Computer History Museum

Weitek Oral History Panel

G. Leonard (Len) Baker, Jr., Stephen (Steve) Farnow, Everett Roach, and Edmund Sun

Moderated by:
David House

Recorded: February 15, 2012
Mountain View, California

CHM Reference number: X6384.2011

House: Okay, it's February 15th, 2012, and this is the Weitek Team History. This is Dave House doing the interview, and we're going to start out by introducing the panel members, and so we'll start out with you, Steve, and what I'd like each of you to do, is to tell us where you grew up, where you went to college, your employment before Weitek, approximate date that you joined Weitek, and then the various jobs you might have had when you were at Weitek. So Steve?

Farnow: Okay. I'm born and bred in the San Francisco Bay area, went to school down at UCLA, and then to Stanford for a PhD in physics. From there I went down to Texas and worked for Texas Instruments, doing CCD sensors, then to Intel where I worked in the DRAM organization up in Portland. After a couple of small companies, I ended up in Weitek in 1986. Eight-six? Yeah, 1986, and was responsible for operations during my four years there.

House: Okay, and Ed?

Sun: Yes, I grew up in Taiwan, and came to United States to attending college called Caltech. Got my Master and PhD there, and then start working at General Electric first, then—and then followed by Hewlett Packard, and in 1980, I wrote a business plan for the Weitek Corporation.

House: And your duties while you were at Weitek?

Sun: My—actually, I'm the, sort of blending of the Technology-slash-Marketing function, more like the technical marketing, as well as some engineer work.

House: Len.

Baker: So I grew up in Houston, went to Yale as an undergraduate, Stanford Business School, I worked for Cummins Engine Company in the diesel engine business for seven years, and then I joined Sutter Hill Ventures a Silicon Valley venture capital firm in 1973, and in 1982, we made an investment, a B round investment in Weitek and I went on the board. I was on the board through the IPO up until the early '90s.

House: And Ev.

Roach: Sure. I was born in Ridgewood, New Jersey, and I went to Saratoga High School, and UC Davis. I joined Weitek as a marketing manager, business development guy, in 1986, about the same time that Steve started.

House: So the very beginning, Ed, you were there as one of the founders. You were at HP labs. Can you tell us about what the first ideas were, and what was happening at HP labs at that time?

Sun: Yes. In the 1980s, there was a lot of engineers in my lab, the Hewlett Packard Central Research Lab, was thinking about to start companies, especially in the—in both design and processing area. In fact, one of my friends, Lam, started Lam Research, okay? And the others are starting various companies, such as IDT [Integrated Device Technology], Altera, and LSI Logic, So I wrote a business plan around the same time, and trying to basically doing design work. But of course I invited Chi-Shin, who was considered highly in Hewlett Packard Research Lab, to be an excellent engineer, and he became my cofounder, and together with another Hewlett Packard alumni, Godfrey Fong and we formed the basic core of the Weitek business.

House: What was the concept of the business at that time?

Sun: The concept was more like—actually, I discussed with Chi Shin, would say it's okay. Of course we would form a VLSI company, but main application would be audio and image, that was actually the first impression, but we still don't have exact idea where the application is yet at that time.

House: Audio as in music, or speech--

Sun: Speech recognition.

House: Okay, speech recognition. And the visual part was graphics?

Sun: And the images is more like the graphics, yes.

House: And how did you get the first financing, how did you get this company off the ground?

Sun: We, through the introduction of Godfrey Fong, we got hold of the Innoven Capital, in New Jersey, and Jerry Lodge was the head of the firm at that time, and he flew in and we talk, and he decides to put in one million dollars into our company for the series A fund at end of December of 1980. And enabled us to start in January 15, 1981.

House: So the company started, where did it start?

Sun: It started at the—in the heart of the Silicon Valley, 3255 Scott Boulevard.

House: And you had some famous neighbors there, I understand.

Sun: Yeah, it was in the same complex, we are in the building two. Actually, next door is Activision, which is now very famous graphic content company, and also in the same complex we also, my friends, Paul Wang started ECAD, later it become the so-called Cadence. We all, we meet each other always at the toilet place, okay.

House: And so what's the first thing you did when you arrived at Scott Boulevard?

Sun: Excuse me, please just--

House: So when you arrived at Scott Boulevard, you had a facility now, you needed to buy some equipment, so you decided you needed some computers and some other equipment, so tell us about that.

Sun: Yeah, with one million dollars, we don't have a lot of money to go around, but in order to start, IC design company, the basic requirement is a CAD machine, a drawing machine, which you draw the—for the layout, and a computer to do some basic CAD. And the—so we bought—we spend in our right of 500,000 dollars to buy a Calma Layout Machine from General Electric Calma Division. And also we bought a VAX computer from Digital Equipment Corporation, a VAX-750 for $250,000. So we only left a quarter million dollar left.

House: And so without—with only $250,000 left, and you needed to develop a product, how did you make that money go around?

Sun: We don't have enough money to go around, so we actually got a contract from a company called Qume Corporation, to do the daisy wheel printer controller, and we also got a contract from Dialogue to do a ROM design, supplementing our income. And using that to—we basically spent about 50 percent of the time to work for somebody else, and 50 percent to develop our own product.

House: So work to make money during the day and get your product at night, sort of like that?

Sun: Yes. Actually in the night, we also rent out our machine to the neighbor of LSI Logic. Wilf Corrigan was actually contract with us.

House: So that was for the GDSII?

Sun: Yes, that's the GDSII machine.

House: So when you bought the GDS-II machine, you met somebody who wound up being important to the future of Weitek, and that was Art Collmeyer.

Sun: That's correct.

House: Can you tell us about hiring a CEO?

Sun: Yes, we quickly found out the three of us doesn't know what we're doing, okay? So we do need a business leader. We certainly very impressed with Art Collmeyer, because he was just bring the CALMA division growing at nearly 100 percent a year rate at that time, in the 1980s, to 100 million dollars. And so—and it seems like he's willing to talk to us. We are very excited. So in the end, we were—he was able to join us with similar conditions like the founders, in November 1981.

House: So he was quite successful at GE Calma, having doubled their sales. What inspired him to join Weitek, a little startup with no revenue and very little money?

Sun: Art has his own idea about running his own show. He would, by coming to Weitek, he can call the shot, we said. We all agree that you're the boss, okay, and you can call the shot, you can do—you can— he has idea about to making a CAD system to selling to the mechanical CAD system, to sell to the automobile company as well as the defense company to do design of automobiles, you know, simulations and so on. His background, he has a PhD in Computers, computer science, so he always want to do that. So we support his idea. That's why he is willing to join, because he's also getting the founder status as well.

House: But you never wound up developing CAD products for automotive products, did you?

Sun: We do, engage to his vision of building graphics engine, and in fact, I think the original architecture of the graphic engine that we are intended to sell for $80,000, attached to a Digital Equipment Corporation VAX machine, VAX-780 attached with our box, we'll be able to sell automobile companies design cars on a realistic view. So we actually engaged to do it. In fact, I think we finished it, the machine, the graphic engine, but the price was $80,000 in 1982-83, and the—it was kind of steep for people to take an OEM box, so we didn't sell a lot.

House: So you did implement his vision right away, it just didn't—weren't able to sell it for the price you needed to.

Sun: Yeah.

House: So what was your view? You're starting a semiconductor company, you've got very little money, you've only got $250,000 left after you buy equipment, and you don't have a wafer fab facility. What was your strategy for actually making these products?

Sun: Actually, we are—when Art come in, we are actually—he prefer a system business. The chip is very useful, he also agree, because that will enable a system can be built much more compact and also lower cost. So we engage and take advantage of the IEEE floating point standardization process. At that time, much of the activity is in UC Berkeley, and so we take advantage of that, and we have hired Fred Ware from Hewlett Packard Research Lab and Computer System Group, to do that floating point design. And he, of course has done an excellent job. And it was to building the graphic engine to do the floating point multiplier and adder, to be able to do these 3D graphic transformation in the—back in 1983.

House: So you developed these chips. Where are you going to get them made? Who's going to manufacture them for you?

Sun: The manufacturer, we do not have. At that time, there is no foundry business so therefore, we just have to scramble to go to everywhere and it happen to be Intel was willing to help us to build it. And so one of our—our first foundry was Intel Corporation.

House: And had you planned on always buying your parts from somebody else, or was your vision, you were going to have a wafer fab facility at some time?

Sun: Yeah, obviously it is awkward to go with the—begging somebody who is not really in business to selling wafers, but so we engaged in some kind of strategic relationships, such as Intel that they were, at that time, they needed to have 286 and 386 needed a floating point co-processor, and so we are—by engage in such relationship, were able to getting a more secure wafer supply.

House: Mm-hmm, so Len, you're at Sutter Hill Ventures at the time. How did you first hear about Weitek? Tell us about getting involved.

Baker: So we first heard Weitek in the fall of 1981, so I guess about a year after the company got started, from Gerry Lodge at Innoven. I sort of got assigned to the project, and I have the business plan from 1981, late '81, that was presented. And essentially, the business plan said, well VLSI is getting to be really important. VLSI is so complex, that all of a sudden, design is going to be a lot more important that manufacturing, and we're really good VLSI designers, and it was kind of a list of things that we might use our VLSI design on, like, graphics and voice processing and a number of other things. It was sort of, more

of a laundry list than a—there really wasn't anything—any detectable business strategy in this business plan. But we did reference checks, and the technical team checked out just unbelievably outstanding, and Art Collmeyer, who had joined the company just a month or six weeks before, checked out very well, too, and Art, I think at this point, hadn't had a chance to put any of his stamp on the business plan. I mean, I think the business plan was sort of, well we've got to raise money now, so the business plan is going to say whatever we've got. So we ended up investing. I think we put up a million dollars, and I think it bought about 20 percent of the company, roughly, and Gerry Lodge put in another quarter of a million, so we did the B round, which was about—just about a little under a million four in early 1982, and then I went on the board.

House: Okay, so Len, do you recall what the business plan said about sourcing semiconductors at that time?

Baker: Yeah, the business plan was pretty vague about it. I mean, it said that, initially, that they had these arrangements that Ed talked about, and the idea was that, well we're great designers, we can trade intellectual property for access to fab capacity. But then, you know, as a longer-term strategy, it was certainly no idea that we're going to create a fabless semiconductor company or any prediction about the fact that fabs—merchant fabs would emerge. And I remember thinking that—we thought that was a big risk factor, you know, could you do a fabless semiconductor company? I remember, I talked to one expert in the semiconductor industry and asked him the question, and he said, something like, real men have fabs. And so it was a very big point of uncertainty at the time.

House: So basically you were investing in an excellent team, great engineering team and a good business line manager, is what you were investing in.

Baker: Yes.

House: So you arrive on the scene, and what do you observe, relative to the culture or spirit or working environment when you show up?

Baker: They—very bright team, incredible work ethic, terrific sense of urgency, both in the technical team and also with Art, and then also I think a drive to get revenue and get revenue early with some intermediate products which were the multiplier products.

House: So soon it became time to make the next round of financing, and I guess by this time, this $80,000 box that adds onto the VAX to give it great graphics capability, was on the scene, and you went around and raised some money. I understand you had an interesting conversation with Kleiner Perkins, can you tell us about that?

Baker: Well, so I have the—I have here the business plan for the next round, which happened about a year later. I think we started in late '82, and closed the round in early '83.

House: Do you recall how it is different than the previous round, the business plan?

Baker: And the business plan was completely different. So this business plan says, as Ed said, we're going to make a graphics engine. In effect, it was very much like a strategy of Silicon Graphics which got started at just about the same time, except that Silicon Graphics, which intended to sell mostly end user, although they did have an OEM component at the time, this was essentially an OEM strategy. So we're going to create these graphics engine boxes, and Ed, correct me if I'm saying anything that's not accurate here, but we're going to create these graphics engine boxes, and then we're going to sell to other people like Digital Equipment. And so that was the plan, and I remember we all sat around and Art said, well it would be great to get a good board member, somebody who had some experience in the semiconductor industry. So I said, well you know, there's this young guy that just joined Kleiner Perkins from Intel. He's an engineer, John Doerr. And I just met him, and so I called up John, and I said—as the first guy we talked to, and I said, why don't you come down, and because we've got a really good deal to show you. He came down and heard the pitch, and I thought it went pretty well, and I walked with him out into the parking lot, and he basically said nothing, sort of got in his car and left. So I called him the following week. They turned down the deal very quickly, and he said, well, it's a great team, but Tom Perkins has no interest in investing in companies who sell boxes to other companies who sell boxes.

House: Do you recall who the new investor was in that round?

Baker: No I don't.

House: Okay. And so Ed, you've got this--

Sun: Bank of America.

Baker: Oh, was it Bank of America?

Sun: Yeah.

House: Bank of America?

Sun: Bank of America Venture.

Baker: Okay.

House: So Ed, first you do this $80,000 box and you don't sell very many of them, but soon there was a plan to create a CMOS version of a bipolar product. Can you tell us about that product?

Sun: Yes, actually in order to fund ourselves and while we were trying to do the graphic engine which required a 32-bit floating point as a transformation engine, we feel there's a derivative product which is utilizing the same design, making a 16 by 16 bit multiplier accumulator, which is doing the socket stealing with the TRW 16 by 16-bit multiplier accumulator using the bipolar design. And that has a very high power. Despite we were using NMOS, because we only were able to access NMOS, we were actually wanting to do CMOS, but no fab was available, okay, at that time. So we started with NMOS design. But even with the NMOS design, the power is relatively high. Still significantly lower than the TRW bipolar design, and we can make it cheaper, so we're basically doing a pin to pin compatible business for a while, in order to getting us funding with a continued cash flow. The—because the other chips, like the 32 bit floating point chip, we finished in '93, was required a design in period takes about a year or two before people can manufacturer a product using those chips, and that takes—we have a cash flow problem. So this multiplier-accumulator help us with cash flow for the 1983.

House: So Everett Roach, you joined a little bit later, but in an era where John Rizzo was already at the company, but can you recall for us, basically when the story about John and where he'd come from and the role that he had there at the company?

Roach: Yes, let me try to piece some of it together. First of all, John, I worked with him at Intel, and John was a fair haired boy, and kind of a rising star at Intel. He was Stanford educated, handsome, charismatic, technically strong, Stanford EE, and everybody kind of saw John as a rising star. And John left Intel, and he worked at Apple and he was a kind of a special assistant to Steve Jobs, which, in a sense meant he was kind of a product PR guy, and one funny story about John is, he did the rollout of the Macintosh US-wide, and just a funny anecdote, John was very charismatic and he had a big booming voice, and he was just a terrific showman. And when he rolled out the Macintosh for Apple, the story was that he had a wireless microphone on, and he just killed the audience, he did a terrific job, but then he went into the men's room and he forgot to turn the wireless mic off, and so the 1,200 people in the Chicago Auditorium heard more than they wanted to. But anyway, John was very, very strong, from a, I would call it a marketing, branding positioning standpoint, and as I understand it from talking to Art, Art had seen the Weitek business which was the, call it socket stealing business, and the 16-bit multipliers. The margins were dropping quite a bit, down to the 40 percent kind of range, and Art wanted to get it back up with proprietary products, and a new positioning of the company to get it more in the 80 percent kind of range. Part of John's role in that was to kind of reposition the company, rather than selling through distribution, and through the purchasing side, he wanted to get deep relationships and contacts with the engineering side of the OEMs that we were dealing with. These were the graphics companies, the workstation companies, the super computer type companies as well as other embedded applications. And

John realized that we really didn't have any connection with those—with the engineers, so he put together—he changed the logo of the company right away, he put together a very professional high quality brand, if you will, for the company, and some of this today sounds commonplace, but back then it was quite unique. So John, what he did was he did a lot of things that the engineer would see. He wanted to make the engineer, who we call on, the walking billboard for Weitek. So for example, he did very high quality, if you will, boxes that would sit on the engineer's shelf, that said, Weitek in very nice glossy graphics and we had gorgeous data sheets. He brought in in-house desktop publishing, so the data sheets looked like mini books, and so they could be put inside that box. And he did all sorts of giveaways and brochures and things that really helped position Weitek as a quality outfit, to kind of always get people thinking about Weitek, and the name.

House: So I understand he did a rather unusual ad for those times.

Roach: Yes he did. This maybe says it all in a way. John really liked to think out of the box, and this was an ad that was placed in "PC Magazine," and at the time, "PC Magazine" was a few hundred pages, it was quite a thick book, if you will. And most of the ads were very techie, a lot of specs, a lot of technical jargon. And this ad has a picture of a young boy, a black and white photograph, looking out the window with a book on his lap, and the headline says, "Tuesday's shipment of Time arrives early. But what if they needed more, what then?" And what this was, it was an ad for our math coprocessor that was used in Intel based 386 machines, and was called the 3167, but we also had a product name for that, and John labeled it—he worked very hard with a PR company, with Geoff Moore, from Regis McKenna at the time, to come up with a brand name. It was called the Abacus, because what the chip was, was a calculator, add, subtract, multiply and divide. And so he called it the Abacus, which is an adding machine, and we positioned this product for the retail channel.

House: I understand he also created something that became a coffee table book.

Roach: Yeah, there were—we wanted a company brochure, but most of us in sales and marketing thought a company brochure should fit in your briefcase, and you could hand it to a customer, and they could put it on their shelf, and it would fit with other, if you will, PR pieces. The coffee table book was gorgeous. It was very, very high quality images and photographs, but the book itself was probably this big by this big, so it was very difficult to mail to anybody, and you couldn't really carry it, but it was a statement, and it really said something that Weitek is different.

House: So in those times, and even before John, Jim Girand was the sales manager. So—and he had some unique characteristics as well. Can you tell us a little bit about Jim, the good and the bad?

Roach: Yeah, Jim was the kind of guy, he was athletic, a very grizzled build, crew cut, and he looked like the kind of guy that could get thrown out of the marines for being too aggressive. And Jim was very good

at driving sales of the, if you will, commodity kind of products. He—if you said, Jim, knock the wall down, he would knock the wall down. But what John found out, John Rizzo, that is, when he came to Weitek, he did some customer surveys and he found out there was a lot of animosity with the customer base, and what he really found out was most of the relationships were with purchasing, and there was very little dialogue and credibility with the engineering team. So he set out that that was the goal of a lot of these pieces that John developed, to get to the relationships with the engineers. He wanted to provide air cover for the sales force. In parallel with that, the sales force refashioned itself to have a very technical bent to it, so one of the points we prided ourselves on, was having a one-to-one ratio of sales engineer and application engineer. So a lot of it was technical driven with higher value added products.

House: So, but the customers weren't too much in love with the company at the time, because of some of your pricing tactics, or—

Roach: Yeah, the surveys came back, and they basically said, Weitek is very proud of their products, but they're not an easy company to do business with.

House: So you joined about this time. Why were you hired?

Roach: Sure, go ahead.

Sun: I'm sorry, just to interrupt, part of the reason, we are a little bit, I think you mentioned, we are a little bit arrogant, seems like. It's part of spoiled by some of our early development. I want to bring this, because this is Computer History Museum. We are actually bring some part into the supercomputer area. In 1983, I got phone call from IBM Research Lab, Thomason Watson Research Lab. And they said they want to build a super computer, to utilize our chipset, okay. Not only our Floating Point chipset, but also the future we're developing an ALU and a sequencer.

House: This is Yorktown Heights.

Sun: Yeah. Yes, and we actually not only we—the machine has 1,024 nodes. At that time, the top of the game was a Cray computer, Cray-1 at that time, 80 megaflops machine. And the—it was—they were trying to solve one problem for Nobel Prize winner, basically called the quantum chromodynamics. And so the machine was designed specifically for quantum chromodynamics to try to find out from the first principal to find what's the proton mass through the use of the quark model. Anyway, so I went to Yorktown Heights to work with the hardware and software guy, both are super smart guy, and we build a—basically start this 1,024 nodes super computer, and interestingly, because of that reason, we also got order from Columbia University as well as in Germany and Italy, they all competing for the Nobel Prize. Whoever can solve the problem quicker, got a Nobel Prize. That's what they said. So we were actually the first generation of massive parallel processing computer. We also designed into Thinking Machines,

so in view of Computer History Museum, I think this is related, okay? So we actually was designed almost all the computers of the super computers at that time, using the hyper—there's a hyperlink technology of different type of linking for each company. We also designed, like, Alliant Computers, and all the super computer startup.

House: And some of those machines are in the Revolution Exhibition at the Computer History Museum now, in the supercomputing section, so there may be some Weitek floating point math units actually on display down there. I don't know if they're in the actual models that are down there, but--

Sun: Exactly because we were, at that time, we were the only machine that had a vector pipeline able to do actually today term is very slow, but it's eight megahertz, 125 nanosecond to do one pipe, okay.

House: But that was fast then.

Sun: Yeah.

House: So Ev, what were you hired to do at Weitek?

Roach: So I had spent the previous eight years at Intel, and I had a chance to work for Intel Europe, and then a couple of years for Intel Japan, so I was viewed as somebody who knew a little bit about selling outside of the country, so when I came in, in '86, the bulk of our sales were domestic, and so I was charted with first off, trying to recruit a new VP of sales, and in parallel, expand our sales channel internationally, particularly in Japan where they really valued the high tech and the high prestige products that we had.

House: And so who did you recruit for head of sales, and what--

Roach: Yeah, it was actually my previous boss at Intel, Bob Derby, who was—had actually worked in Japan for Intel for a couple of years. He ran marketing over there, and he was in the Special Products Division at Intel, which was the non-volatile memory group. And it seemed like Bob, you know, he'd come back from Japan where he was kind of running his own show. He was back in headquarters, and it looked like he was a little bit tangled up in the large company system, so he kept bugging me, and saying, what's it like, you know, working with this small company, and is it exciting, what are you doing, and one thing led to the next, and so we just kept working through, and we had Bob meet Ed and Art and Steve and all the rest of the guys, and we just kept working on him until he said, sure, I want to join.

House: So Len, what did the board's view of Jim and the transition, the transition to Bob, was that a board topic, or was that--

Baker: Yeah, very much so. Yeah, what had happened in this period was, and I have the numbers. Maybe, I don't know if we want to stop this and I can talk about the numbers.

House: Okay, so—yeah, matter of fact, why don't you just start talking.

Baker: So, I mean, what had happened was that we had, in 1983—well 1983, the revenue was four million, and we lost just under a half a million, and then in '84, the revenue went from 4 million to 13.3 million, and we made two and a half million, actually 2.7—2.8 million pre-tax. So that was a huge year. And then we thought that we were going to have another huge year in 1985, and in fact the revenue went from 13 million to 15 million, and we lost money. So what happened was, and then in '86, revenues were relatively flat, and the company was a break even. So basically what happened was that we had very big expectations for '85, based on sales forecasts and based on the fact that we ended the year with a big backlog. And a lot of that backlog was sold in December, and de-booked in January, and so the year ended up being very disappointing. And so, you know, I think as part of that, there were two issues there. One was, we were on a very fast running treadmill in terms of product, and so what we were—we were ahead in terms of product, in terms of speed, had very high gross margins, and then, as soon as anybody else had a product that would match us, if we didn't have the next generation, our gross margins would collapse. But the other thing that happened was that these very aggressive sales tactics created a situation where we were booking and then de-booking revenue and where we were forecasting a lot more revenue than was the reality. And so I think, at that point, the conclusion was that we needed a little more product strategy, but we also needed a little different sales and marketing program.

Farnow: And if I can interject a story, because it relates very much to this, and to Derby. One of the issues that we always had was that—and I was eventually down in manufacturing, is that the end of the quarter was an incredible time, so for maybe 12 weeks, you'd be almost asleep, and then for one week, all hell would break loose, and you'd be shipping everything out that you could. So when Derby came aboard, his—one of his major programs was to get rid of the hockey stick, and we even had cups made, with hockey sticks on them and a no sign on it. And we began to incentivize sales to reach goals on a weekly basis, through the quarter, as opposed to just measuring what we did at the end of the quarter. And it was, you know, very interesting that all you had to do was to change how the compensation program worked, and hearts and minds followed almost immediately, and we were able to get rid of that and it helped us stabilize a lot of what was going on in the company.

House: So Steve, you joined—what was your role then?

Farnow: Yeah, I joined in '86, and I was responsible for operations. Over my four years, I ran engineering for a period of time, too. As Len was saying, we tended to run with very good products or very bad products. They'd be either very high gross margins, because we weren't selling against anybody, or once somebody came into the market, it was a very low gross margin. When you're selling parts that are very high gross margin, they're can be a tendency to not worry about a low yielding lot or quality problems, you just move on to the next lot, because you're making 80 percent gross margin, and why fool with it. I was brought in because of my background on dynamic RAMs where you have to sort of count pennies and quarters of pennies and eighths of pennies and things like that. So my job was to try and put structure into the manufacturing organization. I went and visited all of our fabs to figure out why we were having these low yielding runs, and they said, well that's because you violate every one of the design rules that we have, so I slowly worked with the engineering organization to straighten all that out, so we were running right down the middle of their sweet spot, and that helped us keep our costs much more in line with our margins as they began to deteriorate.

Baker: We had some 99 percent gross margin products, didn't we, Steve?

Farnow: We did, yeah. I think Ed was describing something he made for 200 and—or sold for 200 and made for 2. I'd like to do more of those.

House: That was a chip level sale, right?

Sun: Yes.

House: So Steve, what were your fab sources, and tell us your experiences with sourcing in the early days of fabless semiconductor company.

Farnow: I'll do that. I will mention one story that Ed shared with me, is that in one of his first trips to Japan, he was sitting with a purchasing agent, and he put his quote down for a couple of chips, and the purchasing manager, I don't know if you remember this, looked at it and said, "I can buy a Volkswagen for this." So those were the good old days. When I joined, Ed mentioned that the company started with a relationship with Intel. They were no longer sourcing us when I joined. VLSI Technology, which had then got into the game, the foundry game, and Toshiba were the two primary sources. We eventually—we continued to use both of those manufacturers. We eventually brought up Hewlett Packard, we were actually the first—HP I don't know that they run a foundry business anymore, but they got into the business with us as their first customer, and actually grew to a fairly large foundry. After I left Weitek, some years later, they had grown so large that they needed to start outsourcing their wafers, and actually brought me onboard because of our experience in Weitek, bringing up a foundry, to figure out how—to teach them how to bring up a foundry for themselves. Small world.

House: So the production load started to get serious with the design win at Sun—does someone want to tell us about the interface with Sun?

Farnow: Well I can comment on what happened. There were actually two Sun workstations being released, both of which needed floating point, or both of which had floating point sockets. We ended up winning one of them, and Texas Instruments won the other. Fortunately for us, the one that we won was the SPARC Station, which ended up being fabulously successful. The other workstation ended up being an also ran. For—the implications for Weitek were pretty immense, in that Sun rapidly rose to a very large portion of our business, something like 30, or maybe even 40 percent. That's good news, bad news. It's wonderful to have that revenue, but you also have all of your ducks in one little pond there, so Art came to me one day and said, "I have a new job for you, and your responsibility is to ensure that Sun doesn't have more than—any more product than they can use at any given time, because what I don't want is for them to build up an inventory, and have their business slow down, and not me know it almost instantaneously. And if they have an inventory, they can start working it off, and I would have no idea. So my job was to sit down and work with their purchasing people and our sales people, and anybody else we could find within Sun, to figure out, triangulate in on what their shipping was, and to make sure that we were feeding them absolutely hand to mouth. Every week they would come and complain and bitterly chew on me, and then they'd give us an order for even more parts, because their business was going up. The humorous thing was, one day I was asked to go over and take a tour of the facility where they built these SPARCs, and so I was being walked through, a visiting dignitary, and the Sun representative was with me, and I was meeting all the people on the line who were explaining to me what they were doing as we went along. And we got about halfway through, and we got to the point where they put the processors on, so that was the SPARC processor, and there's a bunch of processors in a little bin, and next to it is the floating point co-processor, which was our chip, and that bin is empty. So the worker is standing there, he turns to me and says, this is where we put the processors in, and here's the SPARC processor. Now, these co-processors, he said, we never have enough of these things, and I don't know why. They end up having to install them just before they go out the door. And he turns to me and says, these things are just gold. So of course the Sun person just goes, Oh my God, no. I immediately ran back and we raised our prices. Not really.

House: So what happened to the Sun business?

Roach: Well before that, there is one funny anecdote that maybe has some wisdom that you always want to call on big established companies to get more reliable high volume business, but the story that I heard is that when—Ed was the guy that cultivated the Sun relationship, and at the time, the other guys were saying, what's Ed doing over there with that tiny little company? We should be calling on DEC, and HP and these guys. And at the time, Andy Bechtolsheim, was the guy that Ed was working with, and the company was called Stanford University Networks. And why are you screwing around with those Stanford guys, when you really should—and of course Stanford University Networks turned into Sun, and if he hadn't taken that time to give them support when they were small, maybe they wouldn't have done business with us later on. So worked out good. What happened with the business is, they ended up using

two generations of chips from Weitek, and then finally they ended up doing their own SPARC chip with a floating point unit inside, as well as they did a X-86 based system out of Sun back in Boston. We got some business there, but over time, they absorbed the floating point function into their own chips.

House: And what happened, you had business as a floating point accelerator for early Intel processors, 286 or 386, when did it first start?

Roach: Yeah, that was back in—well let me see, it was '84 that the 286 came out, and the 386 a couple of years later. So with the 386, we had a chip that would work in 386-based systems and it was about three or four times the performance of Intel's 387 chip. When they went to the 486, and we enjoyed quite a bit of business and that was the marketing that we did both directly to OEMs. Compaq, of course, which was the big PC giant at the time, did a super set socket around their 387 co-processor that fit our chip in there, so there was a socket there waiting to be filled and we just had to do it both through the PC OEMs as well as the aftermarket channel. And then finally when Intel moved to the 486, that included the floating point unit on chip, we did have another solution for that, but we didn't have near the performance delta to get the same level of business.

House: So similar thing happened with Intel and with Sun, the math coprocessor got integrated into the processor then.

Roach: Yeah.

House: Changed the basic nature of the Weitek business, it would seem. So what happened at that time? Len, you were on the board, you were probably talking about strategy. I imagine everybody here at the table was involved in what do we do at this point.

Baker: Well, I'm just looking again at the numbers. So Weitek, in 1990, their revenue was $58 million, and they made $7 million, and then two years later in 1992, revenue was $26 million, so less than half of that, and they lost $11 million. And during that period, Sun went from about a third of the business, to ten percent of the business. And there was always a struggle about product strategy and always a lot of talk about product strategy. And in effect, what happened was that as the coprocessor business became more and more application specific; it went from being a horizontal product to being a vertical product. So multipliers are very much of a horizontal product, floating point coprocessors are very much of a horizontal product, but then, as it became more specific, graphics or other specific applications, it was much more of a vertical market product.

House: The company's got the SPARC design win, and it's shipping product, and it's time to have—and the IPO market is open and it's time to have an IPO, so Len, maybe you could tell us the story about the initial public offering?

Baker: Well the company went public in 1988. I have the red herring here, the prospectus - and sold 1.6 million shares. The cover price was $10 to $12, and I can't remember whether we sold at $10 or $12, but I think it was $10. So it was a—we raised $16 million at a valuation of roughly $75 million for the whole company. And the underwriter on the left was Morgan Stanley, which of course was the most prestigious IPO underwriter in the country at the time. So what's amazing about that is just how small the numbers are, compared to today. I mean, that's below the threshold of an IPO by probably an order of magnitude and a lot of startups today are getting done at valuations that are about the same as Weitek was at the point its IPO, which was one of the big IPOs of the year.

House: Yeah, the banker at Morgan Stanley that handled it was--

Baker: Frank Quattrone.

House: Of course. So was there much celebration at that time, was it a big deal within the company?

Roach: Oh, tremendous, yeah. It was just—everyone was elated, and we really felt a strong sense of accomplishment

House: Did you have a big party?

Roach: Oh, numerous, every night.

Baker: But I will say that I think Art really focused—Art Collmeyer really focused on, you know, let's celebrate and then let's get back and run the business. I think it was a—it was not viewed as a finish line, it was viewed as a milestone, and I have this saying, I call the Bride Magazine view of life, which is, which a lot of companies have. The Bride Magazine view of life is, you have this one event, let's say a wedding on a day, and somehow if you can ever reach that event, then somehow life thereafter just takes care of itself. And that's the mistake that a lot of companies make, either with the first venture round, or with the IPO process, is they have sort of a Bride Magazine view of that, and Weitek did not do that. It was very much a, let's get back and run the business.

Farnow: In fact, I think if Art had his druthers, he would love to have just an employee-owned business, and not have to fool around with any of this IPO stuff.

Baker: Or venture capitalists.

Farnow: Or venture capitalists, right.

Roach: Well, and credit to Brooke Sewell, too, who was the voice to the street, and he was very credible, and we always met—seems like we always met our numbers and Art managed the company very well. Remember the quarterly meetings that every department had their key results up there, and it was graded in front of the company. He ran a tight ship.

House: Was that Art, or was that Brooke that did that?

Roach: Art actually ran the—Brooke was the voice to the street, as the VP of Finance, as the CFO, and then Art was the one that put that structure in place, to have the quarterly reports on each department.

Baker: But Brooke was a very disciplined guy in terms of numbers and setting expectations, and both—certainly with the board, with the street, he was always the guy who, you know, was skeptical about the numbers and kept us realistic.

Farnow: One thing that Art always did, and this happened in his later companies as well, he would bury revenue or profit wherever he could, when he was going to beat the numbers, because he really didn't want to beat the numbers, because he knew a time would come when he couldn't beat the numbers, so he would take massive reserves for certain things so that the numbers would end up exactly where we had predicted they were going to be, and then the analogy that he used is that you want to have a bulldozer pushing dirt along, because when you hit a pothole, then it just fills up the pothole, and then you keep going. So he's one—always wanted that mound of dirt or cash in front of the company, so that we could respond to any potholes where we could see them.

Baker: That was very intelligent behavior for which you'd go to jail today, I think.

Farnow: I know.

Roach: But we did drive the stock price pretty high. It got close to 30 at one point.

Farnow: No, no, 60.

Roach: Sixty? Goodness.

Farnow: It did.

House: So Art was sort of the driving force in the company. Tell us a little bit about Art's background and unfortunately he's not with us any longer, but Art, and the way he worked, and where he came from.

Roach: Well, I don't know his background that much outside of the CALMA days, but I know that John Rizzo, who I talked to before today's session, he said that at Art's funeral, one of the quotes that really hit home with everybody, is that in order to get to heaven, you've got to get through hell. And that was kind of how he ran the company, that hey, there's going to be tough times, but we're going to get there. He was very fair, very high integrity and he was probably the guy that set the tone for the company and the culture more than anybody else.

House: How about work ethic?

Roach: Oh yeah, he would get right in there in the trenches with anybody, and you know, and then outside of it he had a company softball team, and he was out there playing. He was a regular guy.

Farnow: We were, at one point, trying to figure out how we should be handling vacation, versus sick time, versus personal time off, and Art said, you know, I don't really care about any of this. As far as I'm concerned, they're just all excuses not to come to work.

House: So Art was pretty technical, I understand.

Roach: Yes. There is an amusing story. When Steve Jobs had started Next, and they were building a work station as well as the operating system, Steve Jobs came to visit at 1060 East Arques, and I was down the—I was in a meeting, I was down the hall, but I talked to the guys later on, because I heard some shouting in the meeting. And we were trying to market our coprocessor, and the basic concept was, if you take your workstation and add our coprocessor, although it's pricey, it's basically like getting two computers for one. You get twice the performance. So that was the positioning, and so I think Steve liked the whole message, he liked the performance message, everything. Technically he saw he could do it, and finally, when it got down to price, Art had quoted him a price of a couple of hundred dollars, and he said—and Steve Jobs jumped up, pounded on the table and said, "That's more expensive than my whole workstation." So needless to say, we didn't get that design win.

House: So there were some other interesting people that were at the company. John Oxaal Tell us about John, what he did.

Roach: Yes. Yeah, John ran the co—after a while, we kind of formed into business units. We had one for graphics, and we had one for the workstation, and one for coprocessors, and then another one for embedded. And John ran the coprocessor business, and he pretty much singlehandedly managed the

Compaq relationship and got us a design win there in the Compaq PCs. He also was in charge of getting the ISVs, the Independent Software Vendors to port their—to do derivative ports of their software to take advantage of our floating point coprocessor. So very capable guy, and he's had a successful career since then.

House: So Ed, I understand that speech recognition was something that you had in mind from the very beginning, and at one point in time, you were actually running a business line at Weitek in that. Tell us about your experiences with speech recognition.

Sun: That was back very early days, 1981, '82. We actually, Art was—allowed me to run this business for a while. We were actually using—we hired some people from a—I think Bruce Laurie, [ph?] if I remember his name. He was a PhD from Carnegie Mellon University, specialized in speech recognition, and in fact he is the friend of the—with the Dragon, you know, the- today's the iPhone 4S is using Siri, Siri is using the Nuance, Nuance comes from Dragon. Basically the Dragon is actually the same lab where Bruce Laurie came from, okay? So essentially we are all the way to today. But unfortunately in 1981, '82, the computing engine is very, very weak. Our VAX-750 was only one MIP, okay, and the—we are actually trying to do some clever algorithm to try to do speaker-independent connected speech, but it was too aggressive for the time. And even today it's not that easy, okay, so you can imagine 30 years ago, it was just way too much. But anyway, make story short, we actually simplified the things and we were able to get several customer cover such as a Coke machine, vending machine, we just needed to separate the Coke, Mellow Yellow, and so on, to be able to—when people dropped a coin, they just talked into it, and then there were things—Coke would drop out, except sometimes they make mistake, okay, so we didn't get that order. We actually got—we also made discreet component for toys, such as a toy controlled car, by saying forward, backward, left, right. And it works, because we separate the words. Unfortunately, sometimes left becomes right, right becomes left. So we figure, left has become right, right to left it's okay, as long as it's always that way. Unfortunately sometimes left goes left, okay, so it was one of those days. We were—the whole company was playing around with some toy cars, okay? I remember, those were fun days, okay, and then we also doing some—even getting Air Force contract, say it's doing yes or no, just yes or no, those two words. But anyway, make story short, I think we are way ahead of time. The—I remember, I bought the digitizer for 16-bit A to D, for $35,000, just to digitize the words to look the wave form, was ridiculous expensive. And the computation just could not keep up with it. So which—so we end up the things, and obviously I did a bad job, okay, so we cancel the project back in '82.

Roach: But that was always the MO about Weitek, that in general, the company was ahead of its time, and it was okay to play around and try new things. So for example, Ed took it upon himself to try and get us into the laser printer business. And at the time, all of the engines came from Canon, right, and they were sold to Apple's laser writer, was probably the highest selling, along with HP and through a business development, technical development challenge, he was able to get us a PostScript interpreter, which got Adobe to port their PostScript to our engine, and we ended up getting a lot of business. But that didn't come out of a conventional product planning piece it was basically Ed saying, let's go do this.

Sun: Yeah, we did—we made a PostScript microprocessor. The instruction, specifically, tailored it to do online font, vector—

Roach: Well remember the name, it was called the Raster Image Processor, but RIP didn't sound like a very good product name.

Sun: Right.

House: And I understand it wasn't exactly portable.

Roach: No, it was—we had to lug, throughout Europe, before the common market, so you had to go through each country with a carnet and all this documentation, a big, big heavy Hewlett Packard laser jet printer, as well as a Compaq luggable. They didn't have laptops back then, so it was a good 15 pounds for that, and 50 pounds for the laser printer, so—Yeah, we had some back aches toting that around.

House: So the beginning of the company, Weitek had a Chinese origin. Ed, can you tell us where the name Weitek came from?

Sun: Wei in Chinese means micro so Weitek means micro technology, simply replanting at that time, people say integrated circuit is a micro technology. That's it.

House: So I understand that Feng Shui had a role in the facilities. Can somebody tell us about that?

Sun: I think—we moved to a new facility, Arques.

Roach: Yeah, it was a building directly across--

Sun: So maybe you can mention about it.

Roach: Yeah, we had outgrown our primary building, and across the courtyard, there was a large pond there, and there was another building that we wanted to move into, and we negotiated the space. But there was a corner of the building that kind of pointed arrow-like at our lobby, and that was kind of taboo in a Feng Shui sense, so we—but we did have an expert come in and really help us try to think through the right mood of the building and who should go where. So it was thought through carefully.

Baker: But there was a big crisis as I recall. I think it was Brooke that had the job of fixing that, because there was this big arrow pointing right to the lobby, really bad. So I think what they did was they built a mound, a dirt mount out in front of the parking lot to block the juice from the arrow coming into the lobby.

Farnow: See, and you thought we were just making chips. We were solving aura problems.

House: Yes, well I understand there's a story when Bob Derby arrived, about aura.

Roach: Yeah, Bob is a very spiritual right brain VP of Sales, and he wanted to get the most out of everybody, and he actually consulted with some spiritual advisors and at the time, crystals were thought, and still are today by many people, thought to have energy and healing powers, and so over the weekend, this advisor came in, and explained where we should put crystal throughout the company. And that included actually inside your telephone handset. So when we came into work on Monday morning, a number of us would be saying, why is my phone rattling, and if you took it apart, you found your crystal in there.

Farnow: The unique thing was, nobody was aware this was happening except for Bob and his consultant, so it was a fun Monday morning.

House: There were—are there any notable companies that result as a spinoff from Weitek?

Roach: Yes, Chi-Shin Wang started a company called IIT, that was doing X-86 compatible math processors, and then that generated into some other spin off companies from there.

Sun: And 387.

Roach: And 387.

Sun: They make a second source 387 in that company.

House: Any other companies that spun out of--

Baker: Well Eight By Eight, didn't— wasn't 8x8, which is still around, didn't Shih-Hsin originally start that?

Sun: Yes, that's correct.

Roach: And Ed, of course, started a C-Cube, and went on and that became a publicly traded company, quite successful.

Baker: Great success.

Sun: It was an image processing company for image compression company.

House: John Steinhart was another character at the company. Tell us about John.

Baker: John was kind of adult supervision. He had been at Stanford for a number of years, at Stanford business school, ran the MBA program, ran the Sloan program, and we were, at a certain point, looking for a sort of HR, Admin guy, and John showed up as a very senior guy. So John was a very experienced HR guy, very good at sort of soft skills of having insight into organizational issues, dealing with organizational issues and HR problems in a very, sort of low key problem solving kind of way. I don't think we ever got sued over any HR issues. You know, sort of very quiet guy at working behind the scenes. You know, maybe the only completely non-tech guy in the company who was always part of the inner group.

Farnow: John had the ability to really read people very well, and one of my favorite stories about him was that he was a unique interviewer. If I'm interviewing you right now, I'll probably have a tendency to start formulating what my next question is, while you're answering the one that I already asked you. John didn't do that. John would focus in on you like a laser, and as you spoke, you got the feeling that he was absorbing every word. It's a little disconcerting, people aren't used to really being listened to. So invariably when I'd be recruiting somebody, they'd probably give me a call from the airport on their way home, and say, you know, thank you very much for the interview, I hope things went well. And I'd say, yeah, we enjoyed talking to you, you know, do you have any feedback? Yeah, I thought all of my interviews went very well. I was a little uncomfortable with John Steinhart. I wasn't sure how that went, because apparently it was sort of like a Vulcan mind meld when you got interviewed by him, but it was because he'd focused in and really paid attention.

House: So Len, the IPO was in 1988, and sort of one of the stronger years. Tell us a little bit about the numbers after that, and how the business developed post-IPO.

Baker: Yeah, as Steve said, the company was on a good ramp after the IPO. The stock, which came out at 10 or 12, got as high as 60, and then in '89, revenues got to $49 million, and profits were about—pre-tax about $11M. And then in 1990, revenues were $58 million, and profits, pre-tax was a little bit up from that. And then in '91, things were down. It went from $58 to $39 million, and then down further in '92, to $26 million. So from 1990 to '92, revenues went down more than half, and we went from profit of about $11 million, to a loss of about $13 million. And during that same period of time, the percentage of revenue

that came from Sun went from about a third to about ten percent of the company. So there was a big fall off in Sun revenue at a time when the company didn't really have any products to replace that lost revenue.

House: And somewhere along there, Art Collmeyer left. Can you tell us about that?

Baker: Yeah, Art didn't leave, but he stayed—we recruited Barry Cox as president, and Art stayed as chairman. But yeah, I mean, what happened was that the company was really struggling with product strategy, so as—I mean the company was a coprocessor company, and as coprocessors evolved to contain more and more functions on a piece of silicon, inevitably they had to become more application specific. And so we started out in a very horizontal business with multipliers, and floating point processors which were still pretty horizontal, and then graphics coprocessors which are still fairly horizontal, but we were never really able to evolve to the point where a lot of, you know, sort of the next generation of companies that came along in the '90s, like NVIDIA, to inherit the co-processor business, ended up making the transition to be much more application specific. They really figured out the vertical markets for these applications. And Weitek, for a set of reasons, was really never able to make that transition. So inevitably, the products, you know, partly ended up getting commoditized and partly we ended up having a kind of a, I don't know, fibrillating sort of short term attempt to come up with opportunistic products that were—were not really headed in any systematic direction. And so you know, I think the feeling was, we needed a change of leadership, and so I've forgotten exactly what year, but Barry Cox came in, and I think during this downturn period in '91, '92.

House: And, in the end, what happened to Weitek?

Baker: I mean, I wasn't there at the end. I stayed on the board until the early '90s, but at the end, Weitek had products which were increasingly derivative and essentially, and a lot of the superb technical talent went elsewhere and you know, companies sort of reach a point where you can't really recruit anybody, to get products, and if you don't have products, you can't really recruit anybody. And so the company just sort of faded and ultimately sold out to—who did it--

Sun: Rockwell.

Baker: To Rockwell, in '94?

Farnow: I'm not sure.

Sun: Ninety-five.

Baker: Ninety-five, for not much money.

House: So Weitek could have become NVIDIA, but it didn't. Let's hear some of your comments about why did that not happen?

Roach: As I recall, there were two parts of it. One was that we had architecturally we had just kind of grown some of the high end chips that were kind of full custom chips, rather than a lower cost basic type approach, so we kept trying to Band-Aid those to have the next generation of our Power 9000 family, and it was—eventually you're going to hit a wall, which it did. And the second part of it is, I don't think we really understood what the requirements were for PC graphics, which was the major growing area. Meanwhile, S3, and as Len said, NVIDIA, these guys had a pretty good jump on it, and a full head of steam, and they were going at it from a totally different mindset. It looked pretty hard to close that gap.

House: So one of the things is the PC started taking over the workstation market and Weitek was sort of firmly planted in the workstation side, I suspect. And maybe didn't see the PC opportunity as well?

Roach: Yeah, that's probably fair to say. We were kind of gone by now, all of us. I think we had left in '91, and we did make some efforts to get a VGA core. We actually licensed it from Unisys, who had it internally, so they didn't mind licensing it to a merchant chip vendor, and we did that, and I think Barry deserves credit for doing the best he could to make something out of all of this, and he gave it kind of one more generation, one and a half generations, but the fundamental approach was still, coming from a high cost core, trying to go down, whereas the other guys had it much better figured out from low cost to coming up.

Sun: No, I think another thing is even—I left in 1989, but, at that time, I already feel that you know, Art probably fall in love with SPARC, my coprocessor, and much of the engineer resources was channeled into making microprocessor, rather than graphics. And he doesn't believe the game market that was—so he did not put enough resources into the PC game. Rather, most of the resources were used for SPARC development, and this—Sun was supposed to be open everything, both the architecture as well as the software, but they are, from the engineering response, there's always, they are not really open. So as a result, you put a lot of resources in there, you don't get much result out of the Sun, and yet you left very little resource to do the PC graphics. Otherwise, I think if we just focus back to the PC graphics, we would be able to only on PC graphics, I think that Weitek has very good chance to become NVIDIA-like, it's just resource allocation problem.

Baker: But I think there was a—it was in a bit of a classic Clayton Christensen innovator dilemma problem, where you have low end competitors coming in with lower cost structures lower price points, and initially the products they're selling are inferior in capability, but ultimately the low end products grow in capability to the point where they're useful to the mass of the market, and the high end products keep

growing in capability, and they grow to the point where they're only addressing a very small market. And we were, as you said, selling products for workstations when PCs came in—PC graphics came in, and, you know, they were selling at price points of 20, 30, 40 bucks, and at, you know, NVIDIA made very good business at 40 percent gross margin, and you know, 30 percent on the low end. And Weitek's business model was just not geared for that.

Roach: Well, Len's right. And we were getting attacked on all sides. In the embedded area, we were getting these design wins in the laser printer, and that area. We had a pretty expensive two chip set, you know, these are gold BGAs, ceramic pack, you know, expensive stuff, and meanwhile, Intel had the i860, RISC processor, AMD had a RISC processor, you know, the big guys were all coming at us from every side, as well as the small guys coming up and attacking it from the volume low cost, so we were spread pretty thin with these different businesses.

Farnow: At the end, though, I really think it's the inability to recognize where the sweet spot in the market was. And, you know, an analogy, actually, going back to my Intel days, is we made DRAMs. We were very proud of the quality of our DRAMs, and then a company by the name of Micron came out with a DRAM, and we took that into our lab and tested it with our fancy n-cube walking diagonal patterns, and it was a joke. Everybody laughed; this thing is a total joke. Of course they were selling for about a tenth of what we were selling for, and the reality was, it was exactly what the PC market needed, and it was all the PC market needed. They didn't need all the fancy bells and whistles that we had. So the recognition of what the market was, and satisfying the customer, it's like McDonald's is a good—very high quality company, because you get repeatable service from there. It's not high-end cuisine, though, they're different markets. So if you're selling high end cuisine, and not recognizing that the bulk of the market is going to McDonald's, you've got a problem, and I think that was the fundamental issue.

Baker: The other thing that happens in Silicon Valley is that companies pass sort of a point of no return in talent. And so you look at Weitek, which was on the way down, the stock was down, how could we attract people? Well, hope and options. You know, and hope and options were not very attracted to sell. NVIDIA was a brand new company, venture backed, it had hope and it had options, and so it was just an unfair fight in terms of being able to compete for talent.

House: So there were some key people that wound up leaving, Chi-Shin and Fred Ware were both key. When did they leave, and what were the circumstances there?

Roach: I think Chi-Shin left in '86, and--

Baker: Fred was after me, so he was probably around '92. He went to Rambus.

House: And what were the conditions around Chi-Shin leaving?

Roach: I think he saw an opportune business, and an opportunity that could be serviced by something he could do, and he got out a chip—it was kind of socket stealing all over again, and he went and did it with a couple of guys, and got profitable very quickly. It was kind of like Weitek phase one all over again at IIT.

House: So Len, you've got a number of documents there. Fortunately you had a good set of files. Can you tell us a little bit about what you've got there?

Baker: Yeah. I've got a—I'm looking here, Dave, at your name, as part of the board list in the IPO. I know how old you were then, it says so right here.

House: So was I on the board at the IPO?

Baker: You were on the board at the IPO. You were—yeah, and you and I are exactly the same age, which makes me feel bad, because you look a lot younger.

House: I was going to say that same--

Baker: But I have a—the IPO prospectus, I have an annual report from '93, and the original business plans, and a bunch of strategy documents that, from all the strategy off sites that we used to go to, and talk about how to get this product strategy that we never got right.

House: Well we'd love to get copies of those for the records here at the Computer History Museum. And—so one of the things that was always amazing to me about Weitek, is, sort of, the spirit that existed there, and the way the team held together, because I've had invitations to reunions. Tell us about what happened after Weitek, with the team that was at Weitek.

Roach: You mean later on in the stages?

House: Yeah, even till today.

Roach: Well we have an annual Weitek reunion, and we get probably 45 to 55 people each year, that show up, Weitek people over the years. Sadly, Art passed away last year, so he isn't able to come, but we're going to keep that going and I think it's a tribute to the company that it was always a place of high integrity, it was a fun place to work, a lot of the credit I think goes to the original team. You know, Ed and Chi-Shin had that can-do spirit. As Len mentioned earlier, the guys had an uncanny ability to work and want to get things done. Art, of course, shaped the culture a lot. I think Bob Derby deserves a lot of credit, because he's one of the best team builders I've seen anywhere, and John Rizzo of course, of this

profession, you know, adding the brand and making Weitek seem larger than life. You know, Barry later on, added his flavor to the place, because a lot of guys at the reunion came in at—around the Barry stage as well. So somehow it just kept that going through all the years. Very unique in that respect.

Farnow: We were discussing yesterday in our pre-meeting that one of the unique things about the company was that there really were a lot of very intelligent people and not only intelligent, but unique personalities. So that made it a fun place to work, because you weren't really quite sure what you were going to run into when you came in every day. I think also at the core, Art's work ethic, and his interest in the business, and his enthusiasm was quite infectious. He—everybody in the company knew him, he wasn't an ivory tower type of president that would hide away. He'd know all the engineers, and roam amongst them to both evangelize as well as motivate, and I think that went a long way toward making the company flow like it did.

Roach: Speaking of bright people in the company, just a quick story. Ed and I were in Japan one time, and we were meeting with the Hitachi workstation group, very serious guys, and very prideful. So we used our overhead slides, our transparencies for a while, and then they kept asking more and more details, and Ed said, that's okay, do you mind if I go to the blackboard? And it was a blackboard back then. So it was a very large conference room, and it was a wall here, and a wall here. Ed started on the top left hand corner and went all the way, with really detailed floating point algorithms and formulas, covered that, went all the way down over here and finished there, and then he just blew the guys away. They were having a hard time following this, and at the end, Ed stood up, being a very good technical salesman, and he said, "But please, I'm just the dummy here, the guys back in Sunnyvale are very smart, they can go into a lot more detail." And the guys—So yeah, everybody pitched in on the sales process.

Baker: The company was, in terms of the companies I've seen, certainly the IQ density was higher than practically anything I've seen, but also there was an incredible sense of urgency. It wasn't just a work ethic, but it was an incredible sense of urgency. So I went back last night and looked at one of the— actually an annual review I had done for Art, for Jim Patterson, who was the Chairman then, and I wrote about a three page letter on Art, and the word that I kept using was commando mission. So Art was—his operating style was very much sort of a commando mission. He always had a commando mission, meaning—commando mission, meaning, number one, usually it's a very small group of people, number two, a relatively short term objective, and number three, an incredible urgency about achieving that objective, almost with the idea that it's achieve or die kind of sense of urgency. And that was very much the cultural atmosphere in the company from my perception.

House: So Art played a key role. What was Art's approach when he was up against a really difficult problem, or something that you know, difficult situation?

Roach: Sense of humor.

Farnow: Yeah, you know, I think he kept his cool. At one point in time, during our ramp with Sun, we ran into a quality problem, and Art happened to be off on vacation at the time, and this was a potential for us to lose-the-company type quality problem, in that we weren't quite sure of its severity, we had to be very careful with how we treaded with Sun because the last thing we wanted to do was to alienate the customer. You know, you want to protect the customer, but you also don't want to die in the process. So we all stood around and probably didn't do a very good job of seeing our way through to what the end line was. And Art got back from vacation, and just kind of shook his head, took us all into a conference room, and in about five minutes, explained how we needed to approach the problem. I remember, this was a Friday, because Monday was our meeting with Sun to explain all of this. So I got to go home and spend the entire weekend with PowerPoint, figuring—retooling everything, in order to make it a successful meeting with the customer. It actually ended up being successful. The customer was quite upset, and got really, really mad, as I was standing in front of them, so I said, yes, you're absolutely right, it's all my fault, and at that point, they kind of shut up. Later, Art said that was just brilliant, just brilliant. But he got cool. That was the thing that--

House: He had a unique communication style. Can you tell us about how he communicated?

Farnow: Yeah, well I can comment on that. Art was thinking at a million miles an hour, and that made it very difficult for him to sit much like we are now, talking something through. So as a result when you talked to Art, he would typically be standing, wherever you were, and pacing, and not little pacing, big pacing, so of course Weitek was a cube environment, we only had conference rooms, we didn't have any hard wall offices, so it was not out of the question, and actually fairly normal, to be sitting at your desk having a conversation with Art, and while he was talking with you, he'd actually walk out of your office, into the hall while he was talking, and then come back in again, because that was the only way he could get sufficient pace involved to keep his mind working, I guess.

House: And what was his approach to product definition?

Farnow: That's you, Ev.

Roach: You know, he was a very strong sense of imagination, he was a creative guy, so he always had a lot of ideas, but he was never heavy handed, that, hey, it's got to be this way. He would kind of, you know, discuss with everybody on the fly, and come up with things. But he was always pushing—all the ideas he threw out, he didn't mean that seriously. Sometimes it was, okay, I'm throwing this out to challenge, and get the best ideas forward. I think the company then, as we grew, and we were trying to get from 60 million, or whatever it was, to get to a couple of hundred million, that's when we split up into these business units, and then it was harder for Art to really get his hands on it at that point, but yeah, he was hands on guy, and it was always from the customer working backwards.

House: Did Weitek have any favorite restaurant, bar or hotel?

Roach: The Sunnyvale Hilton, which was over on Lakeside, was a good watering hole, and a lot of guys stayed there. That's no longer there anymore, and there was the Rusty Scupper next door, which is now the Fault Line Brewery, so yeah, a lot of credit card bills exercised there.

Farnow: I'm in operations, so I wouldn't know.

House: So what is your most memorable moment or event at Weitek?

Roach: Ed, go ahead.

Sun: Oh, actually, at—I think the, in Weitek, I have many memory moments. One is of course, was the excitement to go to IBM Yorktown Heights to work with those super-smart hardware and software guys and physicists, to work on this quantum chromodynamic supercomputer, and along with the professor in Columbia University, and Germany and Italy. So that's a—and we were building a supercomputer more than ten times faster than Cray-1 supercomputer, and utilizing Weitek floating point chips. So that was one memory moment. The other one is I think we—Everett and myself went to Japan to building the laser printer controller a specialized microprocessor to doing the—for the laser printing, running the PostScript, and that's actually a very specialized microprocessor with instructions optimized for the PostScript and nobody will do that kind of things, and actually I think the Weitek has such an environment allow you to do such thing, was pretty amazing, actually, already. But I think the—in the end, I think they bought quite a bit of those chips for the laser printer, and we are obviously the only one, so actually that was also designed to be very low cost, so very unfortunately that we didn't carry through the same things all the way through the PC graphics. That was a little bit a pity to me, because we actually have some low cost design.

Roach: And just to interject, that was one of my most memorable times, too. Do you remember, we had lunch with Adobe, with [John] Warnock and [Charles] Geschke, and these are the heavy hitters, and they take their time to have this fancy lunch with us, to announce that they're going to port their PostScript engine to our processor. And it was like, I can't believe this. It was just amazing.

Sun: Yeah, the founder of the Adobe directly working with us. So anyway, I just feel a little bit pity, because the PC graphics, even the low end, we can cover. I don't understand later on, why I wasn't able to keep up with—You know, yes, we had high end, but we also have a low end design, because the laser printer required very low cost.

House: Okay, other memorable moments?

Baker: I think the two things I remember, one is, I remember the 1985, when the board and the sales organization went to the Kona Village in Hawaii. Dave, you were there, Ed was there. They had a sales contest, and the sales guys got a trip to Hawaii, but they didn't have enough sales guys, so—to make up a group. So they invited board members and we went and it was very interesting few days, because this was a hyper-competitive group of people, and I remember, we get up in the morning, and sailing and golfing and everything and you know, I think at the end of the week, everybody came back and went to work and I came back and slept for a couple of days. But the other thing I remember is just these meetings with Art. You know, we've all had this experience. You get in these—one of these intense meetings with Art, and he starts talking and his mind is working, and he's completely oblivious to anything that's going on around—except the logic process that's going on in his mind. And he had this way of communicating, where he'd have these very, very long chains of logic, and he'd never tell you what the answer was. And so you'd have to, you know, kind of listen and listen, and he had a kind of roundabout way of communicating, you were never quite sure whether you were going to miss a step, in which case, if you missed a step, you're going to miss the whole thing. And then finally, you know, you'd get to the answer, which was usually a surprise from the premise. And it was just this intensity of these conversations. It was unlike any conversation I've had with a CEO, before or since.

House: Steve, any memorable moments? You told us the Sun story, but other memorable moments?

Farnow: Yeah. I've got two stories to share, and one of them relates to Art. As I mentioned, when I came aboard, my job was to get costs down, and back then we were shipping in ceramic BGAs, so not exactly a low cost package. And Art came down, I think it was the 3132, or 3167, and he said, what I want you to do is to do a gold stencil of our logo and Weitek on top of the package. And I said, well it's going to cost a dollar a chip to do that, Art. He said, yeah, that's what I want to do. And I said, well are you—and he goes, that's what I want to do. So I said okay. So we started doing that. Shortly thereafter, we designed the part into the Sun SPARC Station. So when Sun did their announcement of the SPARC Station, they—I think it was "Electronics Magazine," which was the big deal at the time, they did a two page spread that was nothing but the SPARC Station board. And it's populated with all these plastic parts with laser marking, which you probably know, almost entirely impossible to read, and then there's this big Weitek chip which is a one inch by one inch chip, with this gold logo, Weitek, emblazoned on it. They had mis-socketed it, so that it was upright. Because it actually should have been at a 90 degree angle, but that didn't look right, obviously to the art director. So here's this big thing, you look at it, all you see is Weitek. So I'm at my desk, and Art comes down and he's got the new "Electronics Magazine," he puts it down, he says, "That's why," and walks out. That was Art. The other story that I'll share, which is a little bit of a personal one, but it is interesting from a foundry standpoint. Toshiba was a very strong partner of ours, and did a lot of our chips for us. And at one point in time, from a cost saving standpoint, we did an IP share with them. So we gave them some IP, some floating point IP, and in return for that, we got a whole bunch of foundry privileges. Art was over, along with a couple of other people, and me, negotiating with fairly senior people at Toshiba. So we negotiated a deal, and then I was left there for the next day, to sort of go through the—wrap everything up, and Art and the rest of the guys left and the high end people at Toshiba left, and we're sitting at lunch this last day, and I'm sitting looking through the deal, and all of a sudden, I realize something just really doesn't look right. And so I keep going through it in my mind, and I just had found a

way to look at it that was a little big different. So I mentioned this to my counterpart, and he said, oh, this is way over my head, so we've got to call our VPs back in. So they called all the VPs back down and I explained to them the problem that I was having, and they looked at me, and I guess it was a window into how a US operations fabless semiconductor guy looked at things, because they said, well we understand what you're saying, and what we'd like to do is make the following trade. We'll give you an additional $100,000 that will more than offset your concerns, if you will take the time and explain your thought process to everybody at the table, then you get your hundred grand. So I had a really good sushi dinner that night, I felt very good. I was all by myself, I didn't have anybody to celebrate with, but these guys next to me, who didn't speak any English, but that's a memorable moment of mine.

House: Ev, do you have any more you'd like to add, any more memorable moments?

Roach: No, I don't think so. No, not that I can repeat in public.

Sun: We had a very interesting dinner at Matsushita's 38th Floor.

Farnow: I remember that.

Sun: Maybe you can—You remember that one, they cleared the whole top floor for us?

Farnow: Yeah, Matsushita was another one of our foundries, and we were in the Kyoto Research Facility, and I think, in large part because of Ed's relationship, and you notice that's a common thread to a lot of things we talk about today, but Ed developed a relationship with Matsushita, which I eventually took over from an execution standpoint. But we were invited to go out to dinner with, I think it was the number two guy at Matsushita, and so we were going to go to dinner, and there was a whole bunch of us, Leon Torbin, [ph?] I think there was about ten of us. And Art, of course, and a number of people from Matsushita. And we went to the Matsushita Towers, which are in Osaka. And there's these two giant high rise buildings, these giant high rise for the time, and we go up to the top of the building, and it's one giant room with a huge dining room table in the middle, big chandelier over it. So we immediately walk to the windows and we look over to the other building, and it's like wall to wall people, all crammed in, all of who have paid 100 Yen or however much, to go up and do that, but the top of our building is just us in a room the size of this auditorium. And so we sat down, and they had flown their chef in from Tokyo, and he had his four gold medallions from the—his cooking awards, and I remember Art leaning over to me and saying, Farnow, you have never had it this good, have you? And I hadn't, and the Toshiba executive, I've forgotten his name, was sitting across from me. As we started the meeting, he said, Andy Grove was sitting right where you were last week. So I guess that was a memorable moment, too, Ed, thank you.

House: So, men, I'm going to ask you if you have any other thoughts, but Rosemary, have you got anything other topics?

Rosemary: No, I think we <inaudible> Oh, I do think, a little bit more detail on the first fabless semiconductor company and the transition from contracting with the IP kind of exchanges and becoming a fabless semiconductor—

House: Well the initial work was with Intel.

Sun: Yes.

House: And that was as a pure fabless--

Sun: That's right.

House: That was with Carsten, I think, it started the foundry business, right? Did you deal with Jack Carsten at that time?

Sun: I remember the reason why they let us in, partly because there were a little recession of semiconductor in the '80 to '83 period, so they had some room for—so they really don't want to do it, foundry business, but--

Farnow: Yeah, actually, the foundry business at Intel started around 1990, because it was right about the time that I left the company, because I remember Larry Regis--

House: Okay, because it was in '83 that Carsten left Microprocessors and went over to do the ASIC business, or the idea was to pick up—it was to pick up the technology from IBM in '83, that Jack had negotiated and—because I was working for Jack at that time, in '83.

Roach: When I left Intel in '86, Carsten was in Arizona doing the fab stuff, because that was Fab 6 out there, and he was getting all of that going. So yeah, he had some role, whether he did with Weitek or not, but he was definitely doing ASICs at that point.

Farnow: But certainly at the time that Weitek started, there was no TSMC foundry type business, and I think we were discussing earlier, I think most companies, most chip company startups, always figured that they would grow up and be big and make their own fab. And at some point in time, people just couldn't afford to do that anymore, and whether it was that they were backed into that business model, or somebody was smart enough to recognize that there would be people willing to supply that, as their business.

Roach: But you forget what a big barrier that was at the time, that the real men have fabs. I'd forgotten completely about that until today, but it was a big deal back then.

House: Was it a deal with your customers?

Roach: Yes, definitely. Oh, they just felt like—and then they asked if you had supply agreements and they wanted to see them. And of course you didn't, because a lot of it, the companies weren't pure play foundries, they were just opportunistic, we'll sell you some wafers.

House: Well I recall in '83, when Intel was in a bit of a downturn in the semiconductor business, that we decided to run wafers for other people, and it was very clear at that time, I mean, from my standpoint, that that wasn't a long term deal; it was just a gap filler. I mean, how would we—how could you compete with Microprocessor wafer starts, versus foundry starts? It was, you know, it wasn't going to work long term, so I'm sure the customers were sensitive to the—

Baker: Well we invested, when we invested in '82, it wasn't completely unforeseeable that a startup company could do its own fab. I mean, you said LSI Logic, for example, got started, you know, the same time you did, and they did their own fab.

Sun: They're building their own fab.

Baker: We were an investor in LSI Logic.

Sun: Yeah, you have a six million dollars investment, I remember that.

Baker: Yeah, we put $6 million in LSI, bought 60 percent of the company, which we thought was an outrageous valuation at the time. But Wilf Corrigan was, you know, a big name, and so he could attract what was then a very large amount of capital. But it was—today, of course, it would be completely impossible. I mean, it's impossible for anybody, but IBM and Intel to afford their—maybe TI, to a certain extent.

House: Samsung.

Baker: Yeah, well, and Samsung to afford their own fabs today. So it—but in those days, I mean, I remember when I started at Samsung in '73 we had a mask aligner company and mask aligners sold for $10,000, at 70 percent gross margin, so it's just gotten much more capital intensive.

House: But as the time went on during the '80s, up into the '90s, the fabless business became an acceptable model.

Sun: Yeah, but I remember very well, because before Steve came in, I have to look for foundry, that was my responsibility. So I found Intel, but then Intel start having good business, and they start their lead time stretched, first, when it was empty, they were very happy to see us, and later on, their face became more poker, and the lead times stretched from 16 weeks to 52 weeks, and we know we are finished. So I went to see Yamaha in Japan, Epson in Japan, Toshiba is my friend's company, you know, it happen to be my old friend is in charge of the semiconductor division, so I went to Toshiba. So I went to many companies, to beg for supply of wafers, and so—

House: Was VLSI Technology where you found it?

Sun: VLSI wasn't, because VLSI wasn't mature enough. We were looking for more mature guys, okay, and Intel, of course was mature, and Toshiba is mature, and the Yamaha, at that time was actually having a decent fab as well as the Epson at that time. So VLSI was a new company at that time, so we didn't really look then. So anyway, it was very, very difficulty time, and I think the TSMC and UMC was start, because the Taiwan government fund really, otherwise, it just to start a foundry business, unless you've got a deep pocket guy, even in the 1985 '86, was not easy. You know, because you needed more than just, you know, you need a whole infrastructure, gas, water, everything, okay, and that's the Taiwan government pay for it. that was—

Roach: And we used to fib about our volumes by 10 or 100x, and how many wafers we were going to buy.

Sun: Yeah, so in a way, the fabless semiconductor business was, since the 1985, become viable partly thanks for the Taiwan government, who actually willing to take the risk. In fact, all the money came from Taiwan government.

House: So what have we not covered? Anybody have anything else?

Farnow: You know, the only other comment that I'll add is that, as I was thinking about Weitek driving in, and what made it successful to get off the ground, it's because it had three pillars. One of them is sitting right here, which is the idea guy, and I hope it's come out through our discussions that Ed just has a zillion good ideas in a very short space of time. And you couple that with somebody like Chi-Shin who was an exceptionally good engineer, and Art, who was a very good business type person, and you've got what you really need to make a company, and I think that was a momentum that got us where we got to, and unfortunately we weren't able to reinvent ourselves in the face of what was happening in the industry, but it was a good company to work for, and I'm very happy for the experience, personally.

Roach: Well, you know, one thing maybe we didn't touch on, was back in the mid—I was at Weitek and I took a couple of day class at Stanford, and it was called, High Tech Marketing or something, and I remember they had transparencies, and there was four stages of technology growth, there was zero to 50, then 250, then a billion, and then 10. And so, then they laid another transparency on top, and they showed companies—and the deal was you either got to 50 or you didn't get anywhere, and then you had to go from 50 to 250, you couldn't kind of go to 100, or 150, there was something magical about that. And then they showed how the company, the mindset, the management, delegation has to change, and so Weitek got to 50, but I guess it's the question of why couldn't it get to 250, and what happened. So they showed all these, and the one example they brought up was Gordie Campbell at Chips and Tech. And he had his 300 giga-buck goal, wanted to get to $300 million, and well, he didn't get there, and he slid all the way back down to 100, and a bunch of companies, I don't think that's —maybe they don't comprehend what they really need to do differently to get from 50 to 250.

House: Did any—do you recall anything there about what was required that Weitek did or didn't do?

Roach: Part of it was the characteristics of zero to 50, for one product, it could be a one product—one hit wonder, or socket stealing can get you really fast to something, but that's a certain mindset and then you've got to, you know, change. So I think what happened is, we changed, but we didn't really execute on those business units of multiple businesses, senior management saying how do I have business unit managers or whatever you want to call them, mini- GMs that can run those business, and as we talked before, one of the things we didn't retain the talent so, and then we didn't back fill it with the right talent, and then maybe we didn't hit the timing right, or a whole bunch of things, but that's kind of what happened to the company, it didn't bust through to the next level.

Sun: Now looking back, I think that I had a long discussion with the TSMC founder, okay, and he always said, hey, you've guys, at fabless semiconductor company. They come and go. I'm the house. You are just a player. I see too many people come and go, okay, and you know, I always win, I'm the house, I'm the casino house, okay? The players always lose, okay, somehow they—you become a supernova for a while, you know, like supernova means two weeks shining on the sky and everything is very bright, and cover the whole universe but only two weeks. Two weeks later, gone, okay? You know, that's the—back to the Jerry Sander always say, the real man has the—needed fab, and the Intel does that, and the Intel always doing good, okay, so for Intel, you don't—you can stick with the microprocessor business continuously, because you always have new leading edge, probably one generation ahead of everybody else in the manufacture technology and so on, so with the Moore's law, it means that there's always new opportunity for new companies, so if you want to stay in the fabless semiconductor, you've got to continually reinventing yourself. You need some new idea, good idea, more integration, or continuously follow the trend. If you don't, you will be just a supernova, okay? You know, shining.

Farnow: It's probably hard, if you're a supernova, to recognize that you need to reinvent yourself. That's right about the time you need to think about it.

Sun: By looking back, all my history, same thing. I think the fabless semiconductor people need to be very careful. You've got to always thinking ahead. I think there's a lot of good company now, like Broadcom, Qualcomm—

House: NVIDIA?

Sun: And they continuous pumping, okay, new ideas, and of course they build some—enough momentum in graphics and so the other guys cannot easily catch up. Okay, NVIDIA, you have to give them credit, they continue improving themselves all the time, and finding new market and so on, so there's Marvell is doing—continues doing good, so--

Roach: But at some point, you have to pick a segment that you can be number one or two in, and dominate that, and then subdivide it, move on to the next thing, and I think what we were trying to do is four or five different things and--

Sun: But even that, okay, because of Moore's law, unfortunately, there's the new guys always can come out with the latest technology and they try undercut you. Okay, and they take more integration, and so, so you have to be careful about it, even you are the leader, you needed to just, you have to work hard. I think that Broadcom is a very good example of that, okay?

Roach: So I don't know if you remember, oh, you were gone, but in 1990, Gary Baum from S-3, came over and remember, S-3, at one point, they had a whole bunch of different stuff and he said—he goes, guys, we've just realized that we've got ten different things we're trying to do. We've got core logic, we've got a CPU, we've got graphics, we've got—and he goes, do you want to buy any of this stuff? We're just going to do one thing. We're going to bet it all on graphics, which they did, and they were a supernova for a while. But that was kind of like we never got to the point where we said, we're going to do this one and just nail it, and put the resources on.

House: Did you ever complete a SPARC chip, a SPARC processor chip?

Linda Berlin: I left in 1989, but Art continued to have heavy resources put on the SPARC microprocessor, and he did some of the generation he did a pretty good job, I think.

Roach: But was it ever a SPARC core? I thought it just had the interface to a SPARC architecture.

Farnow: I don't think we did a SPARC core.

Roach: I don't think so either. I think it was just fashioned to interface to a SPARC processor.

Sun: Actually, I don't know exactly, but actually I think they have the whole thing. But Sun is not that open, so therefore, doing something so-called licensable but not everything open, is very difficult.

END OF PANEL