Oral History of Jerry Hutcheson

Interviewed by:
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Craig Addison: Today we're talking with Jerry Hutcheson as part of the SEMI oral history series. Thanks for joining us, Jerry.

Jerry Hutcheson: You're quite welcome.

Addison: To begin with, can you talk about your very early days, where you grew up and where you went to school and what studies you did.

Hutcheson: Sure. I was born in Oklahoma and lived there the first six years of my life and then moved to the panhandle of Texas, a place called Hereford. And then eventually to Clovis, New Mexico, where I graduated from high school, joined the Air Force during the Korean War, came back and went to school at Eastern New Mexico University, Portales, New Mexico, graduating in physics and math. I joined RCA corporation in Camden, New Jersey, did my Master's work at Temple, across the river in Philadelphia.

I was in the advanced research department at RCA. This was after Sputnik, but not too long after Sputnik. I can remember we were in New Jersey when the first Russian craft was crashed into the moon and we were at work the morning that the first Mercury astronaut, Alan Shepherd, did his sub-orbital flight. The activity virtually came to a stop around the labs.

The place that I was at, at RCA was called Advanced Research Labs. We were kind of sandwiched between Princeton Research Labs in Princeton, New Jersey, and the engineering departments that interfaced with manufacturing. Our work was mostly military. There wasn't really a semiconductor integrated circuit industry back then. Of course, transistors were out and there were some really hot transistors out at the time. Most of our work was in developing transistorized circuits of various types. In fact, one of the many things that the department did was to develop transistorized circuits that would become standards for RCA to use throughout the company. Integrated circuits were still pretty much a gleam in somebody's eye. Somewhere along the way, about that time, either before or after, I don't remember, Jack Kilby and Bob Noyce invented the ICs as we know them today. But I don't remember the exact time period of that. I do know that there in the labs, we were very, very concerned about where the industry might go if integrated circuits became successful. Of course, Shockley was out here on the West Coast denigrating them; saying you could never do that sort of thing. He was a pretty powerful voice against it, but the rest of us kind of felt that yeah, we could pull something off. So we kept working on it. They had Project Cordwood at the Fort Monmouth Army research center. And that was I think the program Jack [Kilby] was working on that he got his ideas for his integrated circuit.

There at RCA we were trying to figure out which way should we go and which way the industry would go. So we were trying a lot of different things. I actually started off not in the integrated circuit industry, but in communications. One of the first jobs that I got there was to build a radio that had no coils. We thought, well, if we could build a radio that had no coils, there is a chance that we could integrate it later on. So I got the job, and I got it completed. I used negative resistance in transistors to create induction, but it wasn't very stable. So most of the time it would whistle and oscillate and I was about the only guy that could make it run. The department head and the assistant department head took it up to Fort Monmouth to show it off and they didn't invite me to go along so it never worked, it just whistled and howled. They came back pretty unhappy about that. But it was quite a learning experience for me, and it got me further and further into this field that we currently call integrated circuits.

I remember the department head at one time there saying that we've really got to solve this problem because right now, based upon everything we know, if we put a computer that we need…into a spaceship, it's going to be the size of the Empire State Building, and it's going to take more power than the entire state of New York City. So we've got to find a way to get that down.

As you can recall, the average working mean-time-between-failure of computers back then, I think it was something like a half a minute. I've forgotten the exact amount. So we had some pretty high pressure to find ways to cut down on the size, power consumption and reliability of electronics, and virtually every company was working on it. The real issue was not only how do you put it all together, but also how do you connect it? Connection was, and to many today still is, the big issue.

I can remember one meeting there in Philadelphia, the Solid State Circuits Conference, where the guys from Fairchild were all in the front row at the conference, asking each of the speakers what they were doing and how they were doing it. I remember I was one of the speakers and I kept thinking, who are these guys that keep asking me all of these questions? I think it was Gordon [Moore] and Bob [Noyce].

But anyway, we were working on it and then Paul Weimer, up at Princeton Laboratories, discovered how to make cadmium sulfide polycrystalline transistors. And that looked pretty good, so I got assigned the job right quick of taking Paul's work and seeing what could be done with it. And so we were working on polycrystalline transistors there for a while to see if they could be used for integrated circuits. About that time, down the hall from Paul was a young guy named Heiman. Right now I've forgotten his first name. In any case, he was working at RCA Princeton Labs and working on his doctorate at Princeton. One day, he walked into Paul's laboratory and asked him what he was doing and Paul explained what he had done. Heiman says, "Oh I can do that in silicon." He walks to his lab a couple of doors down and two weeks later, he had a working model of the MOS transistor. Now of course, people had been trying to make the MOS transistor for years, and had been totally unsuccessful, mainly because of the purity required. I don't know if it was accidental or what, but he made it.

That summer, it was announced at the semiconductor research conference in Santa Barbara, I think that was 1962, and from that point on my life was imbedded in MOS transistors, right up to the time I guess I left the industry.

In any case, the question soon became, how do we take advantage of this? So I was given the task of building a laboratory, an integrated circuit laboratory, and picking the equipment and getting all that started, which I did, and going around visiting all of the companies, learning something about the equipment. That was my introduction to the equipment side of the industry.

Addison: I remember reading in some of the historical records that TI and Fairchild, when they were developing the IC, they heard rumors that other companies were doing a similar thing, like RCA. It sounds like you were there and you can tell the story.

Hutcheson: Right.

Addison: So in fact, RCA was working on an integrated circuit concept around the same time?

Hutcheson: That is correct. Virtually every company that I can think of at the time was working on integrated circuits because the concept was fairly easy to understand, difficult to implement, but easy to understand. Westinghouse was doing research, General Electric, and of course, TI. Fairchild was a fairly small, unknown company, out here on the West Coast. I'll come back to that in a moment. Motorola was very heavily involved. All of the companies were working diligently to try to understand how to pull this off. A lot of it was funded by the military.

The question back than was, what is the best way to go? Should we use thin film transistors, should we use conventional transistors? I know a big question in our laboratory was how do you get aluminum to stick to silicon dioxide? Nobody knew how, and it peeled off every time we tried to put it on. Fairchild solved the problem and we didn't at first really believe they'd solved the problem, when they announced that they were going to start producing integrated circuits. Of course, we all know the story now. Back then, transistors were the main thing, and different companies were trying different approaches. Motorola had the Mesa approach and Fairchild had the planar approach. Fairchild had, perhaps the hottest transistor in the industry, as I recall. The 2N76 I believe. I remember we used to buy them by the truckloads at RCA to use them in conventional circuits, paid $75 a piece for them. Now what do we do? We put 15 million [transistors] on a slab of silicon and sell it for what? Well, of course we all know that whatever the price it is, it eventually becomes three dollars. So a single bit of memory, at that time, was also just about $75, and it was on a PC card that was about six inches long by three to four inches wide. So getting all that packed in a smaller space was really the fundamental issue. Everybody was trying to do it. We weren't sure that we had the right approach. We were trying silicon, we were trying thin films, we were trying tunneling transistors, we were trying tunnel diodes. We were trying just about everything that we could think of to figure out how to do it. Of course, Fairchild was the one that eventually came out with the approach that succeeded, and as we know it today.

Of course, at that time also, the bipolar transistor was the only thing that we had to work with, the MOS was still a year or two in the future. Everybody knew that if you could build an MOS transistor, you would use less power than with a bipolar, and that would help cut it down, but nobody could get it to work. I recall reading an article in the IRE proceedings, I believe it was in 1947, William Shockley had written a letter to the editor. As you know, William Shockley was the inventor of the unipolar field effect transistor, and in his letter, he said he was going to give up trying to invent a surface effect transistor because he tried everything he could, and he just couldn't make it work. Until the materials became pure enough, he wasn't going to do any more work. So that was '47 I believe, 18 years after Otto Heil patented the thing and 15 years before Heiman made it work. I can recall, when I came out to California to work on CMOS, SRI put out this publication, around 1968, that said the MOS IC was never going to go anywhere and never going to be more than just a few percent of the total IC market.

But anyway, to come back to where I was, my wife and I were both from New Mexico, and we kind of wanted to get back to the Southwest. So after three years at RCA, I took a job out at Motorola in Phoenix, to work on some similar methods. But I think the main thing they really wanted to know was what we had accomplished at RCA in MOS, because you know, they were the first.

Addison: Before you move on to Motorola, just a little bit more on RCA. Do you recall hearing the news that Jack Kilby at TI and Noyce at Fairchild had developed the IC? Do you recall that news impacting RCA?

Hutcheson: I don't think it was news at the time. It was kind of, oh yeah, they've done something in the laboratory and it may work out and it may not. It was more along those lines. It was later that it became real news. Jack Kilby of course was a few months ahead of Robert Noyce and his method looked like it was going to work, but it followed more along the Cordwood project at Fort Monmouth.

But I remember when we did hear about the integrated circuit, we weren't disappointed and we weren't surprised. We just felt like, well they've got an approach that might work. We've got our approach, and we may still have the winning approach. It turns out they did, but it took about 10 or 15 years for it to come around, and it wasn't at RCA that the final solutions for MOS were made, it was out here on the West Coast.

Addison: Now the other thing that I had read was that it wasn't called an integrated circuit then.

Hutcheson: It was called a monolithic circuit. Sometimes it was monolithic, sometimes it was integrated...there were several other terms as well. Shockley was the one that was totally against the term monolithic. He said there's nothing monolithic about this and it's never going to work. That may be one of the things that caused people to move away from the term monolithic. I remember Westinghouse was very high on the use of the term monolithic and they had some interesting approaches, too, that they were working on out in Pittsburgh. The question kept coming, how do we integrate all of this together?

Addison: Could you tell me a little bit about Project Cordwood that you mentioned the military was doing.

Hutcheson: Project Cordwood was a method of the U.S. Army to take capacitors and resistors and transistors, and make them into long, tubular structures that were maybe three-eighths of an inch long and perhaps one-sixteenth of an inch in diameter, and then just pack them together like cordwood, wrap them up, seal them, and have the wires coming out of it. Well it was a fine concept back then because we were using flat circuits, integrated circuits, and PC boards. PC boards hadn't really developed to the degree that we know them today. In fact, many of the companies were still using hand assemblies on a race of metal tabs. So Project Cordwood was a way to pack all of this together.

If you look at some of the old ads, take the Motorola hand held telephone of World War II. I don't know if you've ever seen it or not, but it's about that long, it's about two inches on each side, and as I recall, the thing must have weighed 10 or 15 pounds. Contrast that with today's cellular phone that we all stick in our pocket. And so there was this huge effort to make things smaller. If you look inside the Project Mercury capsule, I don't know if you've ever been to the Smithsonian in DC or not, but you look inside, you just notice the tremendous amount of space taken up for nothing more than switches and things like that. Much of the electronics is hidden behind it, but it really takes up a huge amount of room to accomplish very, very, little. So Project Cordwood was an attempt to squeeze all this down.

I wasn't at TI, but I believe that Jack [Kilby] was working on that, and I believe I read that he was working on it when he recognized with silicon, or perhaps germanium, that he could build the same thing, which he did do. That's an interesting question too, because way back then, we didn't know what was going to win: germanium or silicon or some other exotic material. Most of the people wanted to use germanium but you had the problem with germanium, you couldn't grow an oxide on it. Silicon you could grow an oxide on, but silicon was very hard to deal with back then. It did weird things.

Addison: You talked earlier about the Sputnik and Alan Shepherd and so forth. Was that really the big impetus to develop the electronics and solid state electronics in the late '50s, early 60s?

Hutcheson: I think so. I think Sputnik had a tremendous impact on the industry. I was in college at the time of Sputnik. I can remember when Sputnik first went up, what an impact it had there at the college. The ARRL group around college kept trying to pick up the Sputnik signals and see if they could understand them. They couldn't. Finally somebody said, "If we're going to understand this, we've really got to see it. Who's got an oscilloscope?" Finally somebody said, "Jerry Hutcheson has an oscilloscope."

So they called me over and we hooked it up to this transmitter that one of the guys had that's picking up Sputnik and we fiddled with it, and every time we were just about ready to get it operating, Sputnik would go off the edge of the horizon and we'd have to wait until it came back around to try again. I never did learn much about it, but it was a lot of fun.

Sputnik…affected all of us. America had been viewed as being number one in electronics since the end of World War II, and here was our arch rival getting ahead of us. And then what really hurt was just a few years later, they were also the first one to put a probe on the moon. Of course it crashed into the surface, but at least it was first. But both of those events had a tremendous impact on the industry. I think it further accelerated the United States getting into space, and the space race further accelerated the need to pack all of this together and the need to build what today is the commonplace integrated circuit.

Addison: While we're on the topic of the space race, were you still at RCA when Kennedy gave the speech, we will send a man to the moon?

Hutcheson: I don't recall where I was then, but I was at RCA when he was elected president. I believe I was at Motorola when he gave the speech.

Addison: So the question I wanted to ask is, did the Kennedy speech really give things a big push again, similar to Sputnik?

Hutcheson: The answer to that, I think, is yes and no. I think when Kennedy made that speech, as I recall, most of us in the science and technology fields felt very, very good about it. Finally we're going to do something about this. My generation, in grade school, high school, college, myself, and most of the people around me, had the objective to get into space. That was what we wanted to do. But our parent's generation, they laughed at that, "No, you can never do that." Well we knew we could pull it off, we just didn't know how. And of course, that generation did do it. In the process, it had to solve a great number of problems, and integrated circuits happened to be one of the ones to really get us out of sub-orbital and orbital flights to the moon and other places.

Addison: Jerry, can you talk about your post-RCA period. You said you'd moved to Motorola?

Hutcheson: I moved to Motorola about 1962 I believe it was. I wasn't there very long, only about 15 months. I was working in the research department there and I thought I was going to be working on MOS, but after awhile I got to working on some other projects that were related but not the same. It was a fairly quiet period. It was one of the more interesting periods from my personal vantage point from some of the

projects that I worked on. But from this industry's vantage point, probably not too much, other than the fact we tried to work on a calculator and decided it would be too expensive to do at the time. So we missed that.

But in any case, I took a job at a group of consulting scientists called, Dikewood Corporation in Albuquerque, because again, my wife and I wanted to get back to New Mexico, supposedly to work on some integrated circuits. But that fell through and I found myself working mainly on nuclear physics because we were right there by Sandia National Labs. So after about three years I'm getting antsy and wanting to do something else. A friend called from Signetics out here in California. Signetics of course is now Phillips, and he said, "Why don't you come out and talk to us?" He was a friend who had been at Motorola the same time I was and he was running a group in the research department. He said, "Why don't you come out and talk to us because we've got a young guy out here that's developed a triple diffused complementary MOS process and we think it's pretty good." So I did, and the net result of that was to get to what today we call Silicon Valley, at Signetics, working on this triple diffused process that Ken Yagura developed.

He had a very, very, good process. We were all disappointed when Signetics shut it down. Fairchild was working on a similar project, as were most people. By that time, MOS was pretty well known, but it had enough problems that we were trying to solve. We also knew that complementary MOS would be the way to go because it drew very, very little power and so virtually everybody was working on that. RCA had already advanced to the point that they had many MOS integrated circuits on the market by that time, the famous 4000 series. They were also the first to develop complementary MOS. So people were trying to perfect that.

Addison: How long did you stay at Signetics?

Hutcheson: Three years.

Addison: As you know, one of the SEMI great moments in semiconductor history is plasma processing developed at Signetics. Were you involved with that?

Hutcheson: No, I wasn't involved, but my two friends were, Steve Irving and Gene Lemons were involved in it. Steve had an office on one side of mine and Gene was right down the hall. Steve joined Signetics just before I did, in the same department, and we both bought houses that were within a block of each other out in Cupertino. So we knew each other quite well. Drove to work sometimes, played bridge together, did all those things. Yes, I was very much aware of what Steve was doing. I give Steve the bulk of the credit. Gene was very involved, there's no question about that, but I think Steve was the spark plug behind it. I give him most of the credit, and we thought what he did was a great thing. He deserves all the credit he gets. It was a good invention. Of course you know he left Signetics to join IPC and IPC eventually folded into another company. Today it's little known, but I think if Steve had not been there, I rather doubt that plasma would have developed as quickly as it did, if it developed at all. I say that because I really don't know who else was working on it. I know LFE on the East Coast was working on it, but I think they got their ideas from Steve, if I'm not mistaken. But of course you have to remember, when Steve started working on it, he made some of his own equipment, but I think he also bought some plasma equipment from LFE and modified it or something like that.

Addison: That leads to the next question, equipment. Can you talk a little bit about the use of the equipment and materials to produce the circuits when you first got involved with that and then how the industry progressed?

Hutcheson: When the industry started off, there was no equipment and there was no equipment industry. Most of the equipment we used we either bought from someone else and then modified, or we built from scratch ourselves. I think it was probably 50/50 in terms of what we bought and what we built. I can recall very little equipment that you could buy off the shelf and use without being modified. When I was still at RCA, Kulicke and Soffa was probably the first, and if not the first, one of the first companies in the industry. They were right across the river in Philadelphia. I'd go over and visit them and look at their equipment and buy their equipment. That's the main company that I can remember as being far sighted enough to say, "This is where we ought to be going."

Addison: What kind of equipment did they sell?

Hutcheson: Well back then they were selling about everything. They had probers for testing. They were one of the first companies to come out with a contact aligner. They were doing a lot of different things. It was quite an interesting little company. But like I say, the other equipment that we bought, we would buy and modify ourselves. I'm trying to remember whom we got the bell jars from and the vacuum equipment. It was fairly standard but it was research type of equipment. It wasn't modified, just a big inverted bell jar. The furnaces were very interesting. I think we had a two-inch furnace. I don't remember who made it, but by that time, the furnace people had developed enough that we could use their furnaces pretty well without modifying them. But with almost everything else, we learned as we went.

Then when I came out to Signetics, working on MOS, by that time, most of the fabrication equipment could be purchased reasonably well, but much of the test equipment, things like that, still couldn't be. In fact, one of the big issues was how do you test various devices and how do you test various effects within the transistor. We had to build a lot of equipment.

As I recall, it was around 1968 or '69 that the equipment industry really began to flower and began to develop. In fact, that's the period where I changed my field and got out of semiconductors. By that time, I had recognized that my real interest was in the equipment side, more so than the semiconductor side, and I decided to get out of that part of the industry and go with this one. I started looking around to say, "Who can I go to work for?" There weren't very many companies around. So I eventually just started this consulting firm that today is VLSI Research. That was about the time that I think the industry really took off. I had to lay off quite a few people in my staff because we now were in a position that we could buy the equipment, and didn't need to build it, so as that occurred I thought, I better lay myself off too. What do I do now?

Addison: So this was at Signetics?

Hutcheson: No, this was at Teledyne Semiconductor.

Addison: Just backing up to Signetics, were you involved with building equipment there?

Hutcheson: We were in the research department at Signetics and so we built what we had to build and we'd buy what we had to buy. The last year and a half that I was at Signetics, we were so involved with testing memories that I was spending my entire time on building memory testers or adapting the IC testers. The early stages of IC testers had just come out. Fairchild had the old 4000 and Signetics had essentially copied the 4000, except they called it the 8000. So we had very small memories at the time, but we knew that as they became larger, we were going to have issues with memory. So we were working all the time on that. In fact, it was that that drew me out of the industry.

I first joined a company called Litton over on Mary Avenue in Sunnyvale and the group there at Litton had decided that they were going to build a piece of test equipment that the industry could use. So I joined and helped them along. At that time, we knew that TI had their own test equipment that they'd built that was very good and Fairchild had their own test equipment, but nobody knew what the size of the market was or where it was going or anything like that. We were building what we thought would be a state of the art tester. Well, I can remember taking on the job of trying to decide what will the market be? What is the market and what will it be for this industry as it grows? I can remember telling the people at Litton that this was going to become a $250 million dollar market and everybody was aghast, it couldn't possibly get to that size. Today what is it? Several billion, just the test equipment side of it. Anyway, Litton ran into a problem with some ships in their nautical division and they ran out of money and so they shut several projects down and ours was one of them. But that was my full launch into equipment.

Addison: Just backing up a little bit. So at that stage, Signetics and Fairchild were building testers in-house for their own use?

Hutcheson: Yes. Teradyne already had the J259. They were the only company, I think, that was selling them publicly. Fairchild was also selling their tester to other companies as well. So the problem many other companies saw was, "Gee, you buy Fairchild, your competitor's in your laboratory, in your manufacturing facility and they're going to find out all of these secrets." They didn't particularly like that. Even still, I believe at the time, Fairchild was larger than Teradyne. Teradyne was, of course, a totally independent company.

Addison: Do you remember the impact that Teradyne had? Did they come out at the same time that the device makers were doing their internal work? Did customers think, "Well, we've got an outside vendor, we should buy from them."?

Hutcheson: I wasn't that involved with Teradyne at the time. I looked at their equipment and evaluated it. We evaluated Fairchild and we evaluated the internal 8000 that Signetics had and several others, and came to the conclusion that none of them would do the job that we felt needed to be done. So we set out to build our own. When I left Signetics to join Litton, it was the Mellonics division, they already had some very advanced methods. What we didn't know at the time, and we were to find out years later, was that TI had already developed the same methods and they were actually ahead of us. Jim Bagley over at Lam Research was in charge of that project at the time, as I recall. He could probably tell you better than I could what happened there. But we got enough intelligence out of TI to know that they had something in the works that was very advanced, probably equivalent to what we were making, but that's as far as we got.

Of course when Litton ran out of money the project shut down and TI went ahead and completed their work and I do not believe they were selling it. In fact, I know they weren't selling it outside. But by that time, several other companies in the equipment industry had come up with almost the same conclusions as to how to build the testers. There was Bill Mow, in fact he came out of Litton also to start Macrodata. And Macrodata became, of course, the early leader in memory testing.

There was a company up in Salt Lake, VLSI Testing. They must have gone belly up because I never saw them go anywhere. They had a very advanced method. We saw the drawings of the equipment and we saw what they were doing, but for some reason it never went anywhere.

Teradyne was probably not focused on memory at the time. There were several spinouts from Teradyne that did memory back in Boston and eventually, as I recall, Teradyne acquired them and soaked them up when it did finally get into memory. But I don't recall Teradyne being heavily into memory at the time. The J259 was a marvelous machine, but not for that purpose.

Addison: Did you have any contact with the founders of Teradyne?

Hutcheson: Not at the time. At the time we were doing competitive work and we didn't particularly want to have any contact with them. But you've got to give Teradyne a lot of credit for what it's done.

Addison: How long were you with Litton?

Hutcheson: I think about two or three years. They shut the project down. I joined Fairchild briefly, just as a place to stay, and then went to Teledyne Semiconductor [where I] was mostly watching over the equipment within the company. They had three factories, one in Hong Kong, one in India, and one in Mountain View [California], so a lot of equipment to watch over.

Addison: Can you talk a little bit about what you were doing at Teledyne. You were in charge of the equipment there?

Hutcheson: Yes, at Teledyne I was in charge of the equipment, buying, purchasing, maintaining and just overseeing the equipment everywhere. What can you say other than the fact that it was a job of running the equipment. I got to know a lot of people there. One day, our track system was always running down, about an hour or so was about all it would run before it just got all gummed up with photo resist. It was from GCA. I remember one day calling them up and they said, "We don't have a serviceman we can send out here." So I said, "Ok, let me talk with the guy that's in charge of the sales department, whoever." So they get this young guy on the phone and he says, "Hello, can I help you? I'm Barry Rapozo." So I told Barry that my equipment was failing, we couldn't get it working. He made some comment about how it didn't work too well continuously. I forget exactly what he said. But you know how Barry is, he always makes a joke of something. So I laughed. He came out and brought a tech with him and they got it fixed and that was my first encounter with Barry, and we have been, of course, close friends ever since.

Addison: So by this stage, you were able to buy most of the equipment from outside vendors?

Hutcheson: Yes, it was at Teledyne when I had to lay off so many people and I said, “It’s time to go join that side of the industry.”

Addison: The reason you laid off the people was because of a down turn or because of internal problems?

Hutcheson: No, the industry was always having its ups and downs every three to four years and I don’t recall if that was a down year or not. I don’t think it was, but I do know that we could now buy equipment externally and support it more inexpensively than we could to keep our own engineers and our own developers. So that was basically the reason -- the equipment industry now supported itself and we didn’t need internal groups. Most of the other companies eventually followed suit. TI was probably the last company, or one of the last companies, to eventually get out of the equipment industry. That was a shame too, because TI had a really good group down there. They had some good inventions.

Addison: Of the group that was laid off at Teledyne, did any of those go off and start equipment companies that you are aware of?

Hutcheson: I can’t recall a single one that started an equipment company. I think most of them just stayed within the industry and went to work for this equipment company or that equipment company. I can remember one time, it must have been about 1978, I’d already started VLSI Research, didn’t call it that back then, but I’d already started it. I was doing some work for Eaton Corporation. They were buying up equipment companies like mad. So one day I was up in Mountain View at a place called Kasper Instruments [bought by Eaton]. Barry Rapozo was there and Rick Heim was there, several other people were there. I go in one day to have a meeting, I look around and half my friends in the equipment industry from Fairchild and Motorola and TI are all there and they all smile and say, “Hi Jerry.” They’d all left the industry and Eaton was buying up so much that they’d all joined Eaton. One of them was getting ready to run off and run a factory somewhere in Southeast Asia. Another one was getting ready to do something else. It was quite an interesting day, but nothing worth mentioning came from it.

Addison: You talked about Eaton. What is your view of why those conglomerates didn’t succeed?

Hutcheson: All of the companies that wanted to become a general store didn’t succeed, and I believe the reason they didn’t succeed was to begin with, they were all large companies believing in being into every business. General Signal wanted to get into everything. Eaton wanted to do the same.

The problem with these large companies, I believe, is while things were going good, they would dump money into their investment. But as soon as things turned sour, they’d turn tail and run. Well in this industry you can’t do that. The ups and downs are so severe that you have to be willing to put up with that.

I can remember back in those days companies saying, “Well what kind of growth do you see in this industry?” We’d say, “Oh 27 percent or 30 percent.” These companies say, “Oh I would kill for that kind of growth.” They were in 4 percent a year types of growth. Yeah they would kill going in, but they’d kill themselves stumbling out of it. We saw that with General Signal, we saw it with Eaton. Eaton has very, very good things going on that had they stuck in there, I think today they’d be much better known than they were. The work that Peter Rose did at Nova, which Eaton acquired, that was just outstanding. He’s one of the true innovators of the industry.

You get in a large company like Eaton or General Signal and you go around, you talk to all of the managers and they talk about how they're going to take this risk or that risk or some other risk. But the truth of the matter is, most of them are risk averse, and they'll do just about anything to avoid risk. Well with our industry, every four years it goes in the dumps, at least back then it did. And it might grow at 20 percent to 30 percent, coming out of one of these valleys. But man, when it was going into it, it was falling at 60 percent to 80 percent. That was just too hard. So it took guys like Jim Morgan and people like that who understood how to make a business out of this business that hung in there.

I think that all of the companies that did hang in, whether it was Teradyne or Applied Materials, KLA or Lam, they may not have known that going in, but they certainly learned it very quickly.

Addison: Jerry, so the next chapter after Teledyne is when you struck out on your own.

Hutcheson: Shortly thereafter. I had a brief interlude with a company that did a testing laboratory over in Mountain View. They're long gone, a company called DCA Reliability Labs. Knowing by that time very consciously that I wanted to be in the equipment industry…the difficulty I had was being in research and manufacturing all of those years. I really wasn't interested in going high into management, and yet I found myself getting higher and higher and so I saw really no options there except to continue going up the ladder that I didn't particularly enjoy going up.

So I began to look around to find something else and the three years I spent out in Albuquerque with Dikewood, the consulting scientists, I'd learned enough to know how to set up a consulting business. So I got to reflecting on that and decided that's what I should do. I struck out on my own and formed a one-man consulting shop. I called it Technical Ventures at the time. It wasn't until we incorporated that we changed its name to VLSI. The whole purpose was to just do consulting work. My wife and I were at an age where the kids had all left home and we were kind of free and we wanted to do some travel and everything. This was great, we could do consulting and travel. We did that for a year or two, and she found out very quickly, and I did too, that this travel didn't work because you work all day and fly all night, or the other way around. So she'd sit in the hotel rooms or go find something to do while I was out working. So pretty soon she started staying at home and I was getting tired of staying in hotels also. So the travel aspect of it didn't work out. Even still, it was just a one-man consulting shop and I got busy enough that I added another person then I think it was up to about three or four people. No particular plans though, just to be a consulting shop.

My son, Dan, at that point was getting out of college and he was getting his degree in economics. He came to me one day and he said, "Gee dad, I don't know what to do with my life." I told him, "Well that's interesting, you got a degree in economics, there's lots of things you could do." He said, "Well I don't want to go to work for a bank and I and I don't want to go to work for a financial house. I don't want to do all of the things that economists have to do." I said, "Ok, that's very interesting, what do you want to do?" I said, "Well why don't you just come join my company and we'll find some work for you." I told him, "You know, this industry still has its ups and downs and there's a lot we don't know about it. We've had physicists, chemists, and engineers, and just about everyone you can imagine attack it to try to understand it, and quite frankly, we still don't know how to understand it financially so maybe you can do some good."

So he did, he joined the company and that was when we recognized that if he was going to join the company and make a career out of it, we had to make it into a stable company that had long-term viability. So we changed it around into the company it is today. When we incorporated, we found that our name wouldn't work because General Electric already had it and someone down in Los Angeles had it. So we had about eight hours to pick a name, so we picked VLSI Research. We weren't sure that was the name we wanted to go with but it stuck across the years and now it's well enough known that I don't think we dare change it.

So that got me in to the industry. Back then, the objective going in was to either help design equipment needed for the semiconductor industry, or to work with companies to help them design the equipment going into the industry.

The problem back then, as you may know, was the semiconductor companies, when they bought equipment, they weren't about to tell you what they used it for, how they worked it, how they modified it, or anything else, or how it fit into the manufacturing. So the equipment people often didn't know what was happening to the equipment. It would go into this black hole called the integrated circuit industry and somebody was using it, but for what they didn't know. So very often, they designed equipment that would fail. And back then, you really had to sell about 20 pieces of equipment before you could even reach breakeven. The companies were small enough that generally that was a make or break situation. If they didn't have a success, they'd go broke.

So fairly quickly our company evolved from being one of assisting in the design of the equipment to being one of determining whether or not the equipment was going to be a success. And if it was a success, the next question obviously was how big of a success was it going to be? Are we going to make enough money to make it worthwhile? So that led us into marketing and economics and all of the things that we do today. It was really that pressure that got us where we are today, more than anything else, other than the fact that we decided we needed a long-term plan rather than a short term.

Addison: What about the environment for companies analyzing the market. Now there's dozens of companies that do that, but when you first moved into it, were you one of the only ones?

Hutcheson: The answer to that is yes and no. There were several consultants. Dan Rose was ahead of us of course. There were several consultants in photolithography, but they were concentrating solely on photolithography. Part of the problem back then was, you'd go out and buy a report and the report often didn't have much research behind it. It was mostly people's opinions. In fact, that is one of the things that helped give our company strength. Coming from a research background, I knew what it took to do valid research. So all I did was take the tools that we used in research and adapt them to the market. So Dataquest already existed. Jim Reilly was the president of Signetics when I was there and he went off [to Dataquest]. He didn't found Dataquest, but without him, it wouldn't have gone anywhere. Helmut Wolfe was my leader at the Signetics research department and he went off to a company called Quantum Sciences. Quantum Sciences and Dataquest both did a lot of the early work in semiconductor research, but neither one of them were doing very much in equipment. So our company was, I think, the first one that actually set out to do work in equipment. But we were doing consulting much like the other smaller shops.

What really gelled it was we had this proprietary contract going with Eaton, because they were into ion implanters and aligners and track systems and they thought they wanted to be a general store and have it all. And there for a while if you recall, they did. So the company was doing a lot of work for Eaton and one day I was sitting in the airport down at Austin with Ralph Miller, and we'd been out to Eaton's ion implant division there in Austin. We were stuck in the airport for several hours and we got to talking about this. At one point Ralph looked at me, he said, "Jerry, you know all this proprietary consulting is really great, but what we really need is an ongoing study that continuously keeps us up to date." It was him or someone else that had already gone to Dataquest and asked them to do the same thing, and Dataquest said no, "The equipment industry is too small."

So for better or for worse, we looked into it and decided that yes, if we can find a way to migrate out of proprietary work we could pull this off. So we went through a period there of not having many funds around. When we quit doing the consulting work, we started the service that we have today. Of course the service today is completely on the web and back then it was a paper notebook series. When we decided we were going to do it, we developed an outline of everything we were going to do. Then we said, "Well we need a mockup." So we took these four notebooks, they were inch and a half notebooks, and put these nice handwritten mockup covers on the outside but the notebooks were empty. At least it gave us something to work on, and we had the outline of everything we planned to put in it. One day Tektronix was coming through and wanted to stop by. Back then, Tektronix was in the [semiconductor] test equipment business. We invited them over to the office. We got those notebooks out on the conference table and we were so proud of what we were doing. And of course we were showing them just the outside. And finally, they said, "Well what's in them?" So we turned them around, opened them up and there's nothing in them. They looked kind of blank, thanked us very much, and left. We didn't hear again from Tektronix for about four years.

I think, if I'm not mistaken, Teradyne was actually our first customer for the books. And even by then, the contents were mostly promise and not much substance. We persevered and eventually got the service as we know it today.

But we started into the [wafer] processing side and that was probably far tougher getting the books themselves going because the test equipment side was easy because we'd been doing that so much.

Addison: Let's talk about SEMI. Do you have any recollections of the formation of SEMI and SEMICON?

Hutcheson: I was still in the semiconductor industry when SEMI was founded and I think I've been to every SEMICON [West] since its founding, except in the last three or four years. Back in those days of course, they were held up there in San Mateo at the county fairgrounds and it was quite an event and of course everything was stuck into those buildings. I want to say tents, but I guess the tents came along later. But generally, they take a building and just put up a black curtain and divide it up from one group to another.

I never will forget one year, I think it was the second year, it might have been the third, Jim Reilly was the president of Signetics, and he'd been invited to give the talk at SEMICON that afternoon. Whether I was still at Signetics or not I don't remember, but either way I wanted to hear what he had to say. Jim was a very good speaker. So he gets up and he thanks everybody for inviting him and he's thanking all of the

executives. And then finally he comes to all of these ladies that help put it together, you know, calling him and arranging everything, [including] Lisa Anderson and several people. He looks around at them and he says, “And I especially want to thank all you semi-lovelies.” Of course, you could just hear a pin drop the room grew so quiet. Well all of the engineers knew what a semi-lovely meant, half lovely. Some of the outsiders coming in didn’t exactly get it. But those ladies, they were frowning. I never will forget that. That’s a moment that I remember very definitely. But yes, I went to all of the SEMICONs up until recently. I missed the first, and possibly the first two ISS conferences, but I pretty much went to all ISS conferences up until about 1991 or 1992.

I hung in there with SEMI during all the years. I used to go visit them when they were in the second floor of the Bank of America building over on Ellis Street [in Mountain View, California]. They had a very small area at the time. Phil Gregory of course was in charge.

Addison: As a device guy buying equipment, did you think SEMICON was a great concept?

Hutcheson: No, when SEMICON first got started, I recall being kind of quizzical about it and thinking it was a sales gimmick more than anything else, and of course that’s really one of the reasons it was started. But I remember once I attended it, whether it was the first one or the second one, I was so impressed with being able to see the equipment side by side and go from one place to another and getting a chance to operate the same type of equipment from two or three different companies, I remember being quite impressed with that. So I always came back. I was so close to leaving the industry at the time, and like I said, I don’t remember if I had or not. As a result, either way, I don’t recall any direct purchases from SEMICON at the time, but certainly it was a good idea.

The other thing you want to remember, is up until that time, Wescon had become the premier electronic West Coast conference. When I was back at RCA on the East Coast, we’d fly out dozens of people to Wescon. So even by that time, Wescon was still a very large conference and very well attended. But they moved it down to somewhere in Los Angeles [in Anaheim]. I remember the last two or three years I went down there specifically to look at equipment, and I never could find anything. What little I could find, they were so focused on systems that equipment to manufacture things just wasn’t their cup of tea. And so SEMI came along and grew very rapidly. I don’t recall the exact year, but I think when SEMI was probably no more than three or four years old Wescon just collapsed. The same thing happened with, what’s the name of that big convention in Las Vegas that just collapsed?

Addison: Let me just finish up Jerry. There’s been a lot of debate about the equipment materials industry, whether it’s going to shrink or go through consolidation. Based on your long experience, what do you think the future holds?

Hutcheson: It’s interesting the way people continuously ask that question, as if there’s some kind of force out there that’s going to cause the industry to collapse. I’m not suggesting you’re saying that, but I get this question quite frequently. I think the semiconductor equipment industry has probably got more potential and greater potential than any other manufacturing industry I know about, and the reason is quite simple. Just as integrated circuits took over almost the entire world of activities that required some kind of logic, the equipment industry did the same thing. We learned early how to build factories to do work in clean rooms and to work at very, very low molecular levels. Every industry that’s had a substantial success

since then, has adapted those methods. But it has adapted them fighting and screaming against it from the very beginning. When LCDs came along, they were using methods that were 30 years old that were mostly magical concoctions that they themselves often didn't understand. I say that even recognizing Joe Castellano is one of the pioneers of LCD -- he was at RCA and he had some pretty advanced methods. Even still, the manufacturing methods were not. You look at the hard disk drives, [they] went through the same thing, CDs, they went through the same thing. You look at virtually every industry that manufactures at high volume and every one of them were using older methods that were a lot of, I say magic, but what I really mean is misunderstanding of what's actually happening within the chemistry.

Once they began to adapt the equipment that's used in the semiconductor industry, you saw the same development spurt in every one of these industries. The first thing they'd say was, "We can't afford to pay a million dollars for a piece of equipment that we're accustomed to paying fifty thousand dollars for." In every one of those industries, one company took the risk of learning how to adapt things. Steve Irving, we mentioned him earlier. He was a consultant in that industry for many years, teaching many different ways to use plasmas. My next door neighbor created Trimedia, one of the first companies to build hard disk drives made with the methods we use in semiconductors. People at Eaton left and formed thin film head companies that do the same thing. In every one of these industries, they have adapted the methods of the integrated circuit industry. If you look whether it's Applied Materials or KLA or any other company, and you look at their product mix today, every one of them have products in fields outside of the semiconductor equipment industry. I see no end to that. I see no end to it for several reasons.

What we learned in integrated circuits 40 years ago was that it takes far less energy and far less work to move electrons than to move molecules. So back then, you had these big mechanical monsters moving things around whereas today everything is done inside an integrated circuit.

When I first got to RCA, in 1959, I participated briefly in a project [involving] the Nautilus nuclear submarine. The Nautilus was scheduled be the first submarine to go under the North Pole by traveling under the polar ice cap. Our group had the task of building the cameras and the tape recorders to put on the Nautilus so they could see what was going on outside the submarine. Of course we were using the most modern methods we could. Well, the biggest problem that we encountered was building a tape recorder that would go down the hatch [the camera was outside the hull]. So our task was to figure out how do we pickle pack all of that together to enable getting it down the hatch. We were successful. The Nautilus was successful…but those were the kinds of problems that you can imagine. It must have weighed 500 pounds.

Today we do the same in a hand held camera that has equally as good a resolution, if not better than that version the military had us build way back in 1959. So yes, I think that the equipment industry has a great future. As these methods move into the other industries, and the other industries learn the same thing, that you can move electrons much easier than you can move molecules or masses of molecules, and we'll learn that if you use modern equipment methods, you can build things that you couldn't build before. Nanotechnology, of course, is still a gleam in the researcher's eye, but it's going to go places eventually. In fact, it really is here today because our industry uses it more than any other industry, we just don't call it that.

I've seen articles about how TI's method of moving small silicon flaps on a silicon surface is to be used as the control surface of the wing of an aircraft. It's been tried. Can you imagine, a silicon wing on an aircraft? And everywhere you look, you see methods like that that today are as far advanced as Sputnik was in 1959.

So I am very positive on the future of [semiconductor] equipment. I am very positive on the future of integrated circuits, despite the fact that financially, they have their ups and down and despite the fact that some people say it's seen its day. And yes I agree, it's seen its day. And none of us yet know what is going to replace silicon. We know there's something out there, we just don't know what it is, or when it's going to come about. But I can virtually assure you that whatever replaces it, will use manufacturing methods developed by the equipment industry and you'll see the same sort of growth there that we see here. So, be happy. Enjoy the future.

Addison: That's a good place to stop. Thanks very much Jerry.

Hutcheson: My pleasure.

END OF INTERVIEW

