thought, well, they cannot . . . I didn't know that the purchasing agent was at fault. I thought I made a design that was too expensive. I put in a design that was cheaper, and so that was synchronized glow tubes. And there is a circuit, you know, which you can build with . . .

This is neon tubes?

Neon tubes. And there's a circuit that you can build with neon tubes that is very stable, that you

can synchronize over one octave. And I tried it out . . . it worked like a charm.

Was this still an Estey Organ, then?

It was still an Estey Organ.

They had failed and merged with Magna, but they kept the name.

Yeah, yes. And so then the management there at the new set up had . . . the philosophy, which was about 180 degrees reverse from mine. I wanted to have top quality and top of the line. I wanted to have the Cadillac of the organ line. They wanted to have a Sears Roebuck, called "Cheap." I shouldn't say Sears Roebuck, but it's real cheap, you know? With the result that they went cheaper and cheaper and cheaper. Now I think it's just a little V-organ out for Estey. And I lost track of them, but they must be around still.

When did you leave?

I left at the end of ‘59. Then at the end of ‘59, I decided–now I got a number of shares of stock.

One thing, on the Estey instruments that you built, were there models? Was one an AB?

Yeah, it was the AS-1, was the best model [Estey Electronic Organ Model AS-1].

The early one?

AS-1. It was not the earliest one, but that was the best model.

Did that use the neon glow tubes?

No, no, no. That was still the Hartley oscillators. I didn't think too much about the neon tube organ. Didn't have the richness and the possibility.

What was this model number?

I don't remember the model number. I lost interest. At that point, I had the feeling that the organ industry got into a rut. So I thought I had

to break out of that rut and do something completely different. So I parted from Estey and had enough money at that time. So I went back to Vermont. I was in California. I started development on my own. I had the vision of a modular synthesizer, which I thought would revolutionize the whole music industry, which eventually happened. And I wrote letters to all the kinds of famous recording studios and so forth. I almost had no response, and I couldn't understand it.

This was in early 1960 then.

Yeah, that was in 1960. Oh yes. I started at the end of '59. By the end of February 1960, I had a modular synthesizer with reverb–a tape loop repeater. I could do all kinds of crazy things and I still have sample tapes. I presented a paper at the AES convention in the fall of 1960 on this modular synthesizer. Of course, some people had the vision that they saw that this is something. Among others, I got acquainted with Vladimir Ussachevsky. He also at some time later ordered equipment from me. Of course, that was a

business of a volume that I couldn't build a new house from the revenue. I had a family, so I had to go to work again. It just happened that even before I wanted it, I had a job offer from Wurlitzer. This is where Wurlitzer comes in. I held them off and said, "I'm not ready yet, but I'm going to look at your facilities if you want me to." So they invited me and my wife to come down to Corinth, Mississippi. They also invited me to look at their facilities and Dekalb. They really gave me the best carpet treatment. So, when I saw that my efforts to get into big boom business with my synthesizer just didn't show any results, I threw in my towel, if I may say so, and said, "Okay, I'm going to join you." I joined Wurlitzer in March of '60. And then, due to an accident in the upper echelon of Wurlitzer, I don't know if you know about that.

No.

The VP, who was a son of the late Mr. [R. C.] **Rolfing perished in a plane crash around New Year or so** [Three Wurlitzer Company Executives perished in a plane crash into Lake Michigan on 01

December 1960 according to the NY Times]. **I don't know exactly what it was. Now the whole policy changed at Wurlitzer. The whole research and development facility in Corinth was dissolved, and everything was centralized back to North Tonawanda, New York.**

Excuse me, while you were in Corinth, Benjamin Franklin Miessner had worked on tuned reeds and Wurlitzer had produced a piano. Do you know anything about the subsequent development?

Yeah, I know about it, because I was assigned the task to take over further development of the electronic piano.

It had been there about five years, I guess. They came out in about 1955 [1954-1983].

Yeah, well, this was of course before my time. I was there, mind you, in 1960. I did some development on the electronic organ, and I did some other things. Then I was assigned the responsibility for the electronic piano. At the time when I was assigned the electronic piano, the

business management of Wurlitzer, mainly this gentleman Hooper [Hooper Management Company in Corinth, Mississippi was involved in property management and development, according to Corinth Coca-Cola bottling group.] **had a much farther reaching vision than the people who were left over after this. So they thought of a pure electronic piano like this one here. But what fizzled down to remain was just an improvement of the reed piano.**

Did you ever meet Mr. Miessner?

No, I saw him, but I never met him in person.

There was some kind of an unfortunate situation between the Wurlitzer people when he wasn't there. Do you know anything about that?

Yeah, I sensed it. They just wanted to become independent, and they used me to put in things that made them independent of Miessner.

I see. In other words, to circumvent his patents and things like that.

Yes, yes. So, of course, I had to make a living . . .

Sure. Did the best you could.

So I did what I was told to do. And then while I was with Wurlitzer, I gave them four new patents on the new electronic piano development. So now they have a whole array of new patents.

Would it be fair to say that the genesis of that piano, though, still is due to Miessner?

Oh, sure.

So in other words, in no sense of the word, should the Wurlitzer company take that away from him?

I think no. They shouldn't take it away. Clearly, He has done quite a bit of craft work. I did certain things which, for one thing, they had problems with the reed brackets. So I developed a new reed that had much less brackets. And that also had a . . .

Was the design in 1960 the same as it basically was in ‘55? It had an FM situation.

No, no. We had DC bias.

It was not that way.

We put in DC bias, and of course we put in new technology. So we have transistor technology.

What about the reed pickup? In the old days, it was half-lapped so that a symmetrical movement of the read would give an asymmetrical wave shape with a lot of harmonics rather than a sine wave.

Yeah, this was retained. And the reeds were weighted at the end, I think, which also was under Miessner.

His patent?

Yeah.

Was there any relationship between a man named [Hosche] and the Wurlitzer company?

I am not aware of that. So anyway, so this kind of making trying to, under their dictatorship, to make them independent of Miessner was, of course, not a huge technological challenge to me. So, and there was a mutual understanding that I left, when I left Wurlitzer, in the middle of 1963. Now, I thought . . .

Well, let's have you move to North Tonawanda.

By that time, I already had lived in North Tonawanda. As a matter of fact, I already lived in this house, which I built in ‘62, which was finished in March of 1962, after I had at least one house at another place in the neighborhood for one year. I came to North Tonawanda in ‘61. So, now, I had left Wurlitzer, and I had now several orders for frequency shifters, at that time, all the frequency shifters and ring modulators. So, now, I thought, now I set up shop, and now I forget about the industry. And I was really thoroughly sick and tired of the electronic music industry. And so, I did some things, but the orders didn't

come in. They're always in a small business, as you know.

Cash flows is a problem.

They have cash flow problems, slow seasons, peak seasons, and so forth. The nation was, the business, was very much affected by the assassination of [President John Fitzgerald] **Kennedy, which happened in November of '63 . And so, all of a sudden, the business stopped. As far as I'm concerned, I couldn't get through to people, to get them interested in remote things, as certain new aspects of electronic music.**

I also had problems. My first wife became quite ill, which ate up cash. So, I had to go to work for a living again, but this time, no electronic music. So, I joined Bell Aerospace and stayed with them for 11 years. And I became a respected specialist in microcircuit design and development and technology. And to that extent, I was very much respected by NASA and prime contractors. So, when I left Bell, and this is not a giveaway–due to normal retirement. People asked me what I am

going to do now. Why, I said I'm going to work now in my field. Microcircuit technology? No, I said, electronic music. "Do you know anything about electronic music?" So, that's the way it went. So, that was one phase. And of course, now, if I think of having had three starts, the third one worked. That's the present one.

With the frequency shifters?

Frequency shifters, anti-feedback devices, ring modulators, vocoders, and doing some other things which I license others for doing. It all works.

I would like if you would, to sort of go back, further back into the past. I'm going to have to hear if we have time. And ask you if you knew certain people or if you had any experience with them. For instance, you said that originally when you built this organ that you copied Trautwein's or used the public domain design for his relaxation oscillator. And then, neon tube first, and then the thyratron. Did you ever meet him?

Oh, yes. He lived in Berlin. And I moved to Berlin. And when we got on the telephone, the relays must have gotten hot because we talked at least for an hour and a half in one call. So, I mean, we had just so much to say to each other. No, I know him quite well. He was a very likeable man.

Were you in Berlin at the time? Now, he developed the Trautonium before you were in Berlin.

Yes. He developed it. And he got, of course he was a smart cookie too. I mean, he got Telefunken sucked into building two hundred Trautoniums, which were standing around in all kinds of attics and so forth.

There were that many? There were two hundred?

Two hundred. This is just like years when 1630s [Bode Model 1630 Frequency Shifter] **were built, you know. Yes. Although, at the time, when we started the 16–if I may, the 1630–if I may just make a jump, initially there were orders for 45. And then the . . .**

Just took so long . . .

It took too long, and people lost interest.

Right.

But with Trautonium, it was a different story.

Since Telefunken built a Trautonium, he–Trautwein, built Trautoniums from about 1930 for a number of years?

Yes.

Telefunken's involvement was in the late ‘30s?

No, it must have been in the mid-thirties because I went to Telefunken in, well, this was early in ‘37, and asked if I could get some thyratrons, which were used in Trautonium, so that was a standard thing. Huge thing, you know, about the size of the 60 or 100 watt bulb. And, yes, I could, could get them, so. And, as I told before, on the other side of the tape, I put in quite some hours to

make an oscillator with a thyratron, remarkably stable. That it almost worked with the keyboard.

But it's easy to see why Trautwein had used the band manuals.

Oh, yes, absolutely.

So that you could change pitch as you played, by ear.

Absolutely. Like, it's always using something as an excuse for deficiencies.

It becomes part of “technique!”

Yeah, of course, right, right. Of course, [Oskar] **Sala, uh . . . Of course, Sala developed such a tremendous virtuoso’s technique for playing the Trautonium that, I mean, now it was completely justified.**

Yes, and he advanced that instrument beyond the Telefunken.

Oh, yes, oh, yes, he did. He really did remarkable work.

Did you ever hear him perform?

Yes, I did, yes.

Do you recall one of those performances?

Yes, yes, yeah. It was a demonstration type of performance. I think it was in one of the studios of Berlin Broadcast Company. It was at the beginning of the World War II.

In those days, was the impetus, was the direction of the electronic musical instruments, was there a lot of new music played, or was it mostly transcriptions of older music? In other words, did people use the Trautonium for experimental music, or was it more traditional?

That's a good question. This is hard for me to recall. I can only answer that in part as far as my instruments are concerned. I inspired composers

like [Theo] **Mackeben–I don't know if that name means anything . . .**

Yes, I was talking about, hello, hello, testing. It signals a little bit more. Yes, I could be. Let me see. Hello? Oh, this is this. Hello? Aha, that's yours. All right. Okay. That's fine, I could reverse them.

Yes, as I was saying, Theo Mackeben, he was a brilliant composer of popular music–music for film scores, and I inspired him by playing, demonstrating the Melodium for him. And he did the music for *Mary of Scotland,* which was a movie, which he did a brilliant music score.

[This film "Mary of Scotland" was actually known as "The Heart of the Queen" *(Das Herz der Königin)* It is a 1940 German historical film, making selective use of the life story of Mary, Queen of Scots, and her execution by Queen Elizabeth I for anti-English and pro-Scottish propaganda, in the context of the Second World War going on at the time.]

And so this is on the subject, was music written for these instruments? I only know about my own

instruments. And a number of music scores were written for theatrical pieces. The Melodium was used backstage, and the orchestra pit and theaters with theater plays in Berlin. I mean, it's a kind of a situation, as it would be in New York, where you can cart around one single instrument and use it in all kinds of plays or presentations, and saturate the market, so to speak. And what I did, I had a rental arrangement, like somebody would rent out a vocoder. I rented out the Melodium and collected a nice rental fee, like the equivalent of maybe more than $300 a day for the Melodium for when it was playing with the symphony orchestra. And sometimes it was standing there for five days in the room and generating rent for $1500 was maybe used just for ten minutes or so. But this is the typical situation. I mean, this is just by the way, these little things. So, so much about the Melodium, we are really going back and forth. And when we just rushed through the history or the stories that I have told you, and some of the things that you have asked me, we have naturally skipped a number of things, which you didn't know to ask about. So, and the things that I can fill you in

with, like, for instance, the Clavioline. I remember when the Clavioline appeared on the scene, that was just . . .

Constant Martin.

Yes, yes. Of course, I met, not Martin, but I met the mastermind behind the [marketing] Gaston Berger.

[Gaston Burger, general manager of Société Clavioline–the maker–of Paris, France. (Société Clavioline refers to the French company that manufactured the Clavioline, an early electronic keyboard instrument invented by Constant Martin in 1947.) Mr. Burger came to this country–his first trip here, by the way–at the request of M. H. Berlin, President of the Chicago Musical Instrument Company (CMI) and the Lowrey Organ Company; Walter Anderson, chief engineer for Lowrey; and James Wilson, Vice-President of the D'Arcy advertising agency in charge of the Lowrey account . . . Gaston Burger, who came to America a couple of years ago on behalf of the Clavioline was then connected with the Clavioline

manufacturing and promotional organization in Paris, but is now President of the Warner Company of Paris– which rates in France something like U. S. Gypsum rates in the United States. However, Mr. Burger is still [1954] keenly interested in the success of the Clavioline in spite of his big job as an industrialist. "Clavioline Going Over Big Abroad" when interviewed by a representative of PTM [Piano Trade Magazine Volume 51, page 21] upon his return to Chicago, Mr. [M. H.] Berlin [of Chicago Musical Instruments (CMI)] made no attempt to conceal his enthusiasm over the Clavioline. He referred, without giving details, to numerous improvements made in the instrument, and predicted a measure of success in America for it equal to the success which has already been registered in Europe, where it got a head start on us. The Clavioline is distributed in the sterling countries by the London house of Selmer, from Paris by the Selmer establishment there (which has no connection with the London house, by the way), and in Germany and Denmark by the firm of Jörgensen. Mr. Berlin spent some time while abroad in investigating new products, which he hopes Chicago Musical may distribute to the added profit of music dealers of the United States.]

And I had a contact with him later because I was instrumental in generating, as I told you, the Concert model of the Clavioline. And I obtained a number of patents around the world for that. Now, it was quite interesting, the emotional aspects of this thing, because when the Clavioline appeared on the scene, which was around 1948 [1947], **I think, it became known in Germany.**

This is the French version.

Yeah, the French version. I just had the Melochord that didn't have the plucking sounds, the attack-decay characteristics. And now the Clavioline appeared on the scene, which didn't have these characteristics either, or a very poor plucking sound. So, I got scared like hell and I felt that I had to do something better. So, this is how I was motivated to get the second generation of the Melochord, which now had the real string tones and the real plucking tones and everything, way beyond the aspects of the Clavioline, which had the two-tone concept and so forth.

Two-tone?

Oh, yeah, the Melochord had the two-tone.

Oh, the Clavioline also?

No, no, no. The Clavioline stayed where it was, and now I went beyond the aspect of the Clavioline. However, the Melochord was not mass-producible, whereas the Clavioline was mass-producible. So, that's where they beat me. Finally, I made the decision, well, if you cannot beat them, join them. So, this is how I got to the collaboration with the Clavioline people, which happened, or started to happen, in ‘52-‘53.

There was a British Clavioline as well, was that you?

Yeah, there was. It's Selmer, that was [M. H.] **Berlin, and there was the mastermind behind that promoter, and that was also covered by my patent. So, my first royalty check, if one thinks in this country the Clavioline never did anything in large quantities. My first royalty check was for**

1,000 Claviolines in Britain. So, I mean, it did go into quantities.

It was Berlin, Arnold Berlin?

No, I have to look into all correspondence. [Likely Arnie Berlin's father M. H. Berlin.]

But your role then was to improve and enlarge the instrument from the original French version into the one that I think of as the English version?

Well, it was, my alteration was produced in all countries. It was produced in the French version, it was produced in the German version, it was produced in the English version, it was produced in the American version. And then, I think there was also an Italian version.

Well, what did you do?

I put in the octave coupler, which put in the sub and the sub-sub octave, which they then called the Concert model. So, we have the octave and the sub-octave in this instrument here, which is

under the controls on the right-hand side, some of the black. Yes. Now, mind you that this atmosphere in this particular area is extremely, has extremely many chemicals that are very detrimental to contacts, to key and stop switch contacts. So, when I finally moved my organ that I'm going to show you downstairs, to this area, it lost all its charm. Some contacts failed completely, so I have to clean and restore it, and I just haven't had time to do it.

Another small keyboard instrument that looks physically like the Solovox, the Clavioline–the Ondioline came out with Georges Jenny, or J-E-N-N-Y. Do you recall that instrument?

Oh, yes. As a matter of fact, I met him in New York. He was here, and he was sponsored by a studio off Broadway, and they wanted to promote it. At one time, they wanted to. It's a remarkable instrument, and you sometimes hear the sound in commercials.

You shake the keyboard back and forth.

You shake the keyboard. It was . . .

You could have a vibrato that way.

Yeah, it was a remarkable instrument, but I was still with Wurlitzer when they tried to promote it and get Wurlitzer . . .

Did Wurlitzer have that?

No, no, no, no. I was still with Wurlitzer when they contacted me and wanted to get me as the door opening to Wurlitzer. But Wurlitzer, being the strange company that it is, it was not a Wurlitzer instrument. It was not designed by Wurlitzer's engineers, so it was not interested.

Didn't you tell me that at one point the Hellertion was at Wurlitzer?

Yes, yes. But that was way before my time. As a matter of fact, I think that was even prior to World War II, possibly.

I know we are skipping around, but did you ever meet Helberger and Lertes?

No, no, I never met them. You see, it was a different time.

That was the early ‘30s, 1928.

Yes, yeah. So I really considered myself as a late-comer at that time because so much had been done before I did anything. I just happened to stay alone.

What about your relationship with Robert Moog? How did that work?

That is interesting. I was still with Wurlitzer when Bob wrote to me and he had read my article on my first modular synthesizer, which I showed at the AES show.

This is an article from *Electronics* December 1, 1961.

Yes. That was three years before he showed his first modules. He was very impressed by what I had published and what he had heard about my work. At one point he offered to ask if he could work as my Assistant and showed me about his qualifications. But again, Wurlitzer being the company that was, they didn't want to pay for anything. I tell you, I don't have enough words– it's terrible, for Wurlitzer's story.

I'll never let this tape get out into the archives. He must have been building theremins at that time.

He built theremins.

He must have been at Cornell.

Yes. He was at Cornell. And he was really struggling a long time. But he finally built his first modules. After I had made this presentation at the AES in 1960, I was called and asked if I would function as a Session Chairman in 1962. That was still during my Wurlitzer years. Then again, I was called to chair at the session of '64.

In which Bob introduced his modules.

Yes. At that time, Bob got in contact with me. So I was able to take him as one of the papers that were presented at the fall session of 1964. So I introduced Bob as a person who was well known by his theremins. Bob was very shy and almost fainted on the stage when he presented his first paper.

Literally?

No! He was very shy and very slow with words. But everybody who had some judgment, and some sensing knew that this man was going to go places. This feeling I also got from his presentation. Herb Deutsch was the one who played his first modules.

At that convention?

No, it wasn't taped. A tape was shown. Then of course I saw Bob at his stand, which was a jury rig with a few cardboard tables and his modules and his keyboard. I was very impressed, because

it had all the qualities that reminded me of the early days of the Melochord. So history repeated itself as far as I was concerned.

The concept of voltage control didn't originate with Robert Moog.

But he really perfected it.

As far as musical instruments?

Yes. He perfected it to the extent that he adapted the voltage control to the musical scale to . . .

Exponential control.

Exponential control. And then he of course went further with the voltage controlled filter. He really did what was needed to make the voltage control concept work in a modular synthesizer. This I also said, " . . . what you really did was to make the exponential interface work." Because that was . . .

And also much wider range in the modules . .

Oh, yes, yes.

There had been VCAs [VCA–voltage controlled amplifiers] and organs and things like that. They didn't work over such a . . . span . . .

No, no. I mean he really exploited the concept to its full potential. So then of course Moog and I–he was very much impressed and more so than the average worker in this field by the name that I had made for myself. So for his money I was a household word. So he liked to very much get products of mine into his program. So he was very happy when he was able to make an arrangement with me on Bode ring modulators, which enhanced his line. And later Bode Frequency Shifters, which were built by Moog. So we had some Bode frequency shifters of the passive kind, which needed . . .

Not voltage controlled.

No, not voltage controlled, in which just had a signal input and a carrier input, just like the ring

modulator, to do the single sideband work that was known for frequency shifters. I do have a single sideband frequency shifter here, which is the passive kind. That's one here in the right. But I don't have the active kind because the one that I call my own, I have lent out to someone in California who's working with it. Justly so, because I have his frequency shifter here for repair; I haven't had time yet. And both are very happy. He's happy that he has mine, and I'm happy that I'm left off the hook right now. So now, hopping back and forth from one product to another. I also, during my days, prior to coming to this country, developed another instrument. I should interject one thing. My connection with the Clavioline came up when I was approached by a company which promotes the Clavioline in Düsseldorf, Germany. That's a huge and very aggressive music dealer, Musichaus Jörgensen. And they had a lot of initiatives. They also put me together and made the connection between myself and the [Gostang Böger] in Paris. So they got me together with the Clavioline people, and they initiated really the work that I did on the Clavioline, the Concert model.

Did you make substantial changes in circuitry?

No. I just added a little module that could be retrofitted as a kit. And it was a very small thing but did a nice job. Now, these people who were instrumental in getting me together with the Clavioline people, they also had enough customer feedback that they knew that there was a demand for a polyphonic instrument. So at one point, I made a polyphonic instrument, which they insisted upon inventing the name. And it was very unfortunate for the American market because it sounds like tutti-fruitti. It was the Tuttivox. And the name didn't go over. If a name doesn't go over, the product doesn't go over.

It implied all voices.

Yeah, Tuttivox, but it didn't. So it was a dead-born child, not only because of that, but also dead. It was mis-improved after I left Germany.

Mis-improved?

Mis-improved, yes, which means in order to have high reliability on the contacts, I had two contacts for each key which did the same thing. One was scratching, the other one was filling in, so you didn't have any scratching. And some smart aleck simplified the instrument by thinking, "What nonsense is that to have two contacts on one key?" So he left out one row of contacts and now it sounded like scratch, scratch, scratch. So it what was not supposed to be. So a market which had much more air contamination than the European market, namely the American market, it was not feasible. So we lost out on that one. I have a little amateur photo on that one here. The Tuttivox. With the back open. So we had all the tone generators and had 36 double tubes, so it had a total of five octaves.

That reminds me a little of the Connsonata. Do you remember that one?

Oh yes, oh yes. Well, this instrument I have, it stood in the basement.

The Tuttivox? Is that the one you were going to show me?

No.

Oh, you have another one there?

Oh yes, yes. That is in the junk room, I could pull it out.

I'd like to see that.

I would have to do it next time.

Oh, I see.

It's not functional, operative now because I lent it to one of my sons and he dropped it on the floor and something broke. But what I can show you, and of course I don't have a picture. But what I can show you . . .

Was this an add-on instrument that you would hook underneath a piano also?

Yes, yes.

I see. Like a Solovox that was polyphonic or a Clavioline that was polyphonic?

Yeah, so right.

Did you have anything to do with the Electronium Pi? Was an accordion, as I recall?

No, no, no, no. Then of course the imitators appeared on the scene in Germany after I left. That was after ‘54. You know, most of the people who come and go in electronic music don't have a broad range background and they fail on something. They call them flash-by-nights and they just come and go. And many people, I'm not in the way to say that.

You've seen instruments fail for a number of reasons.

Oh yes, oh yes.

And it takes a combination of all those things happening right for the instrument to succeed.

Sure.

Sometimes musically it may be a valid and justified instrument with other factors.

Right.

This is part of what I would like to say to this music industry.

Oh yeah, I mean this is something and would be the object of a very interesting conversation that we could have. To really find out why and why not.

Different instruments fail?

Yes, fine.

I'd like to have that conversation sometime.

Oh yes.

I'd like to see that organ though.

Sure. Well we would have to shut it off.

Okay.

I mean I could, if it's sufficiently interesting, yeah you can ask again your question.

The business about why instruments fail?

Oh, why instruments fail? No, I thought if we have left out anything in the spectrum of instruments.

Oh yes, right. I know we've jumped around.

Well I think we have pretty much covered everything as far as musical instruments are concerned. Of course my other creations you know, I mean the ones from recent years which are mainly ring modulators. And frequency shifters and now the vocoder.

How did you get the idea for those products though? I mean how do you just all of a sudden decide that what people need is a frequency shifter?

Well, this is interesting. I was known and I didn't originate the ring modulator of course. I only discovered that ring modulators which were built in the early years used switching type of diodes and sounded horrible and distorted. And I did, by experimenting around with ring modulators I found if I used germanium diodes and used very low voltages that they were in the square law function region of the diodes. Then I achieved very pleasing sounds with ring modulators. So I then discovered that this was a place for a new breed of ring modulators not for communication techniques or not for control devices but for electronic music applications. So I capitalized on this discovery and built a ring modulator into this modular device which you see on this rack [viewing the Bode Sound Synthesizer of 1960]. **That is the one that is the pioneer if I may say so for the modular devices.**

When was that?

That was 1960. That is the one on which I presented my paper in AES. As a matter of fact on all of these devices that you see on this particular rack that was essentially the object of my development in '59 and '60. Now getting back to the ring modulator I discovered this ring modulator, and it was recognized by people who were interested that this was really a breakthrough in ring modulator technology. And so, Ussachevsky of Columbia and Princeton [The Columbia-Princeton Electronic Music Center (CPEMC) at Columbia's Prentis Hall on West 125th Street, NYC.] **ordered the first ring modulator from me. He is still** [in 1978] **working with those ring modulators of 1962-63 vintage. Now, then he told me that he had worked on a very interesting instrument which he called the Klangumwandler which was developed by Siemens and which was used by Burke and Heck in Darmstadt, Germany. He as a matter of fact had gone to Germany to work with this Klangumwandler which was a $20,000 instrument. He described me exactly what it did and from what he described to me. Then I also obtained recordings of the**

Klangumwandler. And I found out that it was a frequency shifter. So I gave it a more sober name and called it a frequency shifter. If you will, I reinvented the Klangumwandler and built one for Columbia-Princeton. I was commissioned to build one. I think it was 1963, yes. It was a very sophisticated device on which I used all kinds of techniques in order to achieve a very, very clean performance. I used a combination of the single sideband technique which you achieve with heterodyning and single sideband filters. The technique that you use with multipliers and fork multiplication. ["Fork multiplier" likely refers to *voltage multipliers* that use a series of diodes and capacitors to increase the input voltage to a higher DC voltage.] **By the combination of the two techniques I was able to get a single sideband suppression of 80 dB, which was unheard of at that time. So, I built that monstrosity of a Klangumwandler frequency shifter which he still likes to work with** [this interview in 1978]. **Of course I modernized it since it was built the first time. We can just go back.**

OK.

So it used very sophisticated approaches to get a signal to noise ratio of 80 DB. It's not a signal to noise ratio.

Suppression.

Suppression of the unwanted sideband of 80 DB. But I had to become more practical by generating or building a second generation of frequency shifters that could be produced. But at that time the fork multipliers did not exist yet, which came into being in the late 60s. This was still in the early 60s and mid 60s. So I still used the diodes which I used successfully for the ring modulators on which I had discovered the square law function of operation. And I used these diode bridges as quadrature multipliers. And I developed a frequency shifter with this diode bridge technique.

Was the diode bridge ring modulator then that's your development?

In a certain way it's not a basic development. It was just an improvement, discovering this region which was so undistorted and giving the ring modulator such a good quality and then also could be used for frequency shifters. And so a number of frequency shifters were built with that technology until a new integrated circuit technology came into being, which then facilitated the building of the new generation of frequency shifters. One of which is the model 1630 [Bode Model 1630 Frequency Shifter.] **So that's about where we are as far as frequency shifters and ring modulators are concerned.**

Now, my vocoder for which I started the calculations in August 1977 didn't come out of the middle of nowhere. And I, during the course of the years, I mulled over quite a number of vocoder concepts, only always feeling that they were too bulky, too much circuitry, and that I had to wait for the technology to get to the point that they would be practical to build. And a friend of mine in the middle of last year, ‘77, or what I would almost say earlier part of ‘77 said, "Well, I feel that the time it has come for

vocoders, so what do you think if you were to build a vocoder?" So I became more serious. I was really encouraged. And of course I also had heard that something would come into being or go on with the vocoder. So that was then when I started seriously with the calculation of the active filters and with the design notes now taking on shape. And when I decided finally in October to build the first prototype. And this, I already, over the years, I had toyed around with the concept of a vocoder that is a direct performance instrument rather than a device for telecommunication and bandwidth reduction. So at quite an early point in the game, I thought of a vocoder that would not analyze and remake all the channels, but only the channels that are important.

Musically.

Musically important, yes. And transmit another portion of the information that is beyond the range of recognition, pitch recognition, and like the "S" [sibilants in speech] **sound region. And now it was an early observation of mine that, and it must be written up too–that above, just like**

below a certain pitch, you don't recognize– identify pitches. The same is true also above a certain frequency. And I found 6,000 cycles to be the typical frequency about which you don't identify five pitches anymore. And that must have been also an observation of Laurens Hammond, who had his tone wheels only go up to 6,000 cycles, and who could do quite some cheating of the ear without anybody knowing that cheating was done. Now, I used 5,000 hertz as the magic number about which I then bypass from input to output the real world, the real sounds, without the listener recognizing that this is not the direct frequency. However, doesn't always work. Got feedback from one customer and said, "There's a tremendous voice feedthrough, how can that be eliminated?" And I said, "Well, put the switch, which is on the Direct Bypass, put it down to a switch bypass and you will not have a voice feedthrough." And he was tremendously satisfied. So what turns out to be an advantage in some cases for some business?

It almost has to be one of a kind for musicians. Everybody wants something slightly different in

their instrument. I suppose that's one of the reasons the modular synthesizer and the concept of voltage control is so powerful.

Yeah, right. And of course now I think we have enough possibilities in this vocoder, enough variables that every user is satisfied. And then of course with the scrambling possibilities–I'm not talking about something that of course EMS does too. On the bigger, on the $20,000 vocoder that we can do on the $5,000 instrument as far as vocoders can see. Yeah, well, this is, I think this essentially wires it up in a nutshell. And so maybe we can stop the tape at this point.

Alright.

It's the little square.

End of Part 1 Harald Bode interview of 1978.

Interview of Harald Bode in his home/studio in North Tonawanda, NY on 13 September 1978 by Thomas L. Rhea: https://www.drtomrhea.com/

Significant additional printed information and audio examples appear in *Electronic Perspectives: Vintage Electronic Musical Instruments* (2023) Tom Rhea's 400 page book with 2 CDs of audio examples: https://www.electronicperspectives.com/

On YouTube: https://www.youtube.com/@electronicperspectives/videos

Significant audio restoration by Matt Traum: https://www.patchmanmusic.com/mattstimemachine.html

Also appreciated are Kim Traum's skills as a German speaker, who cleared up some questions regarding proper names and company relationships that Harald Bode mentioned in this interview (July 2025), thanks Kim!

Gracious thanks to Peter Donhauser, author of *Elektrische Klangmaschinen: Die Pionierzeit in Deutschland and Österreich,* and *Musikmachinen: Die Geschichte der Elektromusik* for guidance during many years regarding developments in German-speaking countries. He served as Curator and then Director at the Vienna Museum of Technology for many years.

This interview and a shorter one on 14 September 1978 were part of my research in anticipation of publication of three articles on Harald Bode's instruments that appeared as part of my monthly "Electronic Perspectives" (1977-1981) columns in *Keyboard* magazine–for December 1979, January 1980, and February 1980. All 52 of those columns appear in the book (2023) mentioned above.