



## **Oral History of Charles (Chuck) Harwood**

Interviewed by:  
Duane Wadsworth

Recorded: October 29, 2009  
Mountain View, California

CHM Reference number: X5540.2010

© 2009 Computer History Museum

**Duane Wadsworth:** Our guest today is Charles C. Harwood, better known as Chuck Harwood. Chuck has had a long and varied and very productive career. He was the CEO of Signetics Corporation for a decade- and- a- half and will tell us about that. Chuck, welcome and thank you for participating in our oral history project here at the Computer History Museum. First we'd, like to go back to the very beginning, which began in Jamaica Plain, Boston.

**Charles (Chuck) Harwood:** It's a pleasure to be here.

**Wadsworth:** What's the story of Jamaica Plain?

**Harwood:** Well that's where I was born. Jamaica Plain's a suburb of Boston.

**Wadsworth:** And you went to public school there?

**Harwood:** In Cambridge and then in Concord, Mass. where I grew up.

**Wadsworth:** Did you go to Concord Academy or--

**Harwood:** No. I went to Concord High School and then for two years to Exeter Academy.

**Wadsworth:** I see. And then you went to Harvard as an undergraduate.

**Harwood:** Yes.

**Wadsworth:** What year was that?

**Harwood:** [I started in 1945 and] graduated in 1950.

**Wadsworth:** 1950 and can you tell us anything about your college years and how they influenced your later life?

**Harwood:** No, nothing [in particular]. I was on the track team. I was on the football team as a freshman. [I was drafted into the army six months after I started college]

**Wadsworth:** You were drafted out of college?

**Harwood:** Yes. [World War II was over, but the draft continued for a while]

**Wadsworth:** I see. What was your first job outside of Harvard?

**Harwood:** Well then I went to the Harvard Business School and I worked for the Corning Glass Works.

**Wadsworth:** You went directly from undergraduate to HBS?

**Harwood:** Yes

**Wadsworth:** And tell us what you did at Corning Glass and for how long and where.

**Harwood:** At Corning I started as a shift foreman in a big factory that made the glass for television picture tubes. I was then a general foreman. I was a budget analyst. I was the plant accountant. And then in Corning's wisdom, they made me the sales manager of the Electronic Components Department. Electronic Components made glass capacitors and glass-based thin film resistors. After that I was made the general manager of the Laboratory Products Department, selling beakers, test tubes, flasks, etc.. Then I did a stint in Latin America as area manager there for all Corning products. Then I came back as general manager of the Electronic Components Division. Then I got the assignment to go to Signetics.

**Wadsworth:** How many total years were you at Corning?

**Harwood:** I worked for Corning, that from 1950 to 1970-- 1952 to 1970, 18 years.

**Wadsworth:** Eighteen years, wow.

**Wadsworth:** And what were your most memorable management takeaways from those Corning years?

**Harwood:** I guess you'd have to say I learned how to manage and I got a background in some specialties. I was in a factory. I was a plant accountant. I was a sales manager. So I learned some specialties as well as learning, you know, the art of managing.

**Wadsworth:** Is that where you met Jim Riley for the first time?

**Harwood:** Yes. I hired Jim Riley into Corning as a salesman in the Electronic Products Department.

**Wadsworth:** We'll talk about this later but Jim Riley was at Signetics before you. Is that correct?

**Harwood:** That's right.

**Wadsworth:** Let's fast forward now to coming to California and why were you chosen to come out here?

**Harwood:** I later asked that question of the president of Corning at some later date. And he essentially said "You were the only person we had." And they might have been right. They didn't have many candidates in Corning [to become President of Signetics. And, they wanted "one of their own" to be the top person].

**Wadsworth:** Was this a big major decision? After all you'd spent your entire life in the very east coast.

**Harwood:** [I had decided that my career would be with Corning] and essentially if you were asked to take a job, you took it. And of course it wasn't any hardship to leave Corning, New York to come to sunny California.

**Wadsworth:** And your wife agreed with you on that point?

**Harwood:** She wasn't wild about it at first. But she wouldn't move back now.

**Wadsworth:** Signetics actually had begun business before you got here. Why don't you tell us what you know about the days of Signetics before you were there and how Signetics started.

**Harwood:** Signetics got started by four people who left Fairchild. And they were Dave Allison, David James, Lionel Kattner and Mark Weissenstern and they formed the company. And as David James later told me, they were all working at Fairchild. They were unhappy with how it[Fairchild] was being run. They were all scientists. And they went to New York and they got some money from Lehman Brothers given to them by a Partner, Warren Hellman, who today lives in San Francisco and is active in business. And then I think maybe after a year or two, Warren Hellman approached Corning and Malcom Hunt who was then the head of the Electronics Components Division and a real visionary. Hunt persuaded Corning to invest in Signetics. And so the first money that went in came from the Corning Glass Works.

**Wadsworth:** And it was Mal Hunt was a [driving force within Corning]?

**Harwood:** Yes.

**Wadsworth:** And he was influential as far as management and their outside investments.? Really, was Corning involved in many outside investments such as--

**Harwood:** No, no, he was just the head of the Electronics Components Division. He said, "I think we should buy this company." And the company fathers said "Go ahead".

**Wadsworth:** Was Warren Hellman's interest in getting extra money because of dissatisfaction with his investment or was it the fact of just additional money to expand the company?

**Harwood:** No. Lehman Brothers didn't want to run and own a company. They were investment bankers. They wanted to sell whatever they had in it to somebody else.

**Wadsworth:** They were selling their share.

**Harwood:** I think so.

**Wadsworth:** It wasn't that they were going to stay around, so they---

**Harwood:** I think so yes. Yes they were investment bankers. They were looking for somebody to take the business and run it.

**Wadsworth:** Was this a long, drawn-out decision for Corning to make to get involved with this company way out here in the far west?

**Harwood:** I don't know. I really don't know that. It wouldn't have to have gone far because Mal Hunt was a high official in the company and he probably had talked to a couple of people and got the blessing of the founding family, the Houghtons, and then he was on his way.

**Wadsworth:** Do you know what the dollars were? Was that public information at the time? How much was Corning's initial investment?

**Harwood:** I think it might have been about \$2 million and was probably not made public at the time.

**Wadsworth:** By today's standards, very modest money.

**Harwood:** Oh absolutely, yes. But I think they knew there'd be follow-on money. I don't think they said "this is it". They knew that the business was going to be explosive.

**Wadsworth:** And what did they get for the two million or whatever it was? Did they get 100 percent of the company?

**Harwood:** Yes, they got it all. Yes.

**Wadsworth:** And--

**Harwood:** All except that there were some shares for the founding members.

**Wadsworth:** Sure. Who probably didn't have much of their own money in the company anyway?

**Harwood:** That's right. Yes.

**Wadsworth:** As was typical at the time. And Jim Riley was here before you were?

**Harwood:** Yes, there were Signetics presidents before Jim Riley-- Mal ran it from a distance and they had a couple of [other] presidents along the way. And then it seemed like they had to have somebody a little more powerful and somebody they knew, so they sent Jim Riley out to run it. And he had never run a business. He'd only been a sales manager before. But he was a very talented man.

**Wadsworth:** That's interesting because as we were talking earlier, we said that perhaps Jerry Sanders was the first marketing man to run a semiconductor company. But I guess that isn't quite true. But in fact Jim Riley had that distinction--

**Harwood:** Well I don't whether it was before Jerry or not. That might be a close call. I don't know when AMD was founded.

**Wadsworth:** Who was Bob Foster?

**Harwood:** Bob Foster had been Corning's controller. He was sent out from Corning to be the Chief Financial Officer of Signetics [just before I arrived].

**Wadsworth:** And your coming out here, was immediately after Jim Riley, is that correct?

**Harwood:** Right. Jim got an offer to go and run---I think it was Intersil--- and that was attractive to him and so he left Signetics and I was sent out to replace him.

**Wadsworth:** We think about those times where people spend a career--- as was typical--- at say a Corning Glass Works in management, that that is interesting that someone would leave the "mother

womb” of Corning, especially out here in the west, to go to another opportunity. Well it was a new start [for him] I guess, also.

**Harwood:** Yes

**Wadsworth:** A spirit of the west perhaps. I don't know. Was “CEO” your title when you came out here?

**Harwood:** President [and CEO, but we never used the term “CEO”].

**Wadsworth:** You were President.

**Harwood:** Yes.

**Wadsworth:** Which was a wholly owned subsidiary of Corning Glass. And that year was 19?

**Harwood:** That was 1970.

**Wadsworth:** And what was the status of the semiconductor industry when you came to Signetics in 1970?

**Harwood:** The industry has an interesting background. Almost the first thing to say about it, no already big company was successful in the infancy of the integrated circuits industry. Not GE, not RCA, not Westinghouse, not Sylvania. They couldn't do it. They tried to force [the budding] integrated circuit business into their rigid mold of a factory and a sales operations in passive electronic components operation; it didn't work. They were not successful.

**Wadsworth:** You don't consider IBM successful in [developing] their own integrated circuits for their own use?

**Harwood:** Oh, for their own use yes. But that came later. But they weren't in the merchant market [when the semiconductor industry was in its infancy].

**Harwood:** And so it flourished out here and it all came from Fairchild. Everybody in Silicon Valley came from Fairchild except me. Intel, the leaders of Intel, the leaders of National, AMD and National. But there were two other places that it flourished. One was in Phoenix with Motorola and in Dallas with Texas Instruments. And that made up seven companies that dominated the business and dominated it worldwide. It was a long time before anybody else caught up with those seven companies.

**Wadsworth:** This was long before the Japanese “invasion”.

**Harwood:** Yes, but they came along rapidly once they saw what was happening. [And for a long time England, France, Germany and the Netherlands just dabbled in semiconductors]

**Wadsworth:** The original four that founded Signetics, founded it as making integrated circuits only. They did not go through the discrete path of Fairchild, the others pursued.

**Harwood:** That's right. [It is one of the distinguishing facts about Signetics. Signetics was the first company to only make integrated circuits].

**Wadsworth:** Was that by design and they felt that they had the technology?

**Harwood:** [It was by design} Yes, Corning was the first company to make only integrated circuits. We have a claim to fame there.

**Wadsworth:** <Laughs> Well that's certainly a worthy claim to fame. And was the business which certainly has become very cyclical in the years since then, what was the pattern back then? Flat or cyclical growth, low, fast growth, what was it?

**Harwood:** It had two characteristics that are devastating. One, it was, for most of the products we made at the beginning, it was highly competitive between the companies, because we both made the same circuits that could go in the same socket. And when that happens, you get heavy price competition. If you wanted to take the model of a perfect [highly] competitive situation, that's what we had. And so it was vigorously waged. When times were good, we could raise prices, because there wasn't enough [product] to go around. As soon as times were bad, we wanted to fill the factories, so we cut our pricing below our full standard cost and this made it highly cyclical. And that was the cycle we had to live with. We would hire people. We'd ride up the curve of growth and when we were growing, we could raise prices. When we went on the down cycle of the curve, the competition for orders led to cutting prices.

**Wadsworth:** That's interesting in the sense that that sort of pricing model and business mode, certainly is not what you'd come from at Corning Glass Works.

**Harwood:** <Laughs> You're right.

**Wadsworth:** And therefore--

**Harwood:** This was not a Corning model, yes.

**Wadsworth:** Were you influenced by your soul brothers that had come from Fairchild to pick this up, because you essentially joined the crowd on this.

**Harwood:** Well you can't compete otherwise. This is the way the business runs. I mean that's the hand we all were dealt. And let me say another thing. There was no direction from Corning other than from Al Dawson. They never entered into policies we had. They obviously figured in what they were going to pay me. But what we paid other people in the company was our own business. All our human resource procedures, how we ran the company, was totally hands-off by Corning, except I kept Al Dawson informed.

**Wadsworth:** I'm looking at the revenue. When your company was founded in '61, that in '63, the revenues were \$1,892,000 with a head count of 307 people and when you came in 1970, the revenues had grown to \$33,000,931 and a headcount of 2,311. When you are talking about salaries and paying people what you wanted, one of the ways in Silicon Valley was using stock as an inducement. But you weren't a public company. The stock was private?

**Harwood:** We had a phantom stock system.

**Wadsworth:** Would you describe that?

**Harwood:** Yes, since there were shares in the company owned by Corning, quarterly we would have an outside consultant tell us if this were a public company what would the price be. And so that anybody that received shares, stock options or anybody that wanted to sell their stock, that would be the price.

**Wadsworth:** So they didn't actually receive shares or did they?

**Harwood:** No. They got a piece of paper that said you have a stock option.

**Wadsworth:** In Corning.

**Harwood:** No. In Signetics.

**Wadsworth:** Oh, in Signetics, which of course was--

**Harwood:** Totally owned by Corning. It was phantom.

**Wadsworth:** And was that competitive enough to attract the people you wanted--

**Harwood:** Oh, yes.

**Wadsworth:** What else was going on in the Valley? Why did Signetics matter at the time? Was it the uniqueness of being the original integrated circuit exclusive company? What else was there about Signetics that made the difference with this incredible sales growth which actually in '72 you had 48 million dollars, the next year, 98 million dollars, practically double the sales. So you must have been doing something right. Was it uniqueness of product? Tell us about the product families and compare them to your competitors.

**Harwood:** Well we were very strong in digital TTL and Schottky. Thereafter, very strong in bi-polar memories. We had a very good analog line. We couldn't get the handle on MOS. We did not get the job done with that and that is unfortunate we didn't do that well. We all had access to the same pool of people. They were all in Silicon Valley. They moved from company to company. We'd swipe people from each other. They'd come with their ideas. They'd leave us and go to somebody else and take our ideas. It was, if anybody wanted to write a text book on classic free enterprise, this is it. There were no barriers to entry. "Have some money, and get in!" The customers weren't fussy on who they were going to buy from if you could deliver the product that met their specs.

**Wadsworth:** In those days there weren't a lot of lawsuits about stealing people were there?

**Harwood:** No, no.

**Wadsworth:** There were a couple of classic cases?

**Harwood:** Really only one. When Les Hogan left Motorola to head up Fairchild a really small number of Motorola people followed him to Fairchild. Occasionally one of us would have to call the other head man.



I remember talking to the people at Intel and they'd tell me, "hey you've taken enough out of one group". And I'd say, "okay that's enough". And I'd call our guys, and say "lay off" and vice versa.

**Wadsworth:** What were your personal strengths and weaknesses say versus your competitors and who were your competitors. I guess everybody from different families.

**Harwood:** Well I'll tell you about each one of them.

**Wadsworth:** Good.

**Harwood:** My strength if anything, [it] was in selling and marketing and I had a little background in other things. But that was my strength. And I'd gone to the Harvard Business School. That doesn't make one a world beater necessarily, but it taught me to think in business situations. So I had learned that and I had prior managerial jobs, so I seemed to handle that well. I'm not saying [that I was] any better than our competitors were, but that's what I brought to the party. Intel's top management, Andy Grove and Noyce and--

**Wadsworth:** How about Gordon Moore.

**Harwood:** Gordon Moore. They were scientists. That company was driven by scientists. And I'm not saying they weren't very capable as managers or in human resources, but their strength came from that. Charlie Sporck was an operations guy, manufacturing guy, came out of Fairchild. That was his strength. Charlie ran a very tight shop, very stingy, which I say in glowing terms, a very well-run, tight ship. Good folks. Jerry Sanders was a salesman. He was flamboyant. I'll give you a little story about Jerry. We went to call on one of our distributors shortly after Jerry had been there. They told me that they had lunch with Jerry after they'd just had given AMD a big order and Jerry ordered a \$1,600 dollar bottle of brandy for lunch. Now as a New Englander, that shocks me. But they'll never forget that act by Jerry. And that was part of his charm.

**Wadsworth:** What shocked you, drinking brandy at lunch or 1,600 dollar--

**Harwood:** No. It was the 1,600 bucks.

<Laughter>

**Harwood:** I'm a Yankee. I'm stingy.

**Wadsworth:** Well there's certainly was a lot of situations in Silicon Valley that were lubricated by alcohol at lunches.

**Harwood:** Oh yes, yes. But it was the price.

<Laughter>

**Wadsworth:** That is a great story, it really is. I think those days are gone forever around here.

**Harwood:** Well, you'll never know.

**Wadsworth:** Well we can hope for a return. Did the people like to work at Signetics or was it a job? What was the corporate culture at Signetics--

**Harwood:** Well, the corporate culture was---we were decent and polite to each other. Yes. It was that way when I came. Jim [Riley] ran a good company. I picked it up. We had good people. There was no screaming at each other. We didn't operate that way. I think we promoted the best people. They had to earn it. Not many people left us and said, "Hey, I've been passed over seven times." And then went to another company and became president. That didn't happen. I brought out a man from Corning named Gerry Pieters and he was in charge of Organization Development and reported to me. He was a one man band. And I'd worked with Gerry and his group in Corning. And "Organization Development" in language that's understandable to everybody is a process engineer for the human side. People would come to him and say "Hey, we're not getting along with the sales guys." And he'd work and get them to work together. Or, "I'm not getting along with the people in my department." And he'd go in and diagnose, and say "these are some things you can do." We lived by a credo, "treat other people as you'd like to be treated" and that seemed to work.

**Wadsworth:** And I think that was at the time ---having been here---novel compared to the table pounding, profane, almost throwing things stages of many of the other companies.

**Harwood:** We had profanities but they were thrown in the air in frustration, not at somebody. Nobody was ever-- I don't think I ever called anybody or anybody else ever called anybody else a bad name. Never. We just didn't do that.

**Wadsworth:** That's very interesting. Gerry Pieters was then certainly an ombudsman for the employees far beyond the normal human resources.

**Harwood:** We had human resource people [also]. I told the human resource people, you deal with each person as an individual, with their individual problems. Gerry's job was to deal with group issues.

**Wadsworth:** Now you mentioned you got him from Corning Glass. How many other people did you-- not raid obviously, it's your parent company...did you get from Corning?

**Harwood:** I don't think there was anybody else.

**Wadsworth:** So there wasn't a mass influx of--

**Harwood:** No. No.

**Wadsworth:** Of Corning people.

**Harwood:** No. I think after I came, Gerry was the only person [who came out of Corning]

**Wadsworth:** So Alan was there before....

**Harwood:** Alan King was there before me. Don Liddie came out before me.

**Wadsworth:** Paul Feisthamel?

**Harwood:** Paul Feisthamel came out before me, yes. [Also Irving Cooper, Signetics' Sales Manager whom I'd hired as a sales man when I was the Sales Manager for Corning's Electronic Components Department in Bradford]. . So when my name was released, I'm sure everybody had the book on me. It might not have been all favorable but--

<Laughter>

**Wadsworth:** How was the interface with-- after all you had rather entrepreneurial technical people founding the company and then Lehman Brothers comes in and now it's Corning and very different. How is the interface with the four original founders--

**Harwood:** David James and David Allison stayed. They-- David James I think was the last one, and he left a couple of years after Corning took over. David Allison stayed as long as I did.

**Wadsworth:** When they left, did they leave as wealthy men with stock?

**Harwood:** No. I don't think so. Unfortunately nobody got wealthy on Signetics stock.

**Wadsworth:** Nobody?

**Harwood:** Nobody.

**Wadsworth:** What changes or incentives did you introduce over your 15 years?

**Harwood:** I did some interesting things. One was Gerry Pieters, bringing him in. Another was putting in a quality improvement effort, patterned after Crosby method. We were the first company in Silicon Valley to do that and we went at it with a vengeance. Zero Defects was Crosby's brand name. And we put it in across the entire company. And to the layman, I liked to describe it as, "a lot of problems in companies are big. And with industrial engineering, outside consultants, people working on them, you can solve them. But there are a lot of little bitty, day to day problems. They are sand in the wheels and they can only be fixed by the people doing the work." And we went to work on that and we got a big payoff.

**Wadsworth:** That brings to mind, I believe Motorola was heavily pushing their Six Sigma program. And would you describe how Six Sigma would related to your Zero Defects plan?

**Harwood:** Same thing, different name. We were well ahead of Motorola in doing it.

**Wadsworth:** And was Zero Defects used as a marketing tool also?

**Harwood:** Yes, we used it. We used it as a symbol round the company. Yes, yes, yes.

**Wadsworth:** And in fact it was true? I mean relative to the requirements of say something as rigorous as Six Sigma manufacturing?

**Harwood:** Oh they were the same thing, yes, different brands. Getting the people doing the work involved and making the corrections and "doing it right [the first time]", yes.

**Wadsworth:** Did you find that people actually enjoyed doing high quality work?

**Harwood:** Oh, absolutely.

**Wadsworth:** And being shown the path. Talk about--

**Harwood:** Everybody knows it's [easier and less expensive] to do something once than to do it twice.

**Wadsworth:** They may know it but--

**Harwood:** Yes, they know it and they're happy to have [management come and lead them].. The people know this.

**Wadsworth:** Sure.

**Harwood:** And once they've been given [the time and methods to solve their problems], they love it [the method. It saved us a tone of money and improved our market share].

**Wadsworth:** Tell us about the- the facilities as far as when you came there. How many fabs were there and what was the change in fabrication plants, including out of the area plants and foreign--

**Harwood:** When I came, we had the big Arques Sunnyvale facility and we had a big parking lot and built beside the main plant was a little research building. And I said to Dawson, my boss at the time. I said "Al, this is crazy. You know, that distance of 20 yards is like 10 miles" [as far as people interacting with one another]. So as soon as we could, we got those two buildings joined so you could walk down the hall and talk to a scientist. We had a plant in Orem, Utah, which was an assembly and a fab area and we had a plant in Korea which was assembly. We had a service center factory and fab in Scotland, an assembly plant in Portugal and a service center in Noerdlingen, Germany. When I arrived that's what we had.

**Wadsworth:** But there were no fabs outside of California?

**Harwood:** Yes. There was a fab in Orem and a fab in Scotland. And all of that was to get inside the common market, the European Union. That was why we had that over there.

**Wadsworth:** What wafer diameters were you working with in those days?

**Harwood:** That's a good question because when I arrived, really the "harem scarem" in the fab areas was over. The days of having to make your own equipment and experiment [with the processes] were done. We pretty much had those under control. And they had already changed from two inch to three inch wafers when I arrived. So when I was there, we had the change from three inch to four inch. But I was gone before we went to five inch diameter wafers.

**Wadsworth:** That's interesting because unlike the Fairchilds, the Motorolas, the IBMs, you did not go through that vertical integration of equipment manufacturing, silicon growing. Fairchild actually made packages. They made glass to metal seals and so Signetics didn't have any of that. But also, one area that eventually left semiconductor manufacturings you did have, was mask making.

**Harwood:** We did our mask making, yes.

**Wadsworth:** Was that a leading edge area in your plant?

**Harwood:** No. It was for convenience [and reliability of supply and known quality].. And when cutbacks came you know, we asked ourselves “Well why don't we do our own masks ?” And da da da back and forth. However, we never changed while I was there. And then Intel started up and they did not have their own mask making. They did it outside. So I don't-- during my time there we made our own masks but we could have gone outside and gotten it [done].

**Wadsworth:** That “make or buy” decision of course came up in many areas as the industry evolved. But mask making, I can recall that it seemed that that was considered one of the family jewels and why would you let these secret things out? And then of course when Intel went into business with no mask making that was a shot across the bow.

**Harwood:** Yes. [Intel did it successfully but during my time as head of Signetics frm 1970 to 1985, we kept mask-making inside the company]

**Wadsworth:** You were still cutting rubyliths in two I gather.

**Harwood:** The same thing happened in assembly. We all did our own assembly operation. And then [we found] that somebody else could do it [our assembly] and we subcontracted [some] assembly. That happened just as I was leaving. So [today] nobody has their assembly plants and many now don't have their own fabs. But those days, if you said that can run a semiconductor without your own fab area, [people would] think you're nuts. [Now fab and assembly are, for the most part, contracted out].

**Wadsworth:** Well it was also said that when assembly and test went overseas. They said, that's it. Fab will never, never leave this country.

**Harwood:** Yes. Well we mechanized-- one of the reasons, we had up at one point, 10,000 people. Most of them were girls in Korea and Thailand sitting and putting the product together by hand. Then we got high speed equipment to do the assembly. We didn't need those factories and we shut some of them.

**Wadsworth:** Well I see in 1978, you are correct, the head count was 9,800 so you were pushing 10,000 personnel and with revenues of \$200 million and that head count did reflect the foreign plants that you had.

**Harwood:** Yes.

**Wadsworth:** Tell us what's happened to the Orem, Utah, Korea, Scotland, Portugal plants?

**Harwood:** This is going into when we were taken over by Philips. We closed the plant in Portugal. We closed the plants in Scotland and in Germany. We didn't need those. And we expanded Orem a little bit. We started up a factory for MOS in Albuquerque, New Mexico. And we closed down the plant in Manila because we had high speed equipment to put in for assembly. So after having had lots of people [doing hand assembly, we had fully mechanized factories].

**Wadsworth:** In retrospect what would be the biggest problem? I mean Signetics went through the same sort of learning curve I guess with plants and overseas. Overseas seemed to be an expensive operation too, with people constantly flying back to Asia and so forth. Do you have any thoughts on that?

**Harwood:** Help me again with that question.

**Wadsworth:** Well instead of trying to figure out how to automate here, with automatic wire bonders on shore here, I know there's the Asian work week and the general work attitude over there--

**Harwood:** Oh no, no, no. No, when we could get high speed equipment, we just took the high speed equipment and sent it over there and they would run it. That's what we did. We never brought assembly back. We put the high speed equipment in the overseas plants. We just didn't need as many plants. That's why we could shut some of them down.

**Wadsworth:** I see. I see. What were your reporting arrangements with Philips and what percent share? How did that split up because Signetics had gone public by then, right?

**Harwood:** We went public in 1973 I think. My boss Al Dawson, pushed for that. I think he liked it. It did help us clean up our internal stock option situation. It cleaned that up. But Al seemed to be big on that. That was his baby and he got us public. We were the last issue out the door but one before the country went into a little recession. We came out at \$17 a share and the stock promptly went to \$1 a share, then it came back to \$4 a share. And then Philips decided that they wanted to buy Signetics. They had been looking for some time and they came knocking on the door. Corning was, or I think Corning was, looking [to sell Signetics]. Anyway, Corning and Philips got together and they bought the whole company.

**Wadsworth:** So the IPO didn't cash Corning out, then? How much did the IPO net and what happened--  
-

**Harwood:** Oh no. [The IPO brought in some cash for Signetics to use for expansion] When all was said and done with Philips, Corning got their investment back.

**Wadsworth:** And what year was that?

**Harwood:** When they were sold to Philips was 1975 I think.

**Wadsworth:** So it was a couple years after the IPO.

**Harwood:** Yes.

**Wadsworth:** Did the IPO generate operating funds for Signetics expansion?

**Harwood:** Yes, yes there was some money in there.

**Wadsworth:** So did Corning come out of this whole or whole plus or what?

**Harwood:** I think Corning pretty much fished in the icy waters, didn't end up with a major [semiconductor] corporation and got their money back. Yes.

**Wadsworth:** And history would show, you think, that they have no regrets?

**Harwood:** I think they'd shrug at this point.

<Laughter>

**Harwood:** It wasn't [Corning's] finest hour, but it wasn't[ its] worst either.

**Wadsworth:** So there you are now with bosses in Holland, right?

**Harwood:** And New York.

END OF TAPE 1

**Wadsworth:** Regarding the Philips-Signetcs arrangement, there were some synergies actually between Philips' product lines, and Corning's, is that correct? Tell us about that.

**Harwood:** No. Let me explain this. Phillips is a great big [company], was [at one time] family owned, family controlled, [and now is a] worldwide company and from the Netherlands. I guess closest to what it might be in the United States, back when they bought us, would be like General Electric. They were into all sorts of electrical, electronics [products]. The company's official name Philips Gloeilampenfabrieken. They started as [a company] making light bulbs. But they were into transistors and diodes and integrated circuits, but they couldn't get over the hump [in integrated circuits]. Nobody in Europe could, and so they said, "Let's buy an American company." And they looked at [some] American companies and I [know] they looked at Fairchild. And this was driven by Europe, and they said, "We want to buy it."

Philips had set up the US Philips Corporation, a publicly held company in the United States on the American Stock Exchange. So legally, the US Philips was totally independent of Philips in Holland. I believe the Philips family set it up this way because at the time of the Second World War, Holland had fallen into the hands of the Germans. And the Germans could have gotten the Philips holdings in the U.S. if the outcome of the war had been different. So that's why it was done. So Philips in the United States was separate, but nevertheless, it was in the family. So when it came to buy Signetics, the Americans said, "We don't want any part of it. If you want it, send us the money." So \$40 million was sent over to buy Signetics. Then Philips in Europe said, "But New York, you've got to keep an eye on it for us."

So my boss was now Frank /randall, a Philips man in New York. I enjoyed working for him very much, but I had dotted line bosses going into Holland, when it got down to products, [the products we made and the technology we would embrace]. And so that's how it worked. So I had two lines that I reported to. But they also left us alone. Both companies didn't tamper with us.

We had an unusual accounting system from Corning. We closed the books every four weeks. Thirteen periods in a year accounting system. It was great, because every period was exactly four weeks, so we could easily compare [current performance against past performance].. It was wonderful. I said, "I wonder how long before they make me change it?" and I asked them that. "Oh no, we're not going to change it," and they never did. They never did. They left us alone.

**Wadsworth:** There was a lot of scrutiny and I don't know what the timeline on this was, about a foreign company owning American semiconductors. If you remember, Fairchild in some of their talks with people

had said there's critical technology there. And I don't know whether it was because of military products, but was there any scrutiny by the US government on the sale to Philips?

**Harwood:** No, I don't think there was. And if there were, it would have been done through New York. So there's more smoke and mirrors on it. But I didn't have any discussion. [I didn't know about it if it happened...]

**Wadsworth:** Philips was never in the television picture tube blank business, correct?

**Harwood:** Not in the United States. They didn't make picture tubes in the United States. They made them in Europe.

**Harwood:** But they bought Magnavox. Just before they bought us, US Philips bought Magnavox. US Philips says, "We want to do Magnavox, not Signetics, so send us the money for Signetics."

**Wadsworth:** Did you make trips to Holland during this time?

**Harwood:** [No. Only, after we were] purchased.

**Wadsworth:** Not before?

**Harwood:** No. [I don't think so.]

**Wadsworth:** When the negotiations were going on?

**Harwood:** No, no. I didn't know about it. My boss said, "Hey, this is who we're talking to." There's another interesting thing too. Corning and Philips knew each other, because Corning made glass and sold them glass. Also, both companies-- I don't think I said this, did I?-- both companies were family owned in small towns. One was the Houghton family in upstate New York, Corning, and the Philips family, founders of Philips in a town called Eindhoven in the Netherlands.

**Wadsworth:** The families previously weren't involved?

**Harwood:** No, no, but they thought alike. They were both family run companies. The family values of how a company should be run were still intact. So the top people of both companies knew each other [thought the same way].

**Wadsworth:** What were your commercial arrangements with Philips?

**Harwood:** Once we got together, we agreed that they would sell our [integrated circuit] products in Europe and we would sell their [integrated circuit] products in the United States. Around the [rest of the] world, we'd each go our own way. There wasn't much business around the world, but we did come to this agreement. And here is where my accounting background and understanding came in. I said, "How are we going to [set] the transfer pricing?" And they can say, "You can have either a market minus or a standard cost." And I'd been in the business long enough to know that if I had standard cost [system], when times were great, they'd make a lot of money, because we would have high prices. When times were bad [and prices low], they wouldn't take a loss, so they wouldn't sell anything. And, that's just the



time you want them to cut prices [to sell something]. So I took the market minus system and we never had an argument over pricing, never, not a peep. Just totally eliminated.

**Wadsworth:** Interesting. Did some Philips people come to Signetics?

**Harwood:** Yes, Yes. They sent over a kind of ambassador, Don Van Erven Dorens. They sent Klaus Volkholz. That was my choice [decision], but they said, "We need an ambassador." Later they sent me a director of research, who was terrific, Else Kooi. They sent a few people over, but no great army of people. They didn't have them, anyway.

**Wadsworth:** Were there any other products at Signetics that were made, that were not integrated circuits?

**Harwood:** Yes, we took a little fling at making a computer. This was an in-the-back-room affair. A guy came to interview for a job, and he says, "I'm coming, but a few friends and I are working on building an IBM 360 computer. It's a mini computer." And Jack Halter and I said, "Gee, that sounds good." So we financed that for a while, and then the big boss in New York said, "Don't do it anymore," and we sold it. I didn't sell it, but New York got a man to sell it. Sold it to Four-Phase Systems and we got all our money back, plus some.

But we did not do some things that our competitors did, and that is, our competitors got entranced with the idea that an IC was important in handheld calculators, in games, in watches, in toys. Intel bought a watch company (Microma) and I heard Gordon, when it was all done and the dust was settled, in a meeting, he held up his hand with a wristwatch on it and he says, "You are looking at a \$20 million Microma watch." He'd blown \$20 million. Now again, this comes back to something I'd learned. In Corning, there was a consumer products business and I socially knew [some of the people, because these people were [located] in the city of Corning, New York, and [these] neighbors and friends were in the consumer products division. And I knew that that was a tricky business. Your channels of distribution were very important. So I knew that this was not a business [for I.C. people ] to get into. We didn't go in. [Others did], National was in it. AMD did not, but Fairchild got in it, and that was all a waste of money [They all lost of money doing so].

**Wadsworth:** I can remember, and I'd forgotten, because there was a report I did about the number of watch manufacturers and watch module manufacturers here in Silicon Valley, and it was a large number. Now how did you miss the wonderful opportunities that so many of your semiconductor brothers found in calculators and games for example?

**Harwood:** Games? That same thing, no way, no. It was [an issue of] market access. [I'm lucky. No I knew from my Corning days some things my competitors did not know.] A man in Corning said, "Just because you make doorknobs doesn't mean you can go into the hotel business." Just because you could make an IC, doesn't mean you [will be a success making] a computer or making a car.

**Wadsworth:** I can remember in the Microma days that there was an arrogance about the fact that our brothers here in Silicon Valley would bury Switzerland, and history will show that the Swiss are still very much there. But your point to the marketing was that they missed the jewelry aspect of why people buy watches. I guess even though they perhaps keep better time than the best mechanical--

**Harwood:** And it's distribution, getting that distribution chain, all the rest, Yes.

**Wadsworth:** But the arrogance was here. Was there much arrogance in Signetics, and if so, in what areas?

**Harwood:** Arrogance about?

**Wadsworth:** About king of the jungle, "we make the best this..."

**Harwood:** Oh, no, no, no. You've got to be top dog to be arrogant. We were one of seven and we were not leading the pack. We were low in sales. We were down near the [bottom] with AMD. We were not the big one.

**Wadsworth:** But you certainly had some proprietary products.

**Harwood:** Oh, we bragged about those, but [they were integrated circuits]

**Wadsworth:** But you kept the humility at a high level.

**Harwood:** There was nothing to get excited about.

**Wadsworth:** Did you hire key people from others and did you lose key people?

**Harwood:** Yes, we hired them from others, sure. We hired a few. Not a lot, but a few.

**Wadsworth:** Where did Jack Halter come from?

**Harwood:** I don't know where he was [before Signetics], but he was at Signetics when I came.

**Wadsworth:** How did the organizational structure change during the 15 years you were there?

**Harwood:** The organizational structure of Signetics? I don't think it changed very much at all.

**Wadsworth:** You didn't radically reorganize?

**Harwood:** No. [There was a slight reorganization by AI of marketing and product responsibilities. And that's about all.] --- When I arrived in the scene, there was one guy out from Corning that just didn't fit and he was in a key spot. And Dawson took him out when I came out. He reorganized, made the announcement of, "Here's what it's going to look like," and it was perfect way to do it, and I just came into that role [at the top] and off we went. So we really didn't change much.

**Wadsworth:** Clearly you've had a superb education between Harvard College and Harvard Business School. Was the lack of hardcore technical training and knowledge a drawback in running a high tech company like Signetics?

**Harwood:** Absolutely. No question about it. Knowledge is basic through all decision making, and I probably could have done better had I had it, but I didn't. On the other hand, versus my competitors, I knew some things, as I had pointed out, in marketing, and accounting. I did another thing on accounting

inside the company, in which we never had any arguments between people in divisions on accounting issues, because I had some insight on that. I had some background that my competitors didn't have. But, not being technical is not a plus. [It's a big minus.]

**Wadsworth:** Did you have a lot of interaction with the likes of the Mark Shepherd, Jr. (Born: Dallas, TX, January 18, 1923. Died: Quitman, TX, February 4, 2009) at Texas Instruments

**Harwood:** I knew Mark Shepherd, but not because of the IC business. Yes, [I knew the heads of all of the semiconductor companies] because we had a trade association---Semiconductor Industry Association--- we were all members , so I got to meet the top men...John Welty, the people from Texas Instruments and so forth, Yes.

**Wadsworth:** Did you know Les Hogan when he was at Motorola, Phoenix?

**Harwood:** Yes, I did know him.

**Wadsworth:** Tell us about the man who is often credited with coining the term "Silicon Valley", Don Hoeffler.

**Harwood:** Don Hoeffler was a writer for *Electronic News*, which was a national weekly publication newspaper, and he had a column there. And in that column, he was irreverent to Silicon Valley and the goings on. It was a little bit of a scandal column. Then he left that and he had his own newsletter, *Microelectronic News* which was even more of a scandal sheet and he had a pipeline into companies with people that must have given him gossipy tidbits. And various people in the company would subscribe to it, because it wasn't much money [didn't cost much] and so we would wait fearfully every Monday or whenever it would hit our desk, of what Hoeffler had to say. And we escaped pretty well. We were all right, but he found gossip on people. I can remember one with Charlie Sporck. Charlie was a "prudent with a dollar". He wouldn't cut the lawn, so the boys bought a goat and put it outside of Charlie's window. So Don Hoeffler had that in, or I probably wouldn't have heard that story.

**Wadsworth:** You don't think Don Hoeffler had a mole in Signetics then?

**Harwood:** If he did, he didn't get much. He'd take a cheap shot [now and then]. No, but he could only get stuff if things were dysfunctional, where some boss was screaming at somebody or somebody did something naughty.

**Wadsworth:** That's an interesting observation, because as I recall, Signetics generally stayed out of it.

**Harwood:** Yes.

**Wadsworth:** Fairchild was there every time and by the way, we have a rather large Hoeffler collection here now at the Computer History Museum, courtesy of several donors.

**Harwood:** Oh, you do? Well, I've got to look at that.

**Wadsworth:** We really do. In addition, one of his hangouts, the Wagon Wheel in Mountain View, we also have several artifacts from the restaurant before it was scrapped, shall we say. Did you socialize with a lot of people in your company and with the heads of the other competitors you mentioned, SIA?

**Harwood:** No, I did not. I said to myself when I came, "I can't be buddy-buddies with these guys. That's not the way to run it." So I didn't live down in Saratoga or down here [in Silicon Valley]. And another reason I didn't is my wife's sister lived in Menlo Park, so we bought a house in Portola Valley. And I didn't socialize with the competitors. I would see them at Christmas things or something. I knew them on a business basis and I didn't buddy around with the people who worked for me. And I think, anyway, that seemed to be alright. I'm very friendly with many of them since. We had dinners together, business dinners, meetings. Once a month after the staff [meeting] we would go out and [drink a bit] t, have dinner together... or [get] drunk first and then [have] dinner. I don't remember which. ,<laughter>

**Wadsworth:** The dinner that you were involved with, you were the honorary chairman of a very historic event that we held at the St. Francis Hotel in San Francisco, which was a black tie event featuring Brattain, Bardeen and Shockley. It was the first time they'd appeared together really since receiving the Nobel Prize. They were not personal friends either and that was a very, very important evening, with a party before and after the dinner. They didn't speak-- can you tell us any recollections you might have of that evening?

**Harwood:** Yes, somebody asked me to hand out the award we gave to them. I was absolutely astonished [that I was given that honor]. I guessed that I was not a lightning rod like the other [IC company] presidents, as I was told later. I think I was plain vanilla.

**Wadsworth:** You were not as controversial, if at all, compared to some of the other titans of the industry.

**Harwood:** That's right.

**Wadsworth:** At the time.

**Harwood:** Had they picked Jerry Sanders over Charlie Sporck or Bob Noyce or Wilf Corrigan, then [some noses would have been bent].

**Wadsworth:** The event was sponsored by SEMI and it was felt it was very important. It certainly was.

**Harwood:** Yes, it was a big event.

**Wadsworth:** Very historic, as a matter of fact. Back to when you mentioned not fraternizing with your own people at Signetics. Was that a carryover from Corning?

**Harwood:** No.

**Wadsworth:** You were in Bradford and Corning. Those were small towns.

**Harwood:** No, we did. There's nothing wrong with it, but I didn't see a benefit from it.

**Wadsworth:** ....and it's also easier in a big city like this than it is in small towns.

**Harwood:** Oh Yes, Yes. In Corning, everybody knew everybody else. I'm sure there was apple polishing that went on and so forth. In Bradford, when we were in Bradford, we all kind of socialized together with the people in the company and a few outsiders, but I saw no purpose in it. [However, I saw no reason not to do it.]

**Wadsworth:** What are some of your greatest regrets relating to Corning Signetics?

**Harwood:** The greatest regrets, I had two of those really. One was, I did a lousy job getting MOS up and running. We just couldn't get a handle on it, and we never were a factor when I was there. Near the end of my time, we did better. We didn't get the right guy to run it. Kept changing them [the top person]. We didn't get the right process, which meant we didn't-- we just didn't do it. The other one is, analog. It was a part of the business that was highly profitable, because there generally weren't second sources. An analog circuit couldn't be easily copied. So everybody in the analog business had their own part, and when those got designed in, it [pricing the product] was heavenly. And we had some hot products there. We had phase lock loops, the 555 timer, the Dolby circuit, etc. . We made a lot of money and my regret is, I didn't wake up and pour more resources into it [analog products]. Just say, "Hey, go get these designers and let's expand it." So as I look back, I'd say, "Gee, I wish I could," if you gave me two whims, those are the two I'd do differently. [I missed on not doing MOS well and not putting more resources into Analog.]

**Wadsworth:** When you talk about a product having legs, isn't the 555 timer still in production today?

**Harwood:** Oh Yes, I think so. It's a gem.

**Wadsworth:** I wonder what diameter wafer they build that on today?

**Harwood:** I don't know. It doesn't make any difference. They could make them [on one inch wafers] and they would still make money.

**Wadsworth:** Well, you've been kind enough to tell us a couple of your regrets. What about your greatest achievements, of which I'm sure there are many?

**Harwood:** Oh, I survived. No, I think the things that I did well were on special projects. The Gerry Pieters addition was a good move. That worked out. The total quality program---that was, across the board, [a success]., We worked hard at that [and got] a big payoff. When we were doing this, we had a lot of talk about on-time delivery, and we went outside and got a consultant to help us with our whole scheduling system, and we brought that to its knees [greatly improved it]. So we really did a much better job on [on-time] deliveries, and that was a big effort. [Another thing was that our top managers and all of their people worked well together.] Those were some things that I was the most proud of, those kinds of efforts we had.

**Wadsworth:** You haven't mentioned dealing in the era when Japan became such a dominant factor in semiconductors, maybe not integrated circuits as much, but do you have any thoughts on dealing with the Japanese and interfacing and competing with them?

**Harwood:** Tough. They weren't really a factor until after I got out. They were coming on. As I looked at the top companies, the top seven, Japan was not much of a factor, but later on, after 15 years, they were coming along. They know how to do it and they do it right. They're going to be tough. I talked to some Koreans who are building fab areas and they say, "The Japanese, they're lazy." So you want to find tough, somebody else [the Koreans] is going to be there.

**Wadsworth:** After your departure, do you know how Philips handled the onslaught? After all, you paved the road with QC innovations and that obviously was famous considering the Hewlett Packard proclamations about Japanese quality versus US. You left the ship in good state to compete with them.

**Harwood:** Yes, I think it went along all right. Yes. That still had to be tough. But then Philips made a move in which they bought VLSI Logic, Al Stein's company, and then they ran the two separately for a while, I think. Then they put them together. Signetics moved out of the facilities at Arques and went over to Milpitas into the VLSI [buildings]. They had newer quarters. Then one day, three or four years ago, or maybe longer, Philips got out of the business, altogether. What was Philips Integrated Circuits Worldwide is now NXP Corporation, in the hands of KK&R, Kohlberg Kravis Roberts Co. So Philips is out of the business.

**Wadsworth:** Started with a New York financial firm and ended with one.

**Harwood:** Yep, they're out. It's the perfect case study-- if you wanted to study the free enterprise system and what it does, some people get rich along the way, some people get poor, but boy, the best comes out [of everyone] and it never stops being competitive. There's never a day you're not up in the morning working like hell.

**Wadsworth:** There have been a couple of books written about the difference between Route 128 in Boston and Silicon Valley. At one time it was thought both were technological super areas, including semiconductors. They may not have survived, but Raytheon and Transitron were very large factors, plus the other instrumentation companies, and a lot of the books seem to conclude the difference was (...it isn't really the weather around here), it's the great schools, the venture capital availability and people do want to live here for whatever reasons. Do you have any thoughts on why Silicon Valley became what it is?

**Harwood:** Silicon Valley became Silicon Valley because these five companies were here and we drove it. Just started here for integrated circuits, and then from integrated circuits you had the equipment industry support it. That's a big chunk of it. And then the people that went there [Rte. 128], they all turned to software.

**Wadsworth:** There's a piece of history that says that William Shockley, the reason he chose Palo Alto and ended up at Stanford and then in Shockley Labs, was his mother was here.

**Harwood:** That's my story too. I like that. That's a good story, Yes.

**Wadsworth:** So had Mama been in Los Angeles, it might not have been here. Do you think that would have been a possibility?

**Harwood:** As Gordon Moore says, "Thank god she didn't live in Omaha."

**Wadsworth:** That's a good one.

**Harwood:** That's as good a reason as any.

**Wadsworth:** That's a really good story. Well, why did you resign after 15 years? You were at the top of your game.

**Harwood:** I was pooped. I was totally immersed in it. Not that when I went on, I don't still work hard, but I was tired. It was enough. It was enough for me, and if I put on my good hat, it was probably enough for the company itself, the people. New eyes could see new things. I didn't spend much time looking at that...

**Wadsworth:** Do you still keep track of the advances in the industry, both management and technically?

**Harwood:** Oh, I keep half an eye on it, Yes. I watch it, I see what's going on now, Yes.;

**Wadsworth:** The name Signetics then did disappear when KKR took it over. That was the death knell of the name.

**Harwood:** Well, I thought so until somebody showed me a picture of a factory, an assembly plant in Korea.

**Wadsworth:** It's still Signetics, isn't it?

**Harwood:** It has a Signetics [sign] on it, Yes.

**Wadsworth:** To this day, I think.

**Harwood:** I think so.

**Wadsworth:** In 2009.

**Harwood:** To this day. We sold our assembly plant and they left the name Signetics, and Philips is not using it. I'm sure Philips must have given them approval and I think that's a contract assembly house, Yes.

**Wadsworth:** I believe that's correct. Well, obviously after you left Signetics, you didn't buy a rocking chair and sit in Portola Valley and start rocking, so why don't you tell us about Chuck Harwood after the semiconductor industry where most people have found there really is life.

**Harwood:** I wrote a book. I wrote two books. I wrote a book on-- after I left, I started a firm with Gerry Pieters in quality improvement and I worked at that for ten years, and we did very well. As a matter of fact, I made more money doing that than I was paid at Signetics, and we only got up to 13 or 14 people [in size]. I did that for ten years. When I got a little over 65, I said, "That's enough" and I left, and I wrote a book on how to do quality [improvement] for small companies. [It was a book for those who] couldn't afford a consultant.

And then I wrote this book, "It's Your Job: Take Charge of It." (Group Fore Productions; 1st edition (December 3, 2007 - ISBN-10: 0881971022) It's a book on for any person in any job at any level [in any organization] on how to do their job well. We get educated [in the techniques of] how to do our jobs, but [actually] doing our job entails working with other people, making decisions, knowing what you're doing, delegating work, solving problems, being influential and [coping with unpleasant people and situations]. That's what this book says [is about]. [The book] divides any job by any person into five parts, and I tell [the reader] how to do their job.

**Wadsworth:** Is Gerry still around?

**Harwood:** Gerry's living. He's retired. He's enjoying golf and the sun in Arizona.

**Wadsworth:** Is there another book in Chuck Harwood?

**Harwood:** I hope not. My wife hopes not. I think that's it.

**Wadsworth:** Is there anything else that you would like to add to this little history about you and any aspect of your long life?

**Harwood:** Let me just say this, there's something in us as human beings that when we look in the past, we look at the good things. My life, having been sent by Corning to California and had the privilege and the pleasure of running Signetics, I feel good about it. I feel good about it. What more can you ask? I didn't get rich at it. I made a good living. I was paid like a division manager of a big company, which I was, not [like the founder of a company] like Jerry Sanders. But I didn't starve and then I had a chance to run my own little business and write a book, so doesn't get any better than that. Six children and 16 grandchildren, does that count?

**Wadsworth:** It doesn't get any better than that, and you certainly have presented us with a very unique, interesting and inspirational story.

**Harwood:** Well, there's one story you didn't ask me about.

**Wadsworth:** Please tell us....

**Harwood:** When I came to Signetics, just at the time I arrived, fortuitously, there was a sales meeting, and all the salesmen were in and all the reps were in. So I went to the sales meeting and I knew some of the people, the sales manager. Irving Cooper I'd hired in, and so I knew some of them. And so I went around beforehand and introduced myself to various people and I was taken back a little bit by one of the reps that I spoke to, and I filed that away. And then after 20 minutes, I got up to speak to them. And I said, "Well, I've had a warm reception. I've gone around the room." I said hello to, I don't remember his name now, John Jones, a rep in Boston, and I said, "I stuck out my hand and I said, 'My name is Chuck Harwood,' and he looked at me and said, 'No shit?'" The salesmen loved it. They loved it. Already I was one of the boys. "No trouble, he's all right". So sometimes you've got to be lucky.

Then I had another story. It was the time when we had layoffs in the factories and it was terrible, it was terrible in the layoffs. And I gave a speech and I talked about that. I think we had 10,000 people. We had to lay off 4,000 of them in one of the downturns. Just awful. And somebody asked me how I was sleeping at night. I said, "I'm sleeping like a baby. I wake up every three hours and cry." So my humor got me through it. I have a good sense of humor as you can see.

**Wadsworth:** I think that's important that we do. I'd like to add that Chuck is a participant with a couple of other icons in Silicon Valley in our semiconductor special interest group (SemiSIG) here at the Computer History Museum, and we thank you for your service and your interest in this great institution. Thank you very much, Chuck.

**Harwood:** Thank you. Thanks for having me.

END OF INTERVIEW