Computer History Museum

Oral History of John East

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Laws: It's Monday, August 8, 2016. And we're here at the Computer History Museum. I'm David Laws. I'm the semiconductor curator here at the museum. And we're going to interview John East on his long and important career in the semiconductor industry here in Silicon Valley. John, I'd like to start out by talking a little bit about where you came from and how you became interested in technology. Where were you born? And where did you spend your early childhood?

East: I was born in Texas because my dad was in the air force during World War II. I lived there my first year. Then we moved around a little bit until I turned five at which time we moved to the San Joaquin Valley. So I was pretty much raised in Merced and San Joaquin Valley. I was not the kind of student that you wanted to have if you were a teacher because I was mischievous, I guess. So in order to settle me down, my sixth grade teacher tried to get me interested in electronics and that meant tinkering around with crystal sets and things like that which seemed like a fun thing. So I decided then that I wanted to be an engineer and I was. I wasn't a good engineer, but I was an engineer.

Laws: Do you remember the name of the teacher?

East: Sure. Mr. Fantz, F-A-N-T-Z. He was quite an old gentleman then so I'm sure he's passed away. I hope he's not and he sees this and he recognizes I'm giving him credit or blame, however you judge that.

Laws: We all have somebody like that in our lives. I had a teacher who was great benefit to me. And so you stayed in Merced, and you went to high school there throughout your youth. And graduated when?

East: I graduated from high school in '62 and started Berkeley in the fall of '62 as a double E. (electrical engineer.) I did have one semester where I actually changed majors into physics because it was more fun for me. But I'm a practical guy, as you are, and it was a lot more practical to have an engineering degree than a physics degree. So I went to back into EE. And I got out of there in '68 with MSEE and an MBA.

Laws: Good combination for moving into Silicon Valley.

East: It seemed like it. Yeah. It seemed like it.

Laws: And were there any teachers or any people you met at Berkeley that left an impression on you that you think was valuable later in your career? Did you come across Andy Grove's physics class?

East: I actually took his physics class when I was at Fairchild because it was given up at the R&D place, but I was unaware of Andy Grove when I was at Berkeley. I guess the most influential guy would have

been Donald Pederson who passed away a few years ago but he was the guy that drove SPICE and was an early semiconductor guy, but a 'Jekyll and Hyde' professor. He was the nicest guy in the world and a really smart guy and friendly. He would pat you on the back. But he would also stand in front of what he was writing on the chalkboard so it couldn't be seen and talk really fast. I never walked out of one of his lecture having understood anything about what he said. But it was clear he was a good guy and knew what he was talking about.

Jesse Jenkins: Now, he was an author, right? Didn't he write a book?

East: Yes, he wrote the book that his students jokingly referred to as the 'Yellow Peril'. The reason they called it the Yellow Peril is   ---   when he was writing it he would type up drafts of whatever the next chapter was and give them to us. I had the bad luck of being in his class the year he wrote it. So he'd give the notes to us when we'd walk in there and, of course, I just described that I couldn't understand his lectures. But I thought I'd have no problem. I had the notes that he'd passed out.   But an author can never get notes right the first time. He certainly couldn't!! There are always mistakes - right? And so I'd go home with the notes and try to work my way through them and I thought, "I must be stupid. I don't understand this. I don't understand this." And I wasn't the kind of guy who would go ask the profs. I was always afraid of the profs, so I'd feel like I must be the dumbest guy in the world. At the next lecture he'd start out by saying, "Well, I hope you caught that in the notes I had a mistake here and here and here." All the things I'd been working to understand??? They were wrong!! And then, when they actually put it together into a book (which they did right at the end of that semester), it was a yellow covered paperback. So it got referred to, by myself among others, as the Yellow Peril. It was yellow and you read that book with peril. So that's Yellow Peril.

Laws: Did you study much about semiconductor technology when you were there?

East: No. I picked communications for a specialty which I regretted for the next ten years thinking: "Gee, I should have done computers or semiconductors". But, in fact, communications made a return in spades about thirty years after that. But by then anything I'd learned I had already forgotten. But no, I was not a semiconductor guy. In fact, I didn't much like them until I started working with you, Dave.

Laws: So how did you end up at Fairchild?

East: I was going to graduate in December of '68. Not graduate. I graduated in 1966 but I was going to get my master's degree in December of '68. And Berkeley was set up with the two-- I guess they would be biannual -- college recruiting programs, where all of the corporations would come in and the students would go and interview and get the jobs and what have you. So, one of them was in the summer and one of them was in December. My plan was to go through the college recruiting in the December session. . Then,   my 'wife to be' and I decided   that it would be better to get married in June of 1968. (Our original

plan had been to get married the following summer). If we were married I had to be out of school pretty quick and earning a living. So instead of taking the summer off, I went to school in the summer and got out in September. But there was no college recruiting program in September. So I wrote 40 or 50 letters. There was a college placement handbook that had the address of the important companies. I wrote to them basically saying   "Dear Sir, you don't know me but I want a job." I got back, I think, three responses which was a little depressing   One was from IBM, where I interviewed and they didn't offer me job. One was from HP where I interviewed, and they didn't offer me a job. And one was from Fairchild. All I knew about them --- or thought I knew --- was they made cameras because the company name was Fairchild Camera. I said to myself: "I guess I'm going to be a camera guy." I interviewed with them and they were all excited. They thought I was the greatest guy in the world and they offered me a job on the spot. And this was in maybe, May of '68. They knew that I wasn't going to be done until September and they said, "That's not a problem. We'll wait for you. You're going to be wonderful. In fact, you don't even need to communicate with us. The day before you're done, just call me and we'll make arrangements for you to come and everything will be great." This was at a lunch that I had with a guy named Gene Flath, who you would know Dave.

Laws: He went to Intel?

East: Yeah, that's right. And a guy named Jerry Briggs who was the HR guy was at lunch as well and they both gave me their business cards. So when I had one day to go --- I had just taken my last final and was ready to go to work ---- I picked up the phone and called. A lady answered the phone and I asked, Can I please speak to Jerry Briggs", because I was afraid of Gene Flath. He was going to be my big boss, right? And Briggs was the HR guy. This lady said, "There's no Jerry Briggs that works here and I've never even known a Jerry Briggs." We debated for a while and after I while I asked her "well, how long have you been there?" And it had been a couple of months. I can't remember the exact amount of time. The department had turned totally over in that period of time. So I thought, that's not a problem because I've got Gene Flath's card as well. I'll just call Gene Flath. So I called Gene Flath's number and got a secretary. And she said, "There's no Gene Flath here and there's never been a Gene Flath here in all of the time since I got here." Well, how long have you been here? "A couple of months," something like that. Fortunately, I had the offer letter and I told them that I had an offer letter. And they said, "Well, okay, we'll honor it. But what had happened, of course, Dave, you would know all too well ---- was that Noyce and Moore had left in July and Les Hogan had started as CEO all in the four month window between my accepting the job and actually starting there.

Laws: A month after I joined. I don't think there's any connection.

East: Okay, so they left and then Sherman Fairchild brought in Les Hogan. Hogan brought in his seven top lieutenants and they were referred to as 'Hogan's Heroes'. They proceeded to fire about a third of the upper ranks. About another third of the upper ranks said, "Well, wait a minute if I stay around they're going to fire me, too." They left as well.   So everything had turned over. When I got there nobody knew

what was going on. Nobody knew who their boss was. What a zoo it was. But that made it almost seem like fun. And the other thing that was noticeable was ---- in the other companies where I interviewed the managers were 40-year-old, 50-year-old people, which today doesn't seem very old, right? But then it seemed ancient. You mean, I've got to be around twenty years before I can get a manager job? That's terrible. At Fairchild the managers were kids. They were 25 and 26. And not only were they kids, they were kids viewed as being experts in their field because the field was that young. Did I get all carried away to the answer to the question?

Laws: No, I think I've heard the story before, John, and it's consistent. Thank you. Do you remember, who did you work for then when you started? You must have had somebody as a boss and what was your role?

East: Actually, when I got there, they didn't know I was coming or rather they had 24-hours notice. So they looked for a possible job. And the first possible job was not as an engineer. It was as a foreman in wafer sort and class which people today would refer to as probe and final test. But we called it wafer sort and class. So they said, "Let's just stick you in here for a while and you can supervise this group."

Laws: With zero experience.

East: With zero experience, And so yeah, I went in there and there were a whole bunch of ladies, because then it was very sexist. The engineers were all male and the operators were all ladies. They were doing things that I had never seen and never heard of which they called wafer sort and class. I thought class might have something to do with studying. It didn't. And it was my job to supervise them ---- go figure. My immediate boss was a guy named Les Faerber.

Laws: Les Faerber. Yeah.

East: Very nice guy. I didn't get the feeling he knew much about what they were doing either, to be honest with you. But he took me and got me a smock and introduced me to the secretary and then took me into the wafer sort and class area. And then he said, "I've got a meeting. I've got to go." So he left. And I'm looking around scratching my head. So I start introducing myself to the ladies. But they didn't think that was strange at all, because in those days people came and went extremely rapidly. They properly diagnosed that they didn't need to bother being that nice to me because I'd be out of there shortly. They were very nice ladies, though. I hope some of them watch this because I want them to know that I appreciated them. They taught me what little I knew back in the time. And then three months later I was a product engineer.

Laws: Okay, was that a choice? Or, was that the job they offered you?

East: That was a choice because actually, you remember this history, but they were dividing digital integrated circuits, which was under John Carey who is a fascinating subject, in and of himself, into three different groups. And there weren't enough good engineers to staff all three groups. So there was a little bidding war. Each of the three different groups wanted me to join them. It was kind of fun. I got to pick. And I made a pick that in retrospect was probably the worst pick but it all worked out all right.

Laws: And which group did you end up with?

East: I ended up working for a guy named Doug Finch who had been brought in from Motorola by the Motorola guys. His group was called Special Integrated Circuits.

Laws: Yes, custom circuits, CML and the UNIVAC circuits.

East: Yeah, that's right. And, in fact, you and I met each other because one of my products was the CML that we never finished developing and one was the temperature compensated ECL. But those ended up going nowhere. One of my products was RTL, which was the very first integrated circuit line ever in the world and it was kind of a brain dead circuit. It had any number of problems, but that kind of made it fun for an engineer. It's really fun to look back and think I had something to do with that very first line that ever came out.

Laws: Micrologic.

East: Yeah, Micrologic. That's what it was, Micrologic.

Laws: That's a good place to come into the semiconductor industry because you had the chance to see every facet of processing, testing, and design. So it must have stood you well in your future career.

East: It stood me really well. Gee, I had so many different bosses. And, in fact, my boss didn't dictate that I do this, but I had heard of other bosses that dictated it. So I decided I was going to do it --- that is ---- I was going to do 'womb to tomb'. Do your own design, which in those days was almost trivial for a DTL circuit, let's say. And your own layout which, again, was almost trivial. We didn't make our own masks, because there was a mask shop. But you'd do the drawing, which was easy. You'd cut the rubylith, the 'rubies' as we called them, take them to the mask shop and then they'd give you the masks. Take the masks in the fab and make your own run of wafers. There were a couple of things they wouldn't let you do in the fab. Evaporation systems were tricky, so they would insist on doing that. But as far as the masking and the diffusion and things like that, yeah, I went 'womb to tomb'. I did a design and had the mask made. I went in the fab, made the whole thing, wrote my own test tape. It made you feel really

manly at the time. But Dave, there's not one of those things today that I could do. Each aspect has advanced so much that I wouldn't understand the first ten percent of any one of those steps.

Laws: You wouldn't understand ten percent of a circuit diagram today.

East: Yes, that's right. That's right. In fact, ten percent of a circuit today is a billion transistors. Right? <laughs> That's a lot of transistors.

Laws: <laughs> That's for sure. Interesting beginning, John. So how long did you serve as a product engineer? And what was your next step?

East: Well, it was a madhouse at Fairchild which made it fun. But the fact it was a madhouse led to giving you the ability to change what you were doing almost at any time you chose to. So I did that a lot. I did some circuit design. I did some process engineering work under the guise of a product engineer. I was a product engineer for a long time. I was a wafer sort and class foreman. I was a general foreman in those areas. Jobs were opening up all of the time and it always seemed like the best way to get to the top would be to have breadth. Even then you could see that somebody who was an expert in a specific area might have rapidly moved to a supervisor of this or a manager of that position, but then might have had trouble because you needed broad based knowledge and they tended not to have it. So I did every possible different job including a year in marketing. I know you'd find that hard to believe, Dave. But I did do one year of marketing. In total I was there at Fairchild eight-and-a-half years.

Laws: And was your last job at Fairchild?

East: The last job was working for Lowell Turiff -- a fine man. I miss Lowell --- as his marketing manager for Macrologic which was a 2901 competitor. What happened then, though, that really made the big difference was the huge management turnover. The top level managers when I was there, who always took care of me, were David Deardorf and Paul Reagan and also for a while, a guy named John Sussenberger. Basically, in 1976 we were losing money and had been losing money for quite a while. So in those days the top brass thought, "it's easy to fix that". You just throw all of the bad guys out and get new guys in. So --- my benefactors were thrown out. The new guys that came in were fine guys and what have you, but we didn't really know each other. There was no bond. They didn't remember that I had been working my butt off for them. So it was a kind of start from scratch situation. And, of course, they had people that they liked who then were seemingly getting the good jobs. By coincidence, right at that time I got an offer from Raytheon to be an operations manager there. That was a good looking job, because it had wafer fab and process engineering, product engineering, circuit design, marketing, - the whole shooting match. Again, under the theory of breadth is good, I thought that would be a good job. Now, it ended up being not a very good company to work for. But, again, it was a learning experience.

Laws: And this would be about 1976 or so?

East: Yes, I took that job in December of '76 and left it in April of '79 when I got to AMD.

Laws: You were there three years.

East: Well, two years and four months.

Jenkins: So let me ask you a question about Raytheon. My impression of Raytheon is always that they were strongly tied to the military and the government type thing as a primary target audience. So you gained some knowledge of that, which was probably going to be something you're going to use later.

East: Yeah, it's perfectly logical, but not the case.

Jenkins: It wasn't true?

East: No, not the case. They certainly were tied into military. That's why Raytheon's parent company kept them around - to do the little things that they couldn't get other people to do for them. But yeah, I just sort of backed into military later for a variety of reasons that didn't really have anything to do with claiming that I knew something about it. It was just luck.

Laws: So in '79 you moved to AMD. What was the process of recruiting and which group did you come into?

East: I had met a couple of times with Gene Conner, who is one of my favorite people in the world, when I was at Raytheon. We were going to -- in fact, we did form a second source agreement. I think that AMD felt ----- and in those days I think it was true, --- that you really needed second sources. And, of course, you never want a strong second source. So I think Gene got out the phone book and looked under the category 'weakest possible second source', found Raytheon, and called me up. He had been at Fairchild when I started there so I knew him just a little bit. He called me, we talked, and we actually put a deal together where we (Raytheon) became a second source of the 2901. AMD was doing really, really well back in those days. In 1979 they decided to split the Bipolar group up. I can't remember what they called it, but they split it into three pieces. One was interface, one was logic and one was microprocessor. And they wanted what they called a product manager for each one of those pieces. They already had two guys that they liked - Bob McConnell and Don Macintosh --- and were looking for a third. So he interviewed me. He offered me a job and I took it.

Laws: And that was the Interface group.

East: I came to the Interface group. Right job, right time. RS-232 was taking off. I have to be honest with you, I had no idea what that was. So I got the books out - what's RS-232? It was on the job training for me. I read an article just the other day that it's still around. But that's where we made our fame in interface. The group did really well. It grew like crazy and it was because of RS-232.

Laws: And that was AMD's most profitable group for many years.

East: Yes. It was dumb luck for me because actually Gene asked me which group I wanted and I'd done some microprocessors and I had done a lot of logic. So I thought well ---- I'll take the interface. And then we ended up making money hand over fist and that made me look good. So it allowed me to do probably better than I would have otherwise.

Laws: And that's at the time that we were peers.

East: Yes.

Laws: You reported to Gene. I reported to Gene as…

East: Strategic marketing.

Laws: Strategic marketing manager for the group.

East: That's right.

Laws: Interesting times.

East: They were.

Laws: What was your next move, John?

East: Well, I stayed at AMD ten years. So should I elaborate on that?

Laws: Yes, let's hear about the products and the people that you think were important in those times.

East: Okay. So who was important? Jerry Sanders is important and Tony Holbrook is important. Those were just really good guys from totally different standpoints as you know better than I do. But to this day I love both those guys. I fell off of Jerry's dance card when I left the company. But I think I'm mostly back on it now. But he never took kindly to me saying, "Hey, I quit."

Laws: Right. I did that too.

East: Yeah, yeah you did. But off the top of my head, those would have been the two role models. But what happened next? They decided they were going to add an extra level of management because this was back when we were still growing like crazy. So they concocted a new level of vice president. And I was lucky enough to get one of those jobs. Analog was combined with interface and that was one of the groups. Logic and microprocessor became the other group. And, again, Gene asked me, "If we make you VP of one of these two groups, which would you like?" I had been doing interface for two years. That's how long I had been there. So I switched back over to do the other. I became VP of ----- I think we just called it Logic --- but it had the logic and the microprocessor products.

Laws: So you were working on the 2901 again back at AMD.

East: Yes, exactly. Doing the 2901 again. Once again, I was very lucky because 2901 was doing fantastically well because of the good auspices of DEC and Data General and people that are well represented around this place. (The Computer History Museum) They took good care of us. You have a lot of 2901s in this building.

Laws: That's right.

East: We could get a screw driver and take this stuff apart and find a lot of them.

Jenkins: It was interesting that in a previously interview with John Birkner - Jeff Katz and I were the co-interviewers - and Jeff had a lot of background working with 2901.

East: Right.

Jenkins: I had had a lot because I had built stuff at Lawrence Labs. And John had also mentioned that was part of his background as well. We just thought it was something that sort of came by, came and went, but apparently it really had a bigger impact.

Laws: I think there were fourteen second sources on the 2901, everything from CMOS to gallium arsenide. It was also in many gate arrays. It became a cell later in cell designs. And it was always much larger than life at AMD than it really was in terms of the importance in all of the other business that it brought in. So there was probably ten times as much memory revenue associated with the 2901 as with the chip did itself. That was, again, a good product to be involved with, John.

East: Yeah. Luck has a lot to be said for it Dave. And I was lucky. I was very lucky. The thing that I always think about when I think about the 2901 was that was the last vehicle that allowed a computer company to design a computer because they'd take our little four-bit slice, and they'd happily design a computer around it. They were the designer. They were the architect.

Jenkins: Come up with your micro word and use it as you choose.

East: Yes. And I think the computer people liked it because of that as well. I think the computer people liked to say, "I'm a computer guy. I design computers." Of course, you know they do not do that now. Intel designs computers. ARM designs computers. That's pretty much it. Computer companies put nice boxes around them. I don't want to minimize what they do. They do a lot of things. But among them is not designing computers.

Laws: or creating new computer architectures.

East: Yeah. So anyway, the next step was they reorganized, again, at AMD and decided they were going to reorganize the company into three major segments. One segment was memory and one was programmable logic. By then it was clear that programmable logic was going to really be a big factor, and AMD had just bought MMI. Or were we just about to buy them? Can't remember. So that was going to be a big group. And the last was what they called 'General Logic' to differentiate it from 'Programmable Logic'. So General Logic is what I ended up with, which had all non-programmable logic products in the company including the MOS products. That's the first time I actually had anything to do with MOS. That probably happened in 1985. Until then I had always been involved in bipolar technology. My expertise ---- what little expertise I have --- is in bipolar. And, of course, nobody would give you a nickel for a bipolar transistor anymore. It's like a buggy whip, you know. You read about the importance it (Bipolar) had, but people don't buy them anymore.

Laws: You must have learned a lot about what makes a good manager in this process. You saw so many groups, so many projects, some succeeded, some didn't. What do you see as some of the clues to how to pick a good manager in that business in those days, John?

East: Well, I always wanted to be a CEO even back in college. It seemed like I had the work ethic that my mom and dad had given me, "You're going to work hard." And then it seemed like well ---- as long as

you're working hard ---- you may as well be a CEO - right? So I always thought a lot about managing, and in fact, even made notes of the managers that I had worked for and what they did that was good, and what they did that wasn't good. And then, of course, you have to match it up with who you are. When I first got to Fairchild, I think I coined the term 'John Wayne' management but I still use that term today. John Wayne management was: you punch them in the nose, you kick them in the ass, you shoot them, you holler at them and cuss at them. Dave, you remember the guys at AMD, I won't mention names, because they're still alive and they may see this, but there were a lot of John Wayne managers there. And it seemed like a good style. And I thought okay, that's the successful style. I guess I'd better learn that style. But it rapidly became a bad style, when you realized that there were many other places to work in 1975 - as opposed to what there was when I got there in '68. In '68, you kind of wanted to work at Fairchild - that's what was there. So they could kick your ass and you would stay and take it. But later, if your boss was abusing you, you could reach in your back pocket and pull out one of the five offer letters that you had there and say, "I'll take this one". You could tell your boss to kiss your rear end and high-tail it out of there. So it seemed to me the John Wayne management style took a dive only to reoccur when a company was super successful, and you had options in the company and you didn't want to leave the company because the options were doing very well. Then John Wayne could be employed again. But -- in the more average job, to be a good manager you had to be more participative. You had to listen. You had to pay attention to what people were telling you. You had to be a leader. You had to be somebody that people would listen to and want to work for. And that's, I think, a lot harder than being a John Wayne manager. Although --- I don't have much John Wayne in me, as you can see by looking at me. I would have been a particularly poor one of those.

Jenkins: You look like a little Clint Eastwood to me.

<group laughter>

East: Physically I get that all of the time. But I don't have any big gun and I don't say 'go ahead and make my day'. That doesn't happen.

Laws: How about innovation? How would you stimulate innovation in a company as large as AMD?

East: You know, I went to an SIA dinner once, and I don't know how this happened, but I sat at a table with Gordon Moore. I actually sat right next to him. I can't think now of why that would have happened. I was thinking about it the other day. But anyway, I got to know Gordon a little bit that night. Nicest man in the world. I'm sure you interviewed him twenty times. Just a really, really, really nice guy. I asked him that question about innovation. And he said, "Well, first of all, you hire super smart people that want to invent. Second of all, then you encourage them to invent. But third and most important, you let them know what it is that you wish were invented because, otherwise they'll be off doing all kinds of crazy things that you won't have any need for. Those are the three things we've done. And we just haven't had any problems. We get more inventions at Intel than we know what to do with. We reject them hand over fist because

there are more than we can possibly deal with." And I think that's good advice. You also make sure the inventors get the credit. You don't try to steal it from them. You make sure they get praise and glory. Hire smart people and they'll go out and do the invention.

Laws: You mentioned earlier the difference between a Tony Holbrook and a Jerry Sanders, two totally different personalities in style and appearance. Why do you think that kind of combination works?

East: Well, that was a classic combination. You have to have a guy with a vision and a lot of charisma to make people want to work there. And boy, Jerry was that. It got harder to have a good vision towards the end. But the decade that I spent there, Jerry's vision was perfect. And I think, Dave, that you actually squelched the vision towards the end along with Clive Ghest because you two guys together-- well, okay, let me back up a little bit. The super simplified AMD vision in the early days was "building blocks of ever increasing complexity". And that sounds pretty simple, but it pretty much encapsulated what we were trying to get done. Then there was a second vision equally important, but it came from a little different angle which was "people first, products and profits would follow". So those were pretty much the guidelines. And those are really good guidelines which were well articulated. It made you want to work there. And it made you understand what it was you were trying to do there and how it was you were trying to act there. But in 1985 or so you and Clive ended up concluding, "You know what, people don't want building blocks anymore, people want microprocessors, memories and gate arrays. And that's it. So this building block gig is going to come to an end." And you were certainly right. It did come to an end. But then, where do we go from here? A tough choice!!! Lord knows nobody wanted to be in memories. As we talked about when I walked in, you had just done a study finding 300 different people who made CMOS gate arrays. Should we be number 301? Probably a bad idea. We, of course, had a position in microprocessors, but it was subservient to Intel. And that relationship was no fun at all and I'm sure you have lots of interviews that dealt with that one, so I won't try to get into it more. So it made it really hard to figure out where to go from there. Of course, they did eventually settle out on NVM memory and Intel microprocessors, but it was a whole lot less fun than it used to be.

Laws: And there was a stab at communications products for a while too with the Siemens and the Ericson and NEC relationships.

East: That was under me when I was there, and you're right. In retrospect, had I done a better job of really getting a good position there, we would have probably done better. I remember my big pitch was FDDI. I really believed in FDDI and a product called TAXI. And we were spending quite a bit on ISDN. So we spent like drunks on communications. Now, if you went back and looked and said, well, how did FDDI and ISDN do? The answer is the money that I spent pretty much was flushed down the toilet, so it didn't work out the way we had envisioned it. TAXI ended up doing really, really well, but it was Vitesse who reaped the rewards. AMD gave Vitesse a license to build GaAs TAXIs.

Laws: There were so many possible horses to back.

East: Yeah, there were.

Laws: As much luck as judgment, I think - which one came out of the starting gate and then survived coming out of the starting gate.

East: The big mistake probably that AMD made there was, yes, I was running that group but I was, by training, a product engineer of bipolar transistors. I didn't understand communications . And I didn't understand fiber. And I didn't understand this and that and the other but, none-the-less was trying to make all of those decisions. Later, the successful companies in semiconductors didn't have people that understood semiconductors whatsoever. In fact, it's almost scary when you talk to them. They don't know the first thing about semiconductors but they understand the market that they're trying to make a semiconductor fit into. And they were far more successful than a bipolar engineer who understood how to raise the beta of a transistor in an adverse environment.

Jenkins: It's the system architect where somebody at this more abstract level can identify what the functions need to be. I've no idea how to make them but this is what we need.

East: Yes, that's exactly right. And those were the successful people. It felt a crime to me, at first, but in retrospect, it's the way it had to go and it was the right way to go. But at first I thought those guys don't understand the first thing about a semiconductor and they think they're going to run a company. And then of course, they demolished me, causing me to think "Well, wait a minute now".

Laws: So how long were you at AMD, John?

East: Ten years.

Laws: Ten years. And so, what was the decision process in taking your next [career] step? Did you think it through? Or did something appear on the doorstep?

East: I thought it through ad nauseam. And I'll now repeat a story that you and I talked about ten minutes before we started this interview. There were many, many, many start-ups in the valley in the early to mid-eighties. AMD was very successful, and I was a relatively well-known executive at AMD so I used to get offers all of the time to be the CEO of various start-up companies. I badly wanted to be a CEO, but I wanted it to be a successful company - not a failing company. And even in those days you could see most of the companies had a high probability of failure. Not the only type of company but by far the dominant type of company that offered me the CEO-ship was one of the 300 CMOS gate array companies that I knew about because of your study. And usually, I would go and talk to those guys because knowledge is power. But I never wanted to take one of those jobs, because there would be too

much competition. And too much competition generally leads to failure. You can only have one or two successes in a particular field, so I always turned those down. But another comment you had made, Dave, was ---- if somebody could just figure out to make a gate array that was programmable that would be a big win. You didn't call it an FPGA because we actually coined that term at Actel later. But if you could make one of these gate arrays programmable - now that's what everybody would want. I got a call in '86 from a guy named Amr Mohsen. You should do an interview somehow on that subject, but not with me. Amr Mohsen had started a company called Actel. And the concept of it was to make a field programmable gate array. Actually, that's not quite true. When he founded it they were going to make a CMOS PROM, but later decided "Gee, we understand how to make a programmable gate array and we could do it, so let's drop the PROM and do an antifuse based programmable gate array". So in '86 they offered me the job as the president of Actel reporting to the CEO, Amr Mohsen. Now, that gave me some pause because Amr was an extremely bright guy. He was the guy that singlehandedly, all alone, proofread Carver Mead's text: 'Mead - Conway'. The whole shooting match. Carver gave it to Amr , who was his student. He said, "Here, proof this for me." So Amr did the device physics, the circuit design, the architecture, the English, whatever. An extremely bright guy. But, there were personality idiosyncrasies that caused me to think "Maybe I'd not be well off if I took the job". And then when I talked to Tony and Jerry about it, they made me an offer I couldn't refuse to stay - so I turned the job down. And then turned down a few more CEO jobs with other CMOS gate array companies etc.. But finally, Actel came back in '88. And by the time '88 had arrived Laws' premise about 'we only want microprocessors and gate arrays and memories' was really coming to fruition. I could see it affecting what I was doing really strongly. I didn't know what to do about it. Nor do I today know what I should have done about it. Actually, it was a tough problem for them. And the second offer at Actel was as CEO with Amr working for me, so it just seemed like a better deal. So yeah, I had thought about it for basically two years. I really liked the concept of the anti-fuse because I still viewed myself as being a technical guy and it seemed to me like the SRAM FPGA's that were already there would have a lot of problems because they would always be dropping bits. It would be very, very difficult to have a reliable product because it was clear you were going to get to the point where you had a million bits configuring this thing and, if one flips it would corrupt the circuit, but you wouldn't be able to tell the circuit was corrupted. That was going to be a nightmare. I thought that the anti-fuse was clearly a better way to do it.

Laws: From a bipolar technician's point of view.

East: Yes, yes, that's right. So actually, when I took the job it was sort of by your advice even though I didn't call you and ask you, Dave. But it was a programmable gate array and I believed that was going to be a wonderful market. Actel was about five years behind Xilinx and Altera, but they had what, in my view, was a better technology. My sister was a Harvard MBA. She used to tell me about the case studies that they did there. I can't remember if she told me about this case study or even if there was such a thing but I'll tell the story as though there were. Okay ---- a company is out there and it has a product in a nice market, but another company comes along five years later with a clearly better way to do it. Who wins? And the answer is - it depends. But it's a fair fight and if you want to participate in that, you've got a great chance. So that's where I thought we were. Xilinx was already a good company and people were using Xilinx. Altera was a good company and people were using Altera. But they had this SRAM technique.

Actually, Altera didn't even have an FPGA yet. They came out the next year with it. So --- talking about Xilinx --- they had this SRAM technique which I thought was flawed. Anti-fuse was better in my view. We will pillage the market with this thing. Or so I thought.

Jenkins: I'm Jesse Jenkins and I'm simply on the committee that's involved in trying to interview various pioneers and so forth in the area of programmable logic. John's name came up in one of the meetings. And somebody said, "Well, does anybody know how to get in touch with him." And I just sat there and said, I don't know if I do or not. Let's try LinkedIn and it worked. And John was agreeable right off the bat. David gave me some clues with regard to looking up some other interviews that you had done and I read through those. And I noticed that in the interviews a lot of the same ideas and stories were coming up. And I said, it's interesting and I know this is about John East but I also wanted to hear John East talking about Actel specifically. And so I thought I might set the stage a little bit in terms of when you finally did accept the offer and come over. We've had a little discussion prior to this and John shared that he believed there were 54 companies as the number of small companies each with a different architecture and a different process and so forth, a lot of variety, no consistency in design tools. And I'm going to rattle off some names very quickly. I did them in alphabetical order. At this point in time, the very first one on the list would be Actel. The next one is Algotronix, Altera, AMD, Atmel, ATT, Concurrent Logic, Crosspoint Solutions, ICT, Intel, Lattice, MMI, Motorola, Plessey, Plus Logic, QuickLogic, Signetics and Xilinx. And the engineers were confronted with this huge array of capability in these companies looking for business, so it became sort of a little mini 'Wild West'. You went to Actel initially introduced by Amr Mohsen, but I remember that there was Abbas El Gamal, and the one I knew was Khaled El-Ayat. And tell me a little bit about your relationship as you moved into the company with meeting those people, because I think they were the technical founders.

East: Yes.

Jenkins: How did that go?

East: There were actually three technical founders. A man named Esmat Hamdi was the anti-fuse guy, Abbas El Gamal was the architecture guy and Khaled El-Ayat was the circuit design guy. A fourth guy, John McCullom was an excellent process generalist. They were and still are really, really, really smart people. Amr Mohsen was also a really, really, really smart guy. In fact, there were other people there that were possibly even smarter than those. When I got there I was just blown away with the intellect in this company. Ph.D.'s from wonderful schools. There were probably twenty people there at the time that were in that category of having been, all his life or her life, the smartest person in the room, the smartest person in the class, or the smartest person in the school.

Jenkins: I sense large egos getting ready to bang against each other.

East: Yes, not necessarily a good thing. <laughs> It's not necessarily a good thing. And so I think when they offered me the job, maybe the biggest reason they offered it to me was to come in and get these guys to get along a little bit better.

Jenkins: Yeah.

East: But one thing about being that smart is -- I think you often then become less tolerant of "stupidity" and a little more strict on your judgment of what comprises stupidity.

Jenkins: Okay.

East: So if there's only one smart guy, you can sort of put up with it. Everybody knows he's smarter than everybody else. But if there are 20 smart guys all doing it to each other. . . .

Laws: You don't know who to follow. <laughs>

East: Yeah. It doesn't work very well. Now they weren't all in that category. There was at least one of those founders that bent over backward to operate in the other direction. But on average, there were some 'get along' problems there. And that was one of the first things that needed to be solved. But then we moved into problems that were a lot more severe than that which dealt with the antifuse (The antifuse was our switching element).

Jenkins: I had some experience not from the process side, but I was at, at the early part of your career, I was across the street at Signetics. There was one afternoon when I believe it was Terry Leeder, who was the marketing guy, and some of the technical people called us into a meeting to go over to Actel and discuss the possibility of doing a second source relationship. Signetics had been struggling with an antifuse product as well and got-- when it worked, it worked great. Yeah.

<laughter>

Jenkins: But it had a devil of a time programming consistently and having test capability that would let you verify that you were going to ship the product. And I noticed that when we got together with Actel that people huddled and all that and walked away, and I don't think anything happened. <laughs> Just, you know, did you have a lot of those type of meetings with other companies?

East: You know, I don't really remember meeting with Signetics. Did that happen before I got there?

Jenkins: I think it did, yeah.

East: I got there right at the end of '88. Do you remember when that meeting happened?

Jenkins: I'm not sure.

East: Yeah. I think I would remember it. Well, let me elaborate a little bit on anti-fuses--

Jenkins: Sure.

East: So again, I thought anti-fuse was a better technology because it would be stable and solid ---- reliable in other words. But of course, the first problem we had, you just alluded to, was you were in a technical box. If the dielectric was too thin, the things programmed too easily, which meant you'd get fuses programmed that you didn't want programmed. And if the dielectric was too thick, then you couldn't program them.

Jenkins: Right.

East: So maybe you'd think you programmed them and but they didn't actually program. Now the hope was that the too thin was thinner than too thick. You might have to think about that last sentence for a minute before it makes sense.

Jenkins: Okay.

East: Because if it's the other way around, you've got a big problem.

Jenkins: Yup.

East: And depending on the day of the week, we had periods when I wasn't quite sure that was the case.

Jenkins: Now at this time, who was doing your FAB?

East: Well, so let's go into that. Back then the first big issue was, okay, let's get a FAB who is willing to try to make these antifuses. In fact,   when I left AMD, Dave, you asked me if I had thought it through with respect to foundries. Yeah, I thought it through and I understood it might be a little problem to line up

foundries, but I just thought, "Well, I'm a good guy. You know, I'm personable. I can talk somebody into making our wafers"

Jenkins: Sure, sure.

East: "I can get people to do things. I'll solve this." But it was a really hard problem. There were so many foundries, I thought we'd be able to get somebody. But they (the foundries) weren't doing particularly well. They were trying to make money and we weren't a good money making proposition. Basically, the offer we were making them was, "put a bunch of engineers on my product and develop my process and then I will buy 50 wafers a month from you", because that's what we were using at first. Well, you know, even if you lie and say, "I'll buy 500 wafers a month from you," it's still a very small number, right?

Jenkins: Right.

East: So it was really, really hard to get people to do the work. Our initial foundry was Data General, because they were going to get access to technology, but then they closed their FAB down.

Jenkins: Okay.

East: And our next foundry was Matsushita because they were going to get rights to sell the product, and they did get rights to sell it. But as I'll get to later, it wasn't the easiest sell in the world compared with Xilinx. So a little bit of that part of the relationship wore off. Then we got Hewlett Packard to agree to do foundry for us, but soon afterward they reneged on the deal.   Life was tough.

Jenkins: Okay.

East: So it was really, really hard to get good foundries. We ended up with our dominant foundries being UMC and Chartered. We eventually got to the point where our volume was big enough that they noticed us. And then they always charged us extra for antifuse wafers, so it was high margin business for them. Those two companies really saved us.

Jenkins: Really?

East: But, when they set our prices, they were high -- because if you're the foundry you want to make money somehow.

Jenkins: Sure.

East: You don't do it because you're just a fine guy.

Jenkins: Yeah.

East: So we always had to pay more for the wafers than we thought we should.

Jenkins: Because it was still lower volumes--

East: Yeah.

Jenkins: And other people were buying in bulk. Yeah.

East: Way lower, way lower volume than Xilinx and Altera. The biggest two consumers of foundry in the world, I believe, are still Xilinx and Altera. They buy serious amounts of wafers, so they get what they want out of the foundries. We were way, way, way down the list. So it was tough to get a foundry, and that was problem number one. Problem number two was ---- it was clear that the process was special and it took a lot of extra work but, I thought we could take the standard process in this FAB where they were so happy to see me they'd do anything we wanted. I thought they would happily bolt our extra processing onto their basic process. Now ---- our extra processing was considerable. It had high voltage and thin films and a lot of neat, little stuff like that. I thought that might take a couple of years. But, I thought, a process node would last maybe five years. So two out of five years we would be one node behind, and three out of five we'd be right there with them (Xilinx and Altera) . So I thought, "Those are good odds, because there are advantages that accrue to anti-fuse technology such as a potentially smaller die size.

Jenkins: Right.

East: And advantages in speed as well, if you're on the same node. So I thought, "Okay, that'll be a good deal. I like my odds in the Harvard case study example. What happened was, it probably took us four years to get the process bolted on, and the reason was they wouldn't let us start until their basic process had been out for around two years. When the FABs were first putting out a new node, they didn't want us in there messing around with it. They had the more important things to worry about.

Jenkins: They were trying to stabilize and all that.

East: Yeah. They're trying to stabilize it and they're trying to get the low power version and this version or that version that they thought would be high volume. So we weren't welcome in there for a couple of years. And then it would take us a couple of years to get it done. So we were about four years behind and it wasn't on a five year cycle. It was on a two year cycle, because that's how often the new nodes were coming around. So instead of being equal to them (Xilinx and Altera) 60 percent of the time, we were pretty consistently two nodes behind. Well, if you're two nodes behind, you're hopeless from the standpoint of density.

Jenkins: Right.

East: And you're hopeless from the general standpoint of speed, although, if there are certain things you're trying to optimize, generally you can figure out a way to do that. So --- we could only fall back on the reliability that I started out with. And even in the case of reliability, it ended up not being a deciding factor for sea level applications.   Yes. There were upsets, but there were not very many of them. The customers generally didn't care.

Jenkins: The thinner the atmosphere is the better is was for you.

East: That's right. The higher you get, the more radiation there is up there. And in fact, when you get to outer space, I think even today, SRAM configured product will upset every five minutes or so, maybe more often. I don't know today's statistics. So there, in space, anti-fuse was a really good thing. But on the ground in a huge FPGA, people just didn't want to touch antifuses. So you could say, "Gee, that was good." You found your niche and you moved into it, and we did. But our niche was extremely slow growing. There used to be 100 satellites launched in a year and today, I think, there are still around 100 satellites launched in a year. So it's not a growth market. The growth of Actel was then, and I think still is today, in getting a bigger and bigger piece of the pie in each satellite. But it's not a growing market. And those days, the communications market and the networking market were growing at an extremely rapid clip. And those markets wanted huge, fast reprogrammable circuits, - which meant Xilinx and Altera. I wanted so badly to get into that market that I blew a lot of precious Actel dollars trying to figure out schemes whereby we could get a piece of it. But never did do very well in it.

Laws: John, you just described five years of my life.

East: <laughs> I'm sure.

Laws: Down the street about a mile away. <laughs>

East: I'm sure, I'm sure.

Laws: We went through exactly the same issues with FABs, with processes, at what point you're coming in.

East: Yup.

Laws: And we went through V.L.S.I. technology, our first foundry. Cypress was our second foundry. There was a third one after I left, but all with exactly the same issues.

East: Yep.

Jenkins: Now David is referring to QuickLogic.

East: QuickLogic, yeah.

Laws: At this point in time, which was also an anti-fuse company.

East: Right.

Jenkins: Of which he was also the president and CEO of, right.

East: Mm-hmm.

Jenkins: Cool. So our audience should know that. <laughs>

East: Yeah. I'm sure it was no easier for you than it was for me. It was miserable.

Laws: You were more successful, though.

East: You poor guy.

<laughter>

Jenkins: So one of the things that I spent a large amount of my latter career at Xilinx, and we were observing all the other players as well. I was actually in the smallest business unit which was the CPLD

Business Unit there. And at lunchtime conversation, you know, we'd be talking about competitors and so forth. And I remember there was a day when somebody said, well, they had Act 1, Act 2 and Act 3, the play's over.

East: <laughs>

Jenkins: And I-- <laughs> I--

East: How mean.

Jenkins: Sorry. I didn't say that. I'm just repeating it.

East: Okay.

Jenkins: But I wanted to say that--

East: Shoot the messenger.

Jenkins: That that wasn't the game over, because you guys went on and did an SX family and subsequent families. And I think you also got into some EPROM-based products as well.

East: Mm-hmm.

Jenkins: But you were going beyond your initial target of what you were at. And you were growing. I remember you guys had your toolset was growing in terms of the software you offered, just as well as anybody else's if not better than some. And so there was a lot of expenditure of effort and working closely with customers and so forth. You did get into the satellites, but you also got into some military type things as I recall. And so there was the thing about both satellites and military is that the volumes are not particularly high, but the margins are. And so if you're dealing with something that's a smaller volume, that's not a bad approach to take. So were there some highlights and some lowlights in that area that you can recall that--

East: Sure. To begin with, in the Act 1, Act 2, Act 3 days, we still were pretty much after the commercial market.

Jenkins: Okay.

East: It wasn't yet clear that the commercial market was going to be completely dominated by telecom and switches and things like that, which later ended up being the case. Act 1, 2 and 3 had some military business, but primarily we were after commercial business. So the families that did the best for Actel were the ones that came along after that, which were more directly aimed at military.

Jenkins: Okay.

East: In fact, we started putting RT names on them - RT - radiation tolerant. Like RTSX and RT-- RTSXA. I can't remember what the names of all them were, but those were more successful than the early Act 1, Act 2 and Act 3 were in the military and space markets.

Jenkins: Did you have to start doing some additional, like, beam testing and things like that on them to verify that they were gonna--

East: Did a ton of testing.

Jenkins: Yeah.

East: In fact, gee, another story that's a little bit of a diversion, but it's an interesting one for me, anyway.

Jenkins: Sure.

East: We had come up with a new family called RTSX: Radiation Tolerant SX Family.

Jenkins: Sure.

East: It was based on an amorphous silicon anti-fuse, which was our second generation of anti-fuse. It was on a 1/4 micron node as I recall. And we would do a lot of testing. A lot of testing. But one of the many curses of anti-fuse is to test it is to destroy it. Whereas with an SRAM, you just program this in, test it, and then program that in and test it in the same unit, so with SRAM you can test a jillion things with that one unit. But with anti-fuse, to test it is to destroy it. And these were big chips . So, it was hard to come up with as many working devices as you would want to test it in all the different configurations you would want at all the different extremes of temperature et cetera, et cetera, et cetera. It was a big job, but we thought we did it well. So we got this family out and we had people actually waiting to use it. And then the first guy that was waiting to use it --- the first guy --- the first application waiting to use it, was the Mars Rover. They (The Mars Rover engineers) understood well the benefits of anti-fuse based FPGAs,

because they had the typical military problem of low volume.   "How many ASICs do you want, sir?" "Oh, I want one." "I'm sorry we don't do one ASIC"

Jenkins: Right.

East: Well, you know, you can't get an ASIC company to do that for you, so you really want to do it with an FPGA. The Rover people recognized the benefit of FPGAs and so they designed their system on 'the come' assuming that the Actel RT product was going to work well. We had the commercial product out already, so they could prototype using it. They could build their computer. They could prove that it worked and all that.

Jenkins: Right. But they couldn't do the final testing on that sort of thing.

East: That's right. And they couldn't send it up in space to Mars until they had the RT version. So we got it out and we tested it, and we tested it some more. I think we tested it until it turned green and everything looked really good. We sold them some units and they put the units in the Mars Rovers and in the summer of 2003, launched the first one. And a couple months after, they launched the second one. It took them about four months to get to Mars.

Jenkins: Okay.

East: In that interim, a scare came up with respect to the reliability of the anti-fuse product. It wasn't that they would all go bad. The "everything goes bad in time" problem is real.   I've been involved, Dave and I have had real reliability problems where "See that circuit? It's gonna go bad. And I can even tell you when it's gonna go bad".

Jenkins: <laughs>

East: Well, this wasn't that problem. And by the way, that's a not fun problem to have.

Jenkins: No.

East: But this problem was, well, you know, one percent of these circuits might go bad if they're in a certain environment. And they might not go bad. And we're not quite sure what the environment is that'll cause them to go bad. There were customers that were coming back to us warning us of a potential problem. Not the Mars Rover people, but other customers saying they were having some funny-- funny things happen. So we got together with Aerospace Corporation, which is a government-sponsored

operation down in Los Angeles. That's the closest approximation I've ever seen to Actel in the early days, staggering numbers of really smart people down there. And on top of that, they had tons of really expensive equipment. They had equipment that we didn't have. We all got together and started working on it and —even working together --- we were having a hard time sorting things out. Is this really going to go bad or isn't it? And what's making it go bad? We were having a really, really bad time figuring that out. Meanwhile, the Mars Rover lands. The Rover comes down wrapped in balloons as cushions with a parachute and what have you. Then it opens up the solar cells and starts to run around and everything is looking good. It's great. Everything's great. A week later --- oh oh! ---- headline in the newspaper: --- "Mars Rover Goes Bad: Quits Talking."

Jenkins: <laughs>

East: Uh-oh. I wonder what that is. And the answer was, "We don't know, but we'll find out, because the diagnostics on this thing are second to none. "We're going to know exactly what the problem is.", NASA told us. It smelled like the kind of thing that people had been telling us about. And by the way, we didn't have one single unit in there. It was literally made out of Actel. I think there were 76 Actel FPGAs in there. So it's not like, "Well, this one unit will go bad and one little thing might not work." It's, "Oh, geez, you know, if our parts turn out to be bad, the whole damn thing doesn't work." So I remember looking at the symptoms. -----We had a little bit of access to that through our contacts at NASA ----- and thinking, "It could be us." And I remember going home that night and telling my wife about it, opening up a bottle of wine, and I drank the whole bottle of wine that night.

Jenkins: Yup.

East: Now ----- I like a nice glass of wine, but I don't drink a whole bottle of wine. Never! But that night I did. I was thinking, "Oh, my God. I'm gonna be all over the front page of the paper."

Jenkins: A little anxiety there?

East: Yeah.

Jenkins: <laughs>

East: "I'll be famous. Actel will be famous. Well not really. Actually we'll be infamous! You know, this is, oh, this is going to be terrible."

Jenkins: John East is taken away in chains. <laughs>

East: Yup. That's what I thought. But it turned out to be a software problem.

Jenkins: Excellent. <laughs>

East: And none of the Actel circuits ever went bad. And by the way, the Rovers are still up there working. It is 13 years later and they still work.

Jenkins: I got a tee shirt you need. It says, "Don't blame me, it's the software."

<laughter>

East: I needed it then. I needed it then. So they fixed that. And that actually put us on to a potential problem. That's good. Once you know there could be a problem, you can fix it, right.

Jenkins: Yeah, sure.

East: So I would say today that those things are the most reliable FPGAs you could ever find-- the most reliable circuit of any kind you could ever find.

Jenkins: It's interesting, though, that there's been a lot of this effect of having the vehicles go up there with an expectation of a lifespan of so many months or whatever, and then finding them actually outlive their expected lifetime to where they're now changing the ground team that's supporting them. You know, if they're retiring, well, the things are still running.

East: Yeah.

Jenkins: Which is very cool!

East: It's cool, but it's a lesson in life. Because so much of the world is about the guy who does practically nothing ragging on the guy that works his tail off. You know --- Saying, "Oh, he should have done this and he should have done that. They're bad guys and they try to ship junk. They're evil people." And the fact of the matter is, there are some evil people out there in any field. Sure. I've met one or two of them. But, on average, those people were just hardworking people trying hard to do a good job. And when you know you're gonna be in a Mars Rover, you bend over backward trying to make sure that you make a good part.

Jenkins: Sure.

East: And what you're describing is the result of that. A bunch of people who worked really hard trying to make sure they did a good job. And you know what? They did. They did a good job. And I'm not just bragging about Actel there. The Mars Rover is a shockingly complex thing. How could you ever get that done and make it work? That's amazing. Those guys should get accolades. In fact,   ---------- okay, you told me it's okay that I digress. I just did.

Jenkins: Please do.

East: As a CEO, you would get invited to do a lot of public speaking, so I did my share of public speaking. And I was once invited to speak at NASA because we worked pretty closely with NASA. They actually had a division responsible for FPGAs. There are some really smart people who were in on it, and we'd work with them all the time. They had an annual conference called MAPLD. I don't remember what that stood for, but the PLD would be programmable logic device, so what's the M?

Jenkins: Probably Military Aerospace.

East: Yeah, yeah. There you go. MAPLD. There you go. Military Aerospace Programable Logic Device. They asked me to go speak at their conference one year.   The audience was a whole bunch of guys that I just loved to death, 'cause they were your basic physics loving, smart, nerdy, hard working, pride in your work kind of guys.

Jenkins: Classic nerds.

East: Yeah. And you just, you love them to death. They were in there to hear me after just coming out from being beaten up really badly because they-- Geez, this would have been after the Rovers, I guess. But they had a lot of trouble with Mars. Most of the stuff that people did with respect to Mars didn't go well. Maybe this was a Mars mission before the Rover? I can't remember the timing. But anyway, they'd been beaten up, and do you remember the incident where something didn't work because the one diagram had something in the metric scale in it and--

Laws: Yeah, conversion from metric to linear.

East: Yeah.

Laws: Yup.

East: And so this huge, complicated thing failed because of that. And of course, the result is people are saying they're all stupid and lazy and how can Americans tolerate that etc etc. And these are the hardest working, smartest, most lovable guys and gals that you ever want to see in all your life. So I stood up and gave them a talk that was based on -------- which president was the one that said the glory ought to go to the guys and gals --- the people actually conducting the fight and not the narrators telling them what they did wrong? It was some president that did that one. Theodore Roosevelt, I think. So I gave them, you know, my version of that, which was, "doing stuff is hard and criticizing the other guy's work is easy. I'm amazed at the things that you guys do and I'm proud to say I know you, and don't let this get to you." I got a standing ovation at the end of that. . . a standing ovation. And all I did was give a lousy talk. They were the ones--

Jenkins: They needed it, though.

East: They were the ones that did all the work. So I guess maybe I got a little bit far from your point, but.

Jenkins: No, that's fine.

East: Doing honest work in this field is not easy, man. This is complicated stuff and there are so many opportunities for things to go wrong. In my view,   if you make anything like that work, you da man! Or, you da woman. .

Jenkins: I hadn't discussed this with you prior to this, but I thought I would bring it up. The one interaction that I had-- I actually had two interactions with you. One where I interviewed at Actel, and actually, at the end of my interview, I was invited into your office, and I was <laughs> very surprised when you very openly pulled up your computer screen and started showing me the spreadsheets of how you were doing. And I'm sitting there going, "I've never had somebody who runs a company sit here and show me how the bottom line's going."

<laughter>

Jenkins: And it just seems like open kimono to me. But prior to that, I had actually (through my personal relationship with Khaled El-Ayat) gotten-- I was consulting for you. This was in the 18 months between Signetics and Xilinx, where I would work next. Actel was in a legal tangle with Xilinx at the time, and they needed somebody who was not working for either company to come in and take a look at some of the patents and so forth. I did that and I probably was one of several. I hope that was, because, you know, you guys did manage to resolve the thing. But there was a statement that you made to me, and there probably were other people in the room, but you made the comment that, "We have to get this right because if we can't resolve this technical issue with the courts, they want to put a padlock on the front of the building and people's jobs are totally at stake here. They'll be turned away." And I just sat there. It

struck me with the amount of responsibility that was on your shoulders and how you felt it and that you needed to make sure that your people that looked up to you were having the right thing done. And I just, I just wanted to give that little statement, 'cause it was over 20 years ago, and I remember it quite well, because I'd never met a CEO before who was that open with me and who was expressing his concern so strongly for his workforce.

East: Wow. Thank you.

Jenkins: I was-- I was totally blown away.

East: Thank you. You reminded me of two or three different directions that I could go.

Jenkins: I thought you were going to say, "One of them was a nightmare, though," right? <laughs>

East: So let me go in both directions. The most important direction I'm going to put off for a minute. Yes, you were-- you were helping us with our patent battle with Xilinx.

Jenkins: Yeah.

East: Of course they sued us and I asked to be licensed, but they didn't want to license. And I don't blame them for not wanting to give us a license. That was Bernie Vonderschmitt who was a very nice guy. But why would he want to license me? I was just a competitor. So he made it clear that, "No, we're going to take this to court, and we want to shut you down." I think what actually would have happened is he would have bought us for pennies on the dollar, given that we would have been in a position of "take whatever they offered us or put a padlock on the door."

Jenkins: Could I interject something real quick?

East: Yeah, absolutely, absolutely.

Jenkins: Did you know that at the time, Xilinx was also doing an anti-fuse product?

East: Yes.

Jenkins: Okay.

East: Yes.

Jenkins: Sorry. <laughs>

East: Yes. Yes, I did. We could argue we didn't infringe the patent, but it's just a coin flip, because these things are so arcane, and the jury is going to be comprised of plumbers and housewives and other non-technical people.--

Jenkins: Absolutely.

East: All good people, but they wouldn't have had the slightest idea of what anyone was talking about. . So they would have been saying "I don't understand this," and whoever, you know, had the best lawyer would win. So it could have depended on that.

Jenkins: Or if it's in East Texas, whoever has the patent wins. <laughs>

East: That's right, that's right. So our deal was, we had to find some patents that we could assert against them. And that's not the easiest thing in the world, but we actually ended up doing that. Khalid did that. And then, when we had patents to assert against them, we were able to settle. So we were happy. We lucked out there. And we did, afterward, get into the same battle with Quicklogic. Myself against Dave Laws. It ended up the same way. And in both cases, I'm gonna say $10 million dollars was spent.

Jenkins: And it all went to attorneys. <laughs>

East: Yeah, yeah. There's just no way out of it. I know I had no way out of suing you, Dave, because you remember the Birkner story.-

Laws: I do remember the story, yeah.

East: A lot of bad blood, most of which came from Khaled El-Ayat. Well -- maybe not most of which, but a lot of which came from him, so--

Jenkins: I was gonna say, John mentioned his consulting for you guys prior to forming QuickLogic.

East: Yeah. He was-- you know, yeah, John's a good guy.

Jenkins: Yeah, I know.

East: And I know he mentioned to you that he and I lived next door to each other in the dorm at Berkeley. He's a good guy and a smart guy. But he made one tactical mistake, and that is when they founded QuickLogic, they were trying to get some press and they had a nice article in the E.E. Times. It was an excellent article talking about how they would get together in H.T. Chua's garage every night after work, and this was in 1987. Well, Birkner was working for us as a consultant in 1987, and he was still working for us in 1988. The product they came out with looked an awful lot like our product. And it made the people at Actel really, really mad! -- remember, these people with the IQs of 200.

Jenkins: Steam coming out of your ears.

East: Oh, gee. It was a terrible amount of steam coming out of their ears. A terrible amount of steam. So they would have run me out of town had I not filed that suit. But in any event, I got mad at Bernie 'cause he filed against me, and then I turned around and filed one against Dave. And I love Dave Laws. So I don't know what that goes to prove, but life is perverse.

Jenkins: It is. <laughs>

East: But let me get back to the other thing. Everybody has a view of a CEO, I mean, he makes the big bucks and has it easy and he goes out and plays golf and does these sinister political kinds of things and then cheats on his taxes, right?? I mean, that's the average view -- isn't it? But it's wrong! That's not the average CEO. Okay. If you look around long enough, yeah, you can find some bad ones.   I didn't much like the Enron guys and there were a few other bad guys. But on average, CEO is a tough job.

Jenkins: Yeah.

East: I didn't just describe Dave Laws as a CEO when I described that. <laughter>

East: Because most companies are not the next Apple computer or the next Intel or whatever. Most start-up companies are just, man ------   it's a grind. If you don't do this and that and the other, you don't make payroll. It's a tough, tough, tough job. So you put the question on the table of, "Oh, you're going to put a padlock on the door." Yeah. That was a huge, huge concern to me. But stuff like that would come along every day. And in fact, the biggest issue I had   was handling that that kind of disaster on a day-to-day basis.. My particular management style was 'no secrets'. Put the cards on the table --- which is what you described there. Because if you don't play it that way, eventually people know you're trying to pull the wool over their eyes and you lose their faith. So you have to be honest with them. But one of the honest truths was, well, I don't like the anti-fuse anymore. I don't like it at all, and that's all we've got. So here I

am every day, worrying about, "where are we going to go with this thing?" I hadn't figured it out yet. But still, I had 500 employees, and you have to tell them it's going to be all right. And that was hard to do sometimes--

Jenkins: And you did this for how many years, John?

East: Twenty-two.

Jenkins: Twenty-two years.

<laughter>

East: Well, Twenty. The first two, I still believed in anti-fuses,

Jenkins: It's the longest stretch you ever had without a promotion.

East: Yes.

Jenkins: <laughs>

East: Yeah. And that was aggravating me. Twenty-two years I didn't get a promotion. And prior to that, I'd get them every couple of years. So Dave, whatever they were paying you, and it wasn't the big bucks that the big name CEOs make ----   I know it wasn't ---- you earned every penny of it, and you got an ulcer and a few white hairs from doing it.

Laws: Well, they were interesting times, John.

East: It is not easy work

Jenkins: You know, have you got anything else, David?

Laws: Well, I'd that-- John eventually became sort of an elder statesman of the industry, John, right? And you were involved in things like the Fabless Semiconductor Association.

East: Mm-hmm.

Laws: Weren't you on the Board of Regents at Berkeley.

East: An advisory board.

Laws: Advisory board. Tell us about some of the things you did on the bigger scale that came out of your experience.

East: Okay. Yeah, I did end up being the senior guy, but that was really unfortunate. When I got there, --- into the programmable logic business --- there were many companies, and many more came along. But the only ones to thrive were Xilinx and Altera, and then I always put Actel in their league even though we were quite a bit smaller. . In the early days, Lattice didn't have an FPGA. They came along much later with their FPGA. So --- in the early days, there would be lots of conferences where the three FPGA guys would be invited to speak. Bernie Vonderschmitt, Rodney Smith, and me. So I got to know Bernie and Rodney pretty well. I had met Bernie before and I liked him. He was a real gentleman. A real gentleman. So we would go and give talks, and in the early days of those talks, I would tell everybody that we were going to cream these guys, 'cause we had the anti-fuse. Then the rumor got out that Xilinx was actually working on anti-fuse. I got to know Rodney a little bit too, and I thought he probably would start working on antifuses as well. Remember --- in the early days I loved antifuses. But anyway, I got to know those guys. And they were totally different guys. Bernie, the nicest human being on the face of the earth. He always used to draw the diagram of the management structure at Xilinx as an inverted thing.

Jenkins: Inverted triangle, yeah.

East: Inverted triangle. And he was at the bottom taking orders from his VPs who took orders from his directors. And he believed that. He was--

Jenkins: The customer is at the top.

East: And the customer's at the top. And so he was a gentleman. He would listen to you. I don't think he was a technical giant, but he was technical. He had been involved in the development of color TV.

Jenkins: Yeah.

East: Just a very gracious, very gracious human being. He let his technology and his people go conduct the fight for him. Now my Rodney story, bless his heart, was not the same story.

Jenkins: Right.

East: I had not met Rodney Smith, but I had heard about him. We all got invited to speak at the Dick Schafer Conference in Boston - this was right after I joined the company. It was --- I think --- 1989. I didn't know Rodney yet, but there was a pre-conference wine hour where everybody got to go drink wine and get to know each other. Bernie was there and I talked to him a little bit. He was gracious, although you could see he wished he didn't have any competition. In retrospect, he was already planning to sue me. He hadn't yet.

Jenkins: I know. <laughs>

East: But he was a gracious guy. And then I asked, "Well, who's Rodney Smith?" He said, "That guy over across the room." So I went over and he was talking to somebody. I don't remember who the heck it was. And then I kind of tapped him on the shoulder and I said, "Rodney, I want to introduce myself. I'm John East," and I stuck my hand out. He just turned his back. . <laughs> So I'm there with my hand stuck out thinking, "This is not working out well--" He was letting me know that, "You might be a nice guy, and if you lived next door to me, we'd probably have a beer together. But you're my competitor and I'm gonna kick your ass." So yeah --- that was Rodney Smith.

Laws: Yeah. I couldn't image two more different management styles building such totally successful companies.

East: Yeah, yeah.

Laws: Different styles. Bernie was bottoms up. Rodney was tops down.

East: Yup.

Laws: And there was just no other way to differentiate.

East: There wasn't. Now I need to clear up that I wasn't trying to put the kibosh on Rodney. I later got to know him a little bit. In fact, we would go to the Needham Conference and the Goldman Conference, and there would always be a group of IC guys who would go out and have some beers afterward.

Jenkins: Sure.

East: Rodney was one of them. And Jack Gifford was one of them. Jack Gifford was a lot like Rodney, right? A lot like Rodney. But there were not two guys in the world more fun to go have a beer with.

Laws: Right. <laughs>

East: They knew how to drink their beer, to begin with. And they had good senses of humor and were clever. But they differentiated between friendship and war. And yeah, you'd be friends, but war is war, and you fight war to beat the other guy and you kill him in any way you can. So that's the way Rodney was.

Jenkins: Sure.

East: But how did I become the senior statesman? They both died. Really good guys who the world misses. The world does miss them. That left me. So I didn't get there by being better, <laughs> just by living longer, Dave.

Jenkins: And that's just another tactic. <laughs>

East: Now I did stay engaged with Berkeley for a long time. They had an advisory board for EECS that I was on for quite a while. But I think they disbanded that board. I still see a few of those guys. I see Alberto Sangiovanni-Vincentelli now and then. And I'm very proud to say that I'm from there. But they're so far ahead of me, why would they want to stay in touch with me.

Laws: But did they listen to you on advisory board? Were you able to contribute anything that you saw any result from?

East: Well, it's interesting. What would you talk about on an advisory board? You might think, well, you'd talk about the upcoming technology. Yeah, a little bit. Except I'd always come home with my tail between my legs because it turned out that whatever upcoming technology I might be aware of, they knew more than I did about it and they were already ahead of me. So their biggest problem, and I wouldn't be surprised if it was still their biggest problem today. Gee --- now I'm trying to figure out if I'm going to violate some EEOC regulation or look prejudiced or what have you.

Jenkins: Some NDA you've signed? <laughs>

East: No, it's not an NDA kind of a problem. But their problem was this. "We want to be the best engineering school that there is." And they were typically in the top three, top four, top five, top something like that. So how do you do that? How do you get to be the best? Well, you need to have the best professors. And they did. Of course everybody says that, but they may well have had. The second thing is you have the best students. Now, their view was this: "*we look really hard to try to find the best students. And for some reason, we don't understand it, but for some reason, when you get done trying to find the best students, it seems as though they mostly have Asian surnames. Now --- they're not necessarily all Chinese or Vietnamese citizens. Some are from here, second generation and third generation. But they have Asian surnames. And lots and lots and lots of them aren't Americans at all. Lots and lots of them come from Taiwan, China, Vietnam, Korea. Those are the very best students. Now we're a state-sponsored school. We need to somehow cater to the people from the state. I wish they were the best students, but they're not always the best students. So what do we do?*" And every time we had a meeting, which was only once a year, we'd start out with that one and fundamentally, you end up punting it. I don't know the answer to that even today.

Jenkins: Oh, come on. <laughs>

East: Coming back to more recent times, young people coming to Actel from college would invariably ask me, "How can I succeed? How do I get to be the CEO?" In fact, we had a period of a decade or so when we'd hire 25 or so interns every year, perversely enough from the University of Toronto, because they had a really good intern program. And the interns would always ask, "John, how can I get to be a CEO? -- How did you do what you did? How can I get where I want to get? How can I get ahead?" I had a prepared answer I'd give them. I knew they would ask me, and so I knew what I was going to say. I changed the name of this a few times, but fundamentally the issue is this. "Okay, if you want to get to the top, here's what you do. You go to college and you study something practical. And you may not necessarily like it all the time. There are probably things that aren't practical that are more fun. But you study something practical!! You get a degree in that practical subject. You go get a job and you do it well. And you know what, there are going to be times that you don't like what you're doing. Do it well anyway. There are going to be times you wish you'd done something else. Do it well anyway. Do it so that your boss says you're the best guy or gal there. And the only time you ever say, 'I quit' is when you have a better job lined up. If you do that, you're going to succeed." And do you know what the Asian kids would say to me, invariably? "You sound like my mother."

<laughter>

East: Okay. <laughs> And so, I now call that the Chinese mother principle. When they would ask me, I'd say, "I'm now going to tell you the Chinese mother principle"

Jenkins: So maybe your name was really John Far East. <laughs>

East: It could be. So how does that relate? How does it matter in the bigger picture? Well, it says to me that we have a problem as a nation. Simply --- we're being outworked. We can't let this happen to us. So I am all for people getting free everything. Free is a good deal. Free medical care is good and free education is really wonderful. I really believe in that. But if the whole platform is --- "you get it free", I don't like that. I'd like the whole platform to be, "Let me teach you the Chinese mother principle." If I'm president of the United States I'm going to tell you that once a week for my entire term in the presidency, until it's there - at the front of everyone's mind --- until everybody understands the Chinese mother principle.

Jenkins: When would you like to run?

East: Never!!, But I'll reiterate!! I'm all for free education. Health care is really expensive --- that needs to be addressed. You need to take care of those things!! But if it's just, "Vote for me and I'll give you that stuff for free." It's the wrong direction. We need to work for the things we get. So who am I voting for? I'm moving to Canada, that's who-- <laughs>

Jenkins: Yeah, well, they're gonna build a wall, John.

East: <laughs> Build a wall to keep me out, huh? Okay.

Jenkins: To keep you in.

<laughter>

East: Okay. I think I fell far-- I went far away from whatever your question might have been, Jesse, but I don't remember what it was.

Jenkins: I don't either.

East: Oh, I do remember what it was. It was, what are you doing now? Well --- I'm now on some boards of directors and some other advisory committees, and that's fun to do.

Jenkins: Sure.

East: There's a lot less worry than the CEO job you and I did, Dave. The CEO job is not good for sleep or hairlines or--

Laws: No.

East: Ulcers too. It's a bad job.

Jenkins: You just give some thought to it and give some advice, that's it.

East: Yeah. And when your advice is wrong, as mine often is, you get to just say, "That's the best I could do. I thought it was right." Whereas, if you're the CEO of a company, there are repercussions.

Jenkins: So as you have ended your basic technical and managerial type career, and you're in what we would call a retirement mode, you have shared that you have some grandsons.

East: Mm-hmm.

Jenkins: And you've shared that you have an interest in going back and relearning or learning for the first time some physics you didn't have the opportunity to do. Are there any other plans on your agenda? You mentioned that you like to travel.

East: Yeah. Yeah, there's not much good to be said about being an old fart, Jesse.

Jenkins: Oh, no, I understand that very well.

East: You'll know it soon enough.

Jenkins: <laughs>

East: But one of them is --- you do have time on your hands. So yeah, we, my wife and I --- take one or two cruises a year. And that's just plain fun!! I have no problem with that. We babysit maybe four or five days a week for my grandsons, 1 1/2 years-old and 5 years-old. And there's the really, really idiosyncratic thing you mentioned. I always was in awe of Einstein and wondered, --- gee --- how did he figure that stuff out and what exactly is it that he figured out anyway? How can space be warped? That's crazy, isn't it? Oh, my God, this stuff is fascinating. It struck me when I retired that he came up with those things 100 years ago - more than 100 years ago now. And people have moved way, way, way past that. It should be understandable now, shouldn't it? So I've decided when I die, people are going to say, "He understood Einstein."

Jenkins: Excellent. <laughs>

East: And I'm well into that, but I'm not at the end yet

Laws: Have that carved on your tombstone, John.

East: Yup, yeah. That's my plan. General relativity. The equations of general relativity on my tombstone. That'd make me proud. Actually, the equations are pretty simple. They're pretty short. It's just, "what the heck does that mean" that's a little hard.

Laws: So you've been following the Jupiter Mission with great interest, I imagine.

East: You know, I--

Laws: Because that's important in part of the general relativity--

East: It is, but I haven't been following it and probably won't until they start flashing the results of it.

Laws: Yeah.

East: The one that I started to get into, but I've realized I don't have enough background yet to really understand it, is the Higgs Particle.

Jenkins: Yes.

East: And that's not really Einsteinian. But I'm planning on getting to that. But the Higgs Particle, of course ---- they predicted it and then they found it. And somehow, it's what determines mass.

Jenkins: Which is key for gravity, which is key for everything else. <laughs>

East: I bought a couple of books on the Higgs Particle when it came out, and they were both written for laymen, which means you can understand the book. But you can't understand the particle. There's a huge gap between what the book tells you and what this thing really is. And I said to myself, "What's in this gap?" The answer to that calls for a lot of mathematics that I don't understand. So I have to learn that math. And before I learn that, I have to get done with the general relativity.

Jenkins: Yeah, it's easy to get involved in too many things.

East: Yeah.

Jenkins: You need to focus, yeah.

East: Yeah. So anyway, general relativity, then the Higgs Particle. And by then, there'll be some Jupiter Mission stuff, but I'm not into that yet.

Laws: Any other thoughts you'd like to leave us with, John? I usually like to ask people what they would tell young people who are planning to go into a science career today, but I think you've already answered that very eloquently. Is there anything else?

East: Get yourself a Chinese mother and you'll be fine.

Laws: Okay. <laughs>

East: That'd be my advice. And the other advice ---- I'm not sure who or where or when this is watched ---- but to anybody that might watch it, you ought to come into the Computer Museum. This place'll blow you away. It's really, really well done!!

Jenkins: Yeah.

East: You guys have done a really, really good job on it, and I'm proud to say I know you.

END OF THE INTERVIEW