Oral History of Thomas (Tom) E. Oberheim

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Gene Radzik: The time is 2:00 PM on Monday, October the 29, 2012. I'm Gene Radzik with the Audio Engineering Society [AES].

Alex Bochannek: And I'm Alex Bochannek with the Computer History Museum [CHM].

Gene Radzik: We're located in San Francisco, California at the mixing studios of Dolby Laboratories with Tom [Thomas Elroy] Oberheim. Tom, thank you for granting this interview. For this oral history, I'd like to begin by capturing your back history. Would you mind telling us when and where you were born, and how audio entered your life?

Tom Oberheim: I was born in Manhattan, Kansas— home of Kansas State University. Although it was Kansas State College when I was there. I was born in that town and raised— and went to school there and went right on to the Kansas State. In 1956 I got the bug to leave town for a while and met some people in Wichita and moved to California and arrived in California in July of '56 with $10 in my pocket and a broken down car and that's where I started. The first few months I just worked at a— at an aircraft company that needed somebody in their dark room because I had worked in a camera shop when I was in high school. Worked there for a few months and then one day in December of 1956, I saw an ad in the Los Angeles Times for a draftsman trainee job at a company called, NCR, a National Cash Register company. And I didn't really like the job at the aircraft company so I went to interview. Then I got this job as a draftsman trainee. I had had a semester of drafting at Kansas State and it turned out this company was the very new electronic division of NCR that was one of— it turned out to be one of the first digital computer companies in the United States. NCR had bought a small computer company of eight or ten people making vacuum-tube, general purpose computers and they were getting in the computer business. And so I was thrust into digital computers in December of '56. And although my job was a draftsman, I had soaked up everything I could about these things called computers and I just went to it like bees and honey, I guess. And although my day job was drafting printed circuit boards and things like that, at night I got to the point where I was actually going in and programming this computer. This computer was called the NCR 304 and it was the— arguably the first transistorized business computer in development at the time. There's, I guess, some controversy about, which company made the first transistorized general purpose computer but at least NCR has an argument, they were one of the first. So I worked there for a couple of years. And then in the— and I started UCLA in the fall of '57 and I was able to work part-time in NCR and go back to the— work towards a physics degree at UCLA. And during that time actually in 1959 through a guy that I worked for at NCR, I got a consulting job again doing print circuit board drafting a little tiny company in West Los Angeles. And I worked there for— I was working— I work there for three, four, or five months. They made it really early digital logic modules. And one day my boss there came in to my— or came up to me at my desk and said, "Tom, we've got a project from JPL and we're all to busy. You do it." And he threw the drawings— there wasn't a spec or anything, but there were some drawings— blueprints. And I looked at them and I had no idea what to do. But three or four months later I had the thing built, and working, and delivered to JPL. Turned out to be an early time code

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generator. So overnight I was a— an engineer. So I worked my way through UCLA as a digital systems engineer. By the time I had— I graduated in— I mean in UCLA in 1966, I was doing some, you know, I'd worked my way up to doing some very interesting stuff. And at one of the companies where I worked just at the time I was graduating, I designed a system that was a programmable computer device that was built around what's called the CORDIC Algorithm, which is a coordinates transformation algorithm. And during that time I kept getting calls from this head hunter who, in those days, digital computer engineers were in demand. And I was just getting tired of him calling me. I said one day, I said, "Find me job where I design a general purpose computer and I'll— then I'll be interested." I figured he would go away. Well, a couple of months later he called and said, "I got a job for you." And it was a company in Orange County that was financed by Gordon Marshall [ph?], who was one of the big— his company was one of the big parts— or electronic parts distribution companies. And he had some money and he was bankrolling this company that was making a high data rate communications system. And I went there and I hadn't yet designed a complete general purpose computer, but they didn't know that. And so I had— so this— that was my first general purpose computer design in '65, '66, 4K of memory, 4K, 24-bit words and pretty much a minimal instruction set. But it was— it was a full computer. So I really was enjoying that and then over the next few years, I did a lot of work in computer organization and various things. But while I was— while I was at UCLA I— even though I was a physics major I spent all my time in the music department because I had taken a— early days at UCLA I had taken a class in music appreciation because I had no musical training at all when I was younger. And I really liked the instructor. So after I had taken two semesters of music appreciation, I wanted to take more classes from this instructor. And then the next classes he taught were musicianship and harmony. I didn't even know what those terms meant, but I had talked to him and he let me in the class and so I started taking a lot of music classes and met a lot of musicians. Several— by the mid or by the late '80s— or 1960s we were all graduated and they came to me, and wanted me to build them stuff, amplifiers, and things.

Bochannek: So you mentioned the training you had in music, but you didn't really talk about training that led to being able to design a general purpose digital computer. Was this all on the job training? What was your mathematics background? Were you an electronics hobbyist? Did you do Ham radio? Where did this come from?

Oberheim: Okay. Well, I was— I was— I started soldering wires in the third grade, crystal set, one-tube radios, built an oscilloscope in the seventh grade, built hi-fis for all my friends. Worked in a radio shop for several— a few years. Learned to fix radios by the time I was in the sixth grade and then I worked for a camera shop for a long time and learned a lot about that. When I got to NCR and then— in the 1957 timeframe, those were the days where there were no books on— there were no books on computers. There was no such thing as a book on how a computer works. But NCR did have a few pages of typewritten information about logic and things like that and they had a spec on the computer and I just learned the spec and programmed the— did a little fun programming. As far as designing the general purpose computer, I just studied— I knew— well, the small company where I worked at where I became a draftsman and later did digital design they had some early literature on digital logic and I learned that. But I still remember the chief engineer that little company what a flip-flop does and I spent hours, and hours, and hours making a three-bit counter, four-bit counter, a five-bit counter, eleven-bit counter. And then it

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the— the CORDIC computer I worked on had a— was semi-programmable so I learned just on that basically the concept of a program counter and accessing memory, and instruction words with a off code [ph?] address, etcetera, etcetera. But to be honest, when I got to this company in Orange County to design this general purpose computer, I had a lot to learn but it worked out fine.

Bochannek: What was the name of that company?

Oberheim: Marshall Communications. It was long gone by the late '60s.

Radzik: What was the influences you had that led you to those first music classes at UCLA?

Oberheim: Well, what happened was is— even though I was an engineering major at UC— at Kansas State where I went for three semesters, when I got to UCLA, I found that what I considered the engineering department there to be really obsessive in terms of you had to get the Dean's approval to take any courses outside of engineering. I said— plus I found out that to get a physics degree you needed a 120 hours and for engineering you needed 144 hours. I said, "Uhm.. that's for me." And I had already met several engineers at NCR that were physics majors so I knew that that would get me an engineering job. But if you were in the physics major you— in the School of Letters [ph?] and Science, you had to take some art and some music. And so I— and the music was basically two semesters of music appreciation for football players, and sorority girls. I didn't know anything about music. I didn't know who Beethoven was, who Bach was, or anything. And the professor who taught that just— would just transform me. By the time I was through that year I was— I was just so much into music. I just— because I discovered it at age 23 or something, basically. I still remember to this day that's 50-some years later the first time I heard Barber's "Adagio for Strings." I'm sitting there in the auditorium I said, "Wow. That's incredible." It's such incredible music. And, of course, it's almost a cliché now used in movies and all that. But to hear— I remember the first time I heard it. I just wanted— I wanted to have more courses with him basically what happened. And then when I got into the musicianship harmony classes for beginning music majors, I just turned out I had an ear. I could take dictation the first day I went in and I was ready for it. But I hadn't had the training up to that point.

Radzik: Maybe you can speak to what was the transition from working at NCR and being heavily involved in PCB [printed circuit board] design to your first musical instruments and what was that like?

Oberheim: Okay. Well, what happened was is the people I got to know, some of the people I got to know in the UCLA Music Department, we all graduated about the same time, mid-'60s and over the next few years, two or three of them came to me to rebuild them an electronic music equipment or what will start out being amplifiers and things like that. One person was Don Ellis who had— was a well-known trumpet player and big band leader in the late '60s and through the '70s. I built a lot of equipment for him. Another group of people that were after me, the UCLA Music Department when I was there later started a band

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called, “United States of America,” which a short-lived band. And that band was broke up and then reformed and then the woman singer who was in the original band who reformed it, came to me one— called me up one day and said, “The old band had a ring-modulator. We need a ring modulator.” And I said, “Well, I’ve never— I have no idea what that is.” So I went up to the UCLA engineering library and spent a day up there looking through books and I saw some technical books, circuits, for a ring modulator. I looked at it and had no clue how it would be used in music. But then I found an obscure magazine article. It was from an engineering— electronic engineering magazine in the ‘60s called Electronics. It was an article by Harald Bode who later went on to do a lot of electronic music stuff, some by himself some with Bob Moog [ph?]. But he had written an article— this is in 1960 about a modular sound system. It wasn’t a synthesizer. It was more of a modular sound modification system, but it was modular, and there were patch cords, etcetera. And one of the modules was a ring modulator and it showed how you used it. You put audio into one end and put a carrier into the other and it makes all kinds of weird sounds. And so I started building some ring modulators for friends, for Don Ellis, and for this gal that was in the “USA.” And built one for an electronic music lab at UCLA. And then one day I got a phone call from a well-known movie music composer of that era, a guy named Leonard Rosenman. He’s since passed, but he did a lot of great movies. And he would call me and say, “I’m doing a movie called ‘Beneath the Planet of the Apes.’ And I want to use your ring modulator on the score.” And so I took one of my ring modulators to Twentieth-Century Fox, set it up and at the break three or four of the musicians in the orchestra said, “Can I buy one.” And so I was in business.

Radzik: And so was that your first foray into selling your own products, the ring modulators?

Oberheim: I had sold a couple or three amplifiers that I’d built, power amplifiers. But this was the first where I actually— I did actually form a company and got a little bit financing and was going to sell a lot of these ring modulators. So that was the first— as far as the company and— I won’t say mass produced but more than one or two were built.

Bochannek: Where did the financing come from? Were you still a student at the time? Did you work at the same time?

Oberheim: At that time, when I was working at a company that was building a computer output microfilm device. I was hired there to design a control system for that. And I went around to— even though I was still working. Basically, I was still in the computer business, you might say. I went around to three, four, or five friends got a thousand bucks from each one of them. That was the start.

Radzik: So with that leading into your first product, can you talk about how that brought you into the world of synthesizers? What was the evolution of that?

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Oberheim: The ring modulator product was— got me going but it didn't really make it a viable company because I only sold a few. But at the time I knew some young musicians just out of high school that were doing rock and roll music. And they had discovered on Beatle records, Paul Harrison playing— George Harrison playing it's his guitar through a Leslie speaker. And they really thought that was terrific. And I listened to that a couple rehearsals and I thought, "Well, I wonder if there's an electronic way to do that?" So I borrowed a Hammond B-3 with a Leslie speaker from a friend and tried my best to analyze it, but I wasn't that experienced in things that would lead to— actually a Leslie simulator— a Leslie simulator. I, but still I'd come across this circuit called a phase shifter or the other name is called all-pass network, but I thought phase shifter. I wonder what kind of sound that makes? Anyway, to make a long story short, I put together the first phase shifter that was for sale in the music store and used by musicians. It's now, of course, it's a standard item even in this DSP [digital signal processing] field it's a standard thing that people use. But I sold about 75,000 of those and that put me on the map. And another thing that happened about the same time. This was in '71, '72 I went by a NAMM [National Association of Music Merchants] show in Chicago. I came across the ARP Company [ARP Instruments - founded by Alan Robert Pearlman in 1969] and they were early on— early in the synthesizer field, and I talked to them, got to know them a little bit. And at that time, their market was pretty much East Coast because they were a new company. I said, "Why don't you let me be your dealer?" And I don't know if it's a west coast dealer, or Los Angeles dealer or whatever. Of course, they want a guitar center or something like that. But at that point, nobody knew what synthesizers were, especially in music store. So they— I signed up as their LA dealer, west coast dealer whatever. And I knew a lot of— quite a few professional musicians in LA because I sold a lot of ring modulators in LA. So I had a ready market for the ARP 2600 was the— one they were selling. I got one and I learned it— I spent about 36 hours in one stretch learning it and went out and sold quite a few of them. And but the— all my digital logic experience was kind of gnawing away at me. And this was long before microcontroller and microprocessors. They were definitely not viable yet. But I'd have a lot of digital logic experience and I had this idea to make a digital sequencer. At that point in time, synthesizers were— most of them were modular and a lot of them had sequencers that used— they were analogue sequencers using knob— knob settings on a rope, potentiometers. So I had this idea to use digital logic in a computer memory and you could play the keyboard and store those keys depressions in a memory. And so I developed this digital sequencer. It had an early Intel 1024-bit memory chip that cost $25 and it allowed about— I think about 115 notes to be stored. And so that was— that was my first foray into my own product. And over three, four year period I sold 50 or 60 of those. But there was one problem with the— with that concept in— is if you— and at that point and time, all synthesizers [were] monophonic. And so if you used your synthesizer to load up my digital sequencer and then had the digital sequencer play back, you didn't have a synthesizer to play yourself. In those days, people didn't have four or five synths. They generally had one. So I had this idea to make an absolute, minimal synthesizer module that would allow the musician or synthesizer user to store a sequence in my digital sequencer, play the digital sequencer back through my little synth module and then they had their regular synthesizer to do solo on. And so that started me in the actual synthesizer business. And that happened in 1974. And then after I had the module developed and was selling, I thought, "Well, you take four of these." And by then, of course, I mean it was pretty obvious that scanning the digital keyboard would be a pretty simple logic job. I had a digital scanning keyboard before these modules that would be polyphonic synthesizer. And so that's exactly what I did. I started in January of 1975 and by June of 1975,

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I showed a four-voice polyphonic synthesizer and a two-voice polyphonic synthesizer at an NAMM show. And then over the next couple of years that really put me on the map. I need a water break.

Radzik: Sure. Absolutely, I'm sorry.

Oberheim: Any comments dear?

Bochannek: I would be nice if you could name what the synthesizers were.

Oberheim: I'll be glad to do that. But they were not— they're pretty generic. So I developed these two polyphonic synthesizer. One was called the Oberheim Four Voice and one of them was called the Oberheim Two Voice. In the next two and a half years, even though they were quite expensive they were used by a lot of famous musicians. And I was on my way until 1978 came along. And I must explain that these original synthesizers were extremely crude in that each of the— each of the little modules I— which I called a synthesizer expander module. Each one had 20 pots and 6 switches. And so on a four-voice you had— you had that times four and there was no storage of the settings. And, again, it was too early in 1975 to use a micro-controller. I did develop a programmer that stored some of the settings because not all the setting— only a few settings of the synthesizer expander module were voltage controlled. Some were just the switch or the pot was right in the circuit, but I did develop a crude programmer that made some of the parameters storable and I actually got a patent on that back in '76 or whatever. But nevertheless, it was pretty crude. If you were playing live and you wanted to change a sound drastically you had to change a lot of knobs and it wasn't very practical. It just sounded great.

Bochannek: How big was your company at that point? How many employees and how many customers did you have?

Oberheim: By the time I developed the Two Voice synthesizer and the Four Voice synthesizer I'd say that I had about 25 or 30 employees. As to how many units, I don't know how many units I sold because as I will explain later, things move very fast and a lot of that is a little fuzzy. The next significant event in all of this for me was in the 1978 at the NAMM Show when Dave Smith showed his synthesizer. It was called The Prophet 5. And it was five-voice polyphonic, but it had— it was microprocessor controlled. So it stored all of the parameters of each— of the sound parameters. It auto-tuned the circuits that need to be auto tune. You can press one button and get a sound, press another button and get a different sound. And within— by the time that 1978 came to an end, I was almost out of business because nobody wanted my stuff anymore because it was so hard to use. So I quickly had to develop it and get into the microprocessor, microcontroller business and develop a new synth. By the summer of '79, I had a machine I called the OBX and that saved the company.

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Radzik: Could you maybe talk a bit about the first time you heard one of your early synthesizers on a recording? What was the moment of hearing and recognizing that's my creation? And who was that that?

Oberheim: Well, to be honest— oh, well, that's easy. Yeah, that's easy. Going back several years into the early '70s, one of the things that was fun for me was— I think if you read certain history books the evolution of jazz keyboard playing from straight acoustic piano into electric - like Fender Rhodes [piano] [ph?] especially and other stuff would happen, they say because of "In a Silent Way" by Miles Davis. I don't know how true that is. But, nevertheless, some of the great jazz keyboard players started using my ring modulator on a Fender Rhodes piano to get crazy electronic sounds. And one of these was Josef Zawinul. And at that time he was playing with Canonball Adderley I met him in the early days and we corresponded for a while. And I also got to know Chick Corea, Herbie Hancock, and several other players because I was making these ring modulators. I didn't hear a lot from Joe for a few years. But then by the late '70s— or by the late 19— by late 1975 when I was actually delivering these Four Voice— oh. And by the way, I also had an Eight Voice version. I think actually in the early 1976, I got a call from Joe and he said, "Tom, I brought one of your Eight Voice synthesizers and why don't you come over and show it to me or show me how to use it." So I hadn't a lot a of experience with musicians dealing with electronic music devices at that point. So I went over to Joe's house. He lived, at that time, he lived just out above the Rose Bowl in Pasadena. And I sat down with him with his Eight Voice Oberheim and I started telling him about DCOs [ph?], and DCFs [ph?], and envelope generators and whatever. And he was nice, but I could tell that it wasn't registering. I figured— so I left— I left Joe and I went home and figured he'll probably just take it back and get his money back. About four weeks later he called and he says, "Tom, you got to hear this sound I got on your machine." I'm thinking, "What? I mean." So I went out to his house again and he played me a rough mix of "Bird Land." And on the Weather Report "Bird Land" track, there's a part where he gets this incredible big band sound, I mean, considering it was 1976, it's just amazing. So that's— that one was the— my theme song for a long time but there was— more came later too so.

Bochannek: When you took those music classes back at UCLA, did you also learn how to play an instrument or was this something that you picked up later?

Oberheim: I learned enough C Major piano to get in the class, but I'm— what I did is I started singing in choir groups. And at first it was church choirs and little pickup groups. I did audition in early '60s, like '62, for the choir that was used for all the choir music of the LA Phil and I didn't pass that audition. And then I started singing in every group I could get into. And a year and a half later, I again auditioned. This time I got into that group and was in that group with the opening of the Dorothy Chandler Pavilion, the music center LA with [INAUDIBLE] who was very young then doing Beethoven 9th. And I thought this— I loved singing. But singing in that group after a while, I got a little disillusioned because it was as much a social thing as a music thing. So then I auditioned for another group called "The Greg Smith Singers." And they did very difficult music and, in fact, my audition for that was some 12-tone male chorus Schoenberg music. And that was my pinnacle of music performance, singing in that group. We did everything most difficult. We did a recording of Stravinsky [ph?] conducted and that's what I did. I didn't play but I sang.

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Bochannek: And how did you take the— your experience with being a vocal performer and using it towards developing instruments? Did you use that much in—

Oberheim: Not really. Because I was— I had been in music for such a short time in terms of understanding, listening, and doing some performing that I really didn't have a broad knowledge. And so I was treating— I was treating it as an engineering problem more than— I think later I had more of an appreciation. The vocal thing was kind of separate from the engineering and synthesizer thing. So there's not really a connection there. At one point when I was still doing effects things and before I gotten totally into synths I was thinking of how to change pitch without changing speed and all that, but I didn't— I didn't have a clue of how to do that. There were some attempts, Pre-DSP [ph?] in those days to do that, but they weren't very successful. But then there wasn't a big connection between my vocal performance or— singing and the synth stuff.

Radzik: You mentioned the OBX saving Oberheim electronics at the time. What was the next steps to continue on the path of synthesizer development now that you've incorporated microprocessors and you've added memory [ph?] to the products? What was the sort of next evolution of the products?

Oberheim: Basically, what happened over the next approximately six years from '79 to '85 was a progression of better and "better and better" synths that were more stable, would stay in tune better, had more features, etcetera. And then at this— and about around 1980 we'd— I got to— I met Roger Linn and gotten a little exposure to his first drum machine. So we decided to do a drum machine [Oberheim DMX]. And then also about that time I hired a young kid who had never been an engineer, who— but did know about sequencers on larger systems like on the Synclavier [New England Digital – NED Synclavier][ph?]. And he designed a digital sequencer. Then we hooked all three of them together. This is '80, '81. This is pre-Midi to where we had a keyboard, a drum machine, and a sequencer all working in sync. And we sold quite a few of those systems. They were expensive and they were crude, it was— it was very effective. Of course, it was totally obsolete by the time MIDIcame out.

Bochannek: Before we get to MIDI, I was just curious. What microprocessors did you use in your instruments and why did you choose them? Had you prior exposure to different computer systems had anything to do with what you chose?

Oberheim: Well, since I'd been so deep into mini computers in the '60s. I think at one time I had 40-some reference manuals for different mini computers. So when I saw the first— well, not the first. Of course, the '80 wasn't the first. But by the time I got around to looking at micro process, I looked at the Z80 I said, "This thing's useless." But I quickly learned that was not true and especially when Dave Smith came out with The Prophet 5. And I think because of a lot of hobby activity and other equipment on the market using the Z80, we started out with the Z80. We used that for the early equipment and then eventually we moved to a 6809. I looked at the 68000 but it was too expensive in those days.

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Bochannek: Did you maintain communication with people from the computing field? Did you—

<crew talk>

Bochannek: So the question was did you maintain communication with people in the computing field? Did you hire people who came out of computing to work on musical instruments or were they really two separate worlds?

Oberheim: No. It was— we were such small change in those days. I mean it was— when we decided to do the OBX, I think I said earlier maybe 25, 30 people. It was probably more like 10 people. And I had an engineer who was working for me, helped design the synthesizer expander module. And he was— he was involved in the budding micro-computer hobby industry. And I think it was more just he had heard of the Z80 and so we used the Z80. I didn't have— once I left— the last digital computer company I worked for in 1969 that was this computer output microfilm company, I didn't have any contact. I was pretty much out of it.

Radzik: Now, 78th AES convention in '81 there was a presentation of the paper for the universal synthesizer interface. And I know you were actually involved in the development of MIDI. So could you share some activities that ultimately led to the development of MIDI?

Oberheim: Well, I have to admit that I read the history books about the gestation of MIDI being Dave Smith, Kakehashi [ph?], and myself. I have no recollection of that. And despite the— being credited with something to do with MIDI, I really didn't have anything to do with it whatsoever. In fact, there was a contingent in my company that was not me, but a couple of the engineers that worked for me that really didn't think that MIDI would survive because it was such a low-performance system. In fact, we had to overcome a reputation as a company being anti-MIDI over the next couple three years.

Radzik: And so what did you see that sort of getting over the compromises you saw at the time with going in and using MIDI? Was there sort of a breaking point? You saw that would then introduce MIDI into the products you were making or you were planning to design a product with MIDI?

Oberheim: I think basically what happened is far is my company's concern. I can't say this for this industry as a whole, but by 19— by the time we got to 1984, it was obvious that this was— MIDI was being embraced by the industry. And so like it or not, we had to— we had to become a part of it. So we actually went from one side of the situation all the way to the other side because we started developing in early 1984 a synthesizer that was called— what would later be called the [Oberheim] Xpander and it was very popular when it finally came out. And for that instrument we actually convened a two-day MIDI conference of three or four people involved in the industry, not just the engineers working for me. And we

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worked out a very detailed MIDI spec for this machine. So we made the transition from doubtful to fully embracing it in that period of time.

Bochannek: Did you anticipate MIDI to intersect with this burgeoning, hobbyist computer market, personal computer market? You had experience in computing. I was wondering if you had any exposure of these early and larger computer being used for computer music as well? And if that sort of influenced your decision to go towards MIDI?

Oberheim: Well, my experience with computer music. I didn't have much to do— I remember the first time I went to a MIDI trade show in San Jose and saw a card called the Sound Blaster. And I thought, "Well, first all that's really a stupid name. And the thing didn't sound very good." And I thought the industry has got a long way to go. Of course it— I was wrong on that one; it quickly music became an important part of computers very quickly. I wasn't tuned to that at all. We didn't do anything at my company had anything to do with hooking synthesizers up to computers until a few years later but on the other hand, I got interested in computer music as developed by Max Mathews at Bell Labs way back in the early '70s and I— actually there is one thing I did after I got out of the computer business I forgot to mention in the early '70s, I decided to build, not from scratch but by using existing purchasable circuit cards, I built some minicomputers. First of all built a minicomputer for myself, and then I built 5 or 6 more for different friends, so this was a card from a company called General Automation; it was called the hmph, now I can't remember; SPC16, I think. And I built 5 or 6 of those systems based around a circuit card that had the basic processor on it and I even got Music 5 to run on that system and that was in the early '70s. Then I didn't do a lot with it for the remainder of the time that my company was in existence, but I did get exposure to it. Even gave a paper on it to a graduate student class on computer music at UCLA way back in the '60s.

Radzik: So you mentioned as you're going through the synth history, the OBX bringing the company back and in terms of the additional synthesizers that you were developing at Oberheim Electronics; what was the last synth that you'd worked on at Oberheim Electronics and what was your next step in the industry?

Oberheim: The way that the synthesizer product line progressed at Oberheim from 1979 with the OBX. We then went to a more capable but very similar user interface system called the OBX A and then that was later followed by the OB8; again similar user interface. Then we went to this machine called the Xpander, which was a six voice, but without a keyboard, and then in 1980— or late '84, beginning of '85 we developed the Matrix 12 which was a twelve voice analog with a five octave keyboard and that was the pinnacle instrument of the Oberheim age that I was involved with. At that point in May of 1985, the company that I started disappeared. I guess the best way to say it is that in May of '85 the bank that Oberheim Electronics owed money to foreclosed on the assets. That company was put in Chapter 7 bankruptcy, and the assets were sold to the company lawyer.

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Radzik: Could you describe from that point forward, how did you stay involved with music and engineering?

Oberheim: I left the new company after several months of working there and I consulted for Roland for a while. I developed some other different kind of musical electronic devices on my own through the rest of the ‘80s into the early ‘90s and then I developed another synthesizer in the mid ‘90s that wasn’t very successful but it was an interesting concept in that it was a modular— it was a rack mount synthesizer but it was modular and the plan was to have modules that used different technologies such as the different kinds of digital technology. In fact, I’d even licensed some chips from Korg that were used to make a device called the WaveStation but that product was not successful so that didn't proceed. So by 1996, ’97 I was totally out of the music business.

Radzik: Could you maybe expand a little bit more about this modular synthesizer concept; what were the conditions at the time that would lead to this sort of a modular with different sort of synth components; like what was the sort of landscape at the time if you will?

Oberheim: Going way back to one of my cherished memories was back in the fall of 1975, when I first had my four voice synthesizer working and at that point in time, I— hopefully make a good splice there.

Radzik No problem we can start it over right there.

Oberheim: I’ll just go back and see if I... One of my cherished memories in the early days of my four voice synthesizer in the late 1975 was showing the machine to Harold Rhodes who was the designer of the famous Fender Rhodes piano, we were— we’d become friends and I put a synthesizer keyboard mechanism in one of his pianos and so as you played his piano you could get the Fender Rhodes sound and the synthesizer sound together and even though it’s extremely crude, it’s just something that we threw together one afternoon out at CBS where his pianos were being made, CBS Fender. But I remembered that and I thought, you know, it’s this whole idea of taking totally different technologies and combining them. So later, in fact, 20 years later I had this idea that I would make this device that was a rack mount, 2 rack mount— it was only 1 rack mount that would hold 2 modules, and the modules were large, they were 11 inches square, so you could put a complete system on these modules and my first module of course was an 8 voice analog synthesizer and then I’d planned to do 3 or 4 different things, wave table synthesis and attitude synthesis and whatever and the mainframe into which these modules plugged was designed to make it easy for a user to combine different sounds and different technologies and store them all as a patch but it was just too much of an undertaking for the limited financing I had to I sold a lot of those synthesizers but ultimate it wasn’t a success.

Bochannek: Could you talk about the benefits and drawbacks of having a system of specialized modules, even implementing different technologies versus a single standardized module with possibly

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different software that emulates different techniques and why have you made certain choices in that area?

Oberheim: Well this was the idea of synthesizing or simulated analog or any kind of synthesizer, analog, digital, whatever in the 1980s was something I think was more of a dream than a reality, because the computers that musicians could afford were just not very powerful in the '80s. Certainly, simulation of synthesizer sounds became— started to become interesting in the '90s but when I was still involved it was really a laboratory college computer thing and there really wasn't any— there wasn't— well the hardware that— there was some efforts made to make synthesizer type devices with digital technology but they had only limited success until the Yamaha DX7 came out. Sorry. The DX7 of course involved custom chips to produce the FM technology that John Chowning had invented at Stanford. I think even at that time, even on a very large mainframe computer, you couldn't use Music 5 to do even simple FM in real time, I remember because it was certainly not— you couldn't do a lot with it, so the DX7 technology involved custom chips that Yamaha designed but while I was still involved through the mid-'80s, I wasn't aware much of anything going on in software, I mean there were a few experiments like hobbyists playing with the Karplus-Strong algorithm, a few things like that but I don't remember there being any actual products.

Radzik: So much like the resurgence of musical styles and tastes over time, we've seen another resurgence of analog technologies, so <inaudible> inspired you to come back and update the technologies and certainly we see them to be very popular.

Oberheim: The events of from the mid-'80s to the mid-'90s where I struggled to stay in the business were ultimately not successful and so I basically quit the business in the late '90s and did some consulting in Silicon Valley and some other things. In the early 2000s, Dave Smith of course got back into the business of making analog synthesizers and I was aware of that, but I just wasn't quite ready to go back into the business on my own, in fact, I'd pretty much figured it was over for me. Then in the fall of 2008, I was invited to give an interview, not a lecture, an interview at an electronic dance music thing that happens every year that's organized by an outfit called the Red Bull Music Academy; it's electronic dance music organization financed by Red Bull that among other things, sponsors what you might call a contest among electronic dance music type musicians, all around the world and the contest involves the winners, they pick 50 people I think they get several thousand entries a year; 50 people go to some venue somewhere in the world; they do a different city every year, and they have these get together where they make, you know, dance music at night and during the afternoons they listen to industry veterans talk about the business. Most of it is DJ type people that have become successful but they've had Roger [Linn] and Dave [Smith] and Bob Moog and so I got invited and when I got the invite in the fall of 2008, I didn't have a clue what this music was about; didn't have a clue. I mean what is it, I mean it's... is it people playing CDs or...? Well I've since found out, it's probably the biggest music phenomenon on the planet and most people over 30 don't even know it's going on so I went to, you know, it's a free trip to Barcelona, that was fine. So I took my free trip to Barcelona and I got there— and before I left, the organizers said can you bring an Oberheim synthesizer and I wasn't about to lug my 8 voice— my OB8

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all the way to Spain, but I did have one of my little synthesizer expander modules up in the attic of my house and I went up and got it and I dusted about an eighth inch of dust and dirt off of it and plugged it in and a few capacitors blew and I fixed those and they actually worked. And I took it with me and they said they'd have— I made a very quick midi interface for it, because this is 1975 technology. I took it to Barcelona, gave my interview and afterwards I played a few sounds on it through the midi keyboard they had and 3 or 4 of these participants came up and said can I play it and by the time it was over, I had 3 or 4 guys that wanted to buy one. So I went home and I thought, what should I do, you know, should— maybe it'd be fun to make a few of these. So starting in the early 2009, I basically regurgitated this design from the '70s, it took me a while to find all— there were some parts that, you know, I had to look hard to find and got it working and figured I'd build 3, 4, 5 a month and of course I was totally surprised, over two and a half years I've sold almost 800 and that's not even trying very hard. I could have sold more if I could build them, because I'm building them all myself and that's how I'm back in the business. It's just like such a surprise to find people want the old analog stuff, and so I'm having a ball.

Radzik: With all those years of experience designing and building, has there been some refinements to the latest version that you know, just opportunities to refine what you previously had designed but you see there's an opportunity to—

Oberheim: When I started this project, I talked to some of my synthesizer electronic music friends and basically the opinion of them was, build it just like the old one. I said there's so much we can improve. Don't do it! So I didn't. Actually there's one little circuit that was kind of funky from 1975, it had to do with some temperature problems which I changed, but basically it's the same user interface, the same oscillator, same filter, just like back in '75.

Bochannek: Now we talked about how there's a resurgence of interest in analog music generation techniques, yet the recording and the distribution of this music is done digitally and often times the consumer at the end listens to it an MP3 or similar often lossy format and I was wondering if you can sort of reflect in a way media break between the analog and the digital and how that has shifted the business.

Oberheim: The question of the specific question of digital synthesis, of analog synthesizer sound on a general purpose computer Macintosh or PC, whatever, versus the sound you get from lets say my particular synthesizer module is a complex question that could probably occupy many people for a long time and debating it. My answer to that question is it depends on your ears. There's some wonderful programs that use software to simulate analog synthesizers and many companies doing that and they use different techniques, I don't know that much about the techniques but a couple of them say that they actually simulate every resistor, every capacitor, etcetera. I can only go by what my customers tell me because I don't have either the ears nor the system to evaluate that and plus I'm not really that interested, but my customers tell me that my small I mean I have a very small number of customers compared to the industry as a whole, but they tell me that, you know, it's not— it sounds so much better. I can— I've often theorized on why that is and I think it's a question of how do you in software simulate the randomness of

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analog oscillators, the randomness of where on the waveform the triggering of the VCA or the filter hits a waveform and it's not going to be the same every time. Basically I think you're looking at most of them are 16-bit, maybe some are more, have higher resolution but I think it's a little like the LP thing, there's just a lot more resolution in analog; it's noisier and a lot more distortion and all these things but my customers tell me that it doesn't compare and I know enough about computers to know that it certainly is something that can be done and will maybe be done. The thing I like to tell people is, the stuff I built in the '70s and the '80s is still reasonably hot item on Ebay, so those machines are 30— 25, 30 years old. The stuff I'm building now will probably last just as long and how long does a software synthesizer last, well... you know, as long as you don't update your operating system, it might last a while but of course that's... I think the revolution, quantitatively speaking; the revolution in music software is just unbelievable. The amazing programs where you do synthesis and sampling and whatever and all of the other many things, that it's just a fantastic thing to think about. In terms of how you put music together and whatever but end up [ph?] it has to come out a sound and before it's miniscule little area of the world that people have my stuff I think that they're happy because of the way it sounds; it's a sound that has so much to do with it.

Radzik: You mentioned "Birdland" in there as one of those signature sounds that was first created and brought to your attention that this was going to be really a sonic imprint in time. What other Oberheim sounds have captured others imaginations that you also knew that was your creation?

Oberheim: The all time, and I love— when I occasionally give lectures about my history with people who are— especially younger people like at college, I've done a couple college things and whatever, is I tell them about "Birdland" and Michael McDonald when he had his 8-voice back in the '70s and there's a whole list of them, but I saved the best for last and I don't tell them what it is and I usually— I'm giving the music examples as I do this and so I get to the last thing, I turn the volume up a bit, I play it and it's "Jump" by Van Halen, which is basically a demo of one of my synthesizers from beginning to end, except for a short guitar solo that Eddie Van Halen plays, his Oberheim is playing through the whole thing and he's playing it; he's actually quite a good keyboard player, it turns out and it's just a great tune. So that's always fun. There are others. "Tom Sawyer" [from Rush] starts out with this big, you know, sound out of one of my machines and those things are always fun. But I always get shivers when I listen to "Jump" [from Van Halen], there's no question about it.

Radzik: You said that there's kind of a minor evolution of different functions that are happening in the music industry with instruments, I guess we've pretty much done as much as we can and either go to software or hardware in many ways, but do you have a sense of where else we can improve in terms of electronic instruments and computer instruments for that matter, through music?

Oberheim: I suppose one thing I learned because I did do all the singing I did and one of the first things that I did when I got in the big Los Angeles Philharmonic; well it wasn't the LA Phils Choir, but it's the choir that always worked with the LA Phil was just had gotten in that just the past the audition for the

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second try after doing a lot of wood shedding in a lot of little groups and it was before the music center opened, the LA Phil played in a very old building called Philharmonic Auditorium in Los Angeles and that particular concert included excerpts from “Boris Gudunov” by Mussorgsky, which it’s orchestrated by Rimsky-Korsakov and so the LA Phil and 120 piece choir jammed, jammed on this small stage and I’m 3 feet from the timpani player and immersed in this 120— 80, 90, 100 piece orchestra and it was just the most incredible sound I’d ever heard and that was in the ‘60s so to me, I mean I’ve been a professional engineer since 1959; professional meaning I’ve got money for doing it. I’ve seen the technology develop from mainframes that took a large room to where you could do it 10 times faster on one chip or maybe 100 or 1,000, who knows how many thousand times faster and seen other things develop in the technical area and it’s got to sound right; it’s got to sound good. And that... I guess you have to ask the question, since we’re all in this business is how much better has the sound gotten? I’m not asking about how easy it is to score a movie or to make a record or whatever, I’m talking about how much better has the sound gotten and of course that's an ongoing argument forever. And so what matters to me is how it sounds. I enjoy reading about the technology and I use some of it but in reality it’s how the thing sounds and one of the things I’ve learned much to my enjoyment in this latest endeavor of building these little modules over the last few years is that I created a classic back in 1975. Now not maybe as quantitatively as big a classic as the Minimoog or the [ARP] 2600 or even the Prophet-5, but it is somewhat of a classic. In fact, over the last few years, last 3 years or so I’ve been doing this, I get a lot of emails from people. They see that I’ve reintroduced the synthesizer expander module, so the emails are, are you going to do the OBX, are you going to redo the OBX A or Matrix 12 or whatever and the amazing thing is is that the newer the Oberheim instrument in question, which goes, it goes OBX, OBX A, OB8, Expander Matrix 12, the less people ask about it and so we go back to the OBX which was this desperation machine to keep the company alive which was— had a lot of faults and didn't auto tune perfectly and that's the one people want to hear, want me to do. They don’t really— nobody’s asked me to do the Matrix 12 or maybe 1 or 2. I’ve got several hundred people, are you going to do the OBX. It’s got to sound good, and so what is sound? What is musical sound and it’s... that's a question we’ll be asking forever.

Radzik: That's a very good question though, to be asked again, what was your— being a kind of a small company and developing these musical instruments and then having a sound quality being the pinnacle for the products, what was your process of getting to the quality sound before you released a product and what was your stamp would you say?

Oberheim: When we started, it was what can we make out of this and I think that well, okay. When I developed the original synthesizer expander module, the engineer that worked for me at the time had put it together, put a prototype together and excuse me, and I didn't really like the— the sound wasn’t knocking me dead. The features were right, this knob did this, this knob did that, the sound was— or the size and all that. I just didn't like the sound and although I wasn’t inspired so much from the musical point of view, I guess through the limited audio engineering knowledge I had plus my limited music experience, it kind of did combine, and I went through and I tweaked circuit levels throughout that module, partially from a technical point of view, thinking distortion versus noise and some by listening, I don’t think I would be the person who would be the best to say is this machine a hypothetical machine that I would develop, someone else would develop is ready. I’ve always relied on the musicians to tell me that and I’ve learned

a lot of lessons doing that. We've had now what, 50 years or so of analog synthesis. It came out of nowhere, it flamed high in the sky, digital came along and pretty much put it to bed; it revived. It's probably around forever, even though it's an obsolete technology, this gets into the area, you just can't— it's not equations. It's not theory written in a book. It's musicians working with sound and so it's just... I don't know how much of that you can decide. You can add features, you can make new waveforms, new filter modes, all kinds of different features but this little module I've got is originally conceived as the absolute minimum possible synthesizer that I'd want to make. It's not filled with a lot of features and yet as a synthesizer on it's own it has it's shortcomings but put several of them together, it's kind of elevate it let's say up to more of a systems level thing rather than each individual module then it starts to do a different thing and start to make the sounds it can make. That isn't to say there isn't a lot of wonderful digital s— I mean there's some amazing digital stuff, stuff that I'd love to be able to make if I knew how to do it but it's a big world.

Bochannek: You commented several times on how you ultimately use engineering trade offs in making some of these choices but there's always this non-quantifiable, how does it sound? How do the musicians, the artists use the product in the end? I'm curious if you can give an example where you made a very clear engineering trade off but it ultimately led you down an unsuccessful path. Was there a particular product or a particular feature?

Oberheim: Yes, absolutely. The path I went— one of the paths I went down that ultimately was not successful was largely due to an engineering decision that I made that was just a bad decision. In the early '90s I mentioned I brought out a synthesizer that was based on the concept of different modules and different technologies that could share a mainframe and the concept was good, but when I developed that, I was coming out of the unpleasant situation that happened with my original company. I was working by myself. I was - certainly had— my confidence had taken a hit. I'd moved from the LA area to the Bay Area. I had family things to deal with or whatever and I made the decision to use a Motorola 68000 processor in this analog module, thinking okay, this is a 16/32-bit processor; it's actually used in desktop computers; it must be powerful enough and I did not analyze whether it could do the job or not and it was woefully underpowered for the particular job and that probably more than anything else, that decision killed that product and so I think the lesson of course is if I was supervising young engineers and they were doing this kind of thing, I'd say, well you have to simulate it and make sure it'll do the job. Well I didn't do that and so that was a case where the engineering ruined the product.

Radzik: It sounds like it may be good sage advice for aspiring engineers. Would you have any other sage advice you can share with an aspiring audio engineer or a computer engineer that's for the future?

Oberheim: When I still had my first company, Oberheim Electronics, I got a letter from a young guy, a graduate from one of the major engineering universities. He wanted to design synthesizers and he came to my facility in west LA and we went out to lunch and the first question I asked him was do you know how to make the basic— no, I didn't say that. What is the basic synthesizer patch and he didn't know what I

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meant. And you know, we didn't go anywhere with that. I mean I think that if you hire— if you get in a band and one of the band members really can't play very well, you're not happy with that guy and maybe he doesn't know his instrument, maybe he doesn't know the material, or whatever he— but you don't want him and that person would until he improves his musical abilities, he's not going to be able to get a good job in an orch— you know, whatever his desires might be. It's a matter of learning what you're doing and synthesizers are appealing to a lot of people because they make these interesting sounds and whatever, but when I think of the people I've known over the years, Bob Moog, Dave Smith, Don Buchla, they're all musicians and not the point of view that they can play the piano very well, but they listen and they know what sound is and you've got to know what you're doing. If you're going to be in a career that involves mixing science and art, you've got to know what you're doing. I mean you might be able to get a job pushing papers since you know how to use Excel in someplace, but this is different, because if you build music instruments of any sort whether electronic or otherwise, your ultimate customer is a musician who presumably has ears, well trained ears and you can't fool him. I remember one time in the early days of being an ARP dealer in Los Angeles, one of the musicians I'd gotten to know because of my ring modulator was Jan Hammer who was a great Jazz keyboard player and of course he was famous with his Miami Vice stuff, but even before that, he toured with Mahavishnu, etcetera and I was talking to him one day and he said, well Tom, I'm about to buy a synthesizer. Oh well I said, I assume you're going to get an ARP Odyssey, of course I was selling ARPs. Oh, no. He says, it's going to be a Minimoog, there's no question about it; it's a much better sound. I was taken aback. I didn't— I knew what the Minimoog was but I didn't have experience with it. So basically what I— and I compared them as well with the ARP you get one more of this than you get with the Minimoog and you get this, it was all technical comparisons and that was a very good lesson because this was a musician who was choosing the instrument because of it's sound and that was my first of many lessons in that area.

Bochannek: I just read about the Dead President's Society; I was very interested in that. Can you talk about first of all, I'm curious to know which coffeehouse you met in, but can you talk about that group of people and it's a very important influential group of people so what did you get together and talk about?

Oberheim: Uh... the Dead President's Society's story's pretty simple. In 2002, I got a job at UC Berkeley in the engineering department designing student labs and so I was on campus in Berkeley and about the same time, Roger Lynn bought a house in Berkeley and one day one of us said to the other, let's have coffee once in a while. So Roger and I started having coffee and we met at Brewed Awakening, which is on Euclid, and it's right off the north gate of Berkeley campus and although I don't remember exactly who came when over the years, probably the most— the next most influential member of our group is Max Mathews who had retired from Stanford and was living in the city [San Francisco] and he starting coming and David Russell [ph?] who runs the CNMAT [*cnmat.berkeley.edu/*] for computer music <inaudible> from Berkeley, he started coming and over the years a number of different people. Don Buchla would occasionally come and for almost 10 years, it was a Thursday morning regular thing, eight o'clock at Brewed Awakening. Unfortunately and sadly, Max passed away a little over a year ago and all of the group continues occasionally to meet; it's not a regular thing now, and so Max really was kind of the glue that held it together for a long time because Max always had something to contribute; he was an amazing man.

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Radzik: Excellent; anything else you'd like to share with us today, Tom?

Oberheim: No that's pretty much my story <laughs>.

Radzik: Excellent. Well on behalf of the Audio Engineering Society and the Computer History Museum I'd like to thank you for your interview and certainly for all your contributions to the music.

Oberheim: Thank you; I really enjoyed it.

Bochannek: Thank you.

END OF INTERVIEW

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