Oral History of Don Faria

Interviewed by:
Jesse Jenkins

Recorded October 16, 2017
Mountain View, CA

CHM Reference number: X8369.2018

Jenkins: Good day. Computer History Museum would like to welcome Don Faria.

Faria: Thank you.

Jenkins: To discuss his experience and contributions in the fields of programmable logic devices. I'm Jesse Jenkins, and I'll be asking questions to try and drive the direction. But mostly, I want to make sure that this interview is all about Don and his experience in this field. As usual, though, we have some warm-up questions, and one of the early ones will be to just kind of get to know the basics of Don where were you born and when?

Faria: Yeah, so I was born a long time ago! I was born in Hudson, Massachusetts. And back in 1959, actually, so it's my 40th High School Reunion this year, actually. And went to grade school there in public schools, grades one through twelve. Small town. My graduating high school class was like less than 200. And then from there, I went off to the University of Massachusetts to get a BS in EE. So I always was an East Coast guy. And after graduating from the University, I knew that I wanted to do semiconductors. And we can talk more about that maybe a little bit later.

Jenkins: Sure.

Faria: And so I knew I had to go to Silicon Valley. So I left and came to Silicon Valley after graduating college.

Jenkins: So you already knew you wanted to head for ICs.

Faria: Yep, yep, came here all by myself.

Jenkins: That's interesting. Stepping back a little bit before your college endeavors. What was your early schooling like out in Massachusetts?

Faria: Well, I think that I went through public school system, and so went through grades one through six at one school, and then six through eight at another school, and then eventually high school.

Jenkins: Right, elementary, middle school.

Faria: Yeah, exactly. And so you know, we were always with the same classmates as well, right?

Jenkins: Oh, yep.

Faria: So because, you know, the size of the town and such. And really it was a fun experience. I think from the early days, you know, I played a lot of sports, and then I was an ice hockey player, so we played hockey morning, noon and night back in Massachusetts. But on the other side, I was really intrigued about experimenting with things. And I remember during my grade school and high school years, I was always building something. Always rebuilding it, to try to make it better. I would go off and look at how we could destroy things. You know, I would soak toys in turpentine to see if I could dissolve them, or, what, you know? So, you know, I think just like any kid, you always experimented with a lot of things.

Jenkins: A lot of healthy curiosity.

Faria: Yeah, and so it was a lot of fun. Yeah. It was good memories.

Jenkins: That, is! So you already knew that you were heading towards an experimental type thing. Was there any strong science type thing in your school? Or--

Faria: So not really, okay? I always enjoyed math and science. And I think that when I got into high school, we got into physics, and I really enjoyed physics. But the one thing we did have in the high school was to look at three-phase motors. And stalling out motors by changing the phase of the motor, and such. And that started intriguing me about all this type of stuff. And then from there, transmission lines, and then eventually power electronics. And I think that's how I started getting naturally involved in technology.

Jenkins: That's interesting, because I'll raise an issue with power electronics later in the summary.

Faria: Okay. All right, okay.

Jenkins: Anyway, so you headed off to college. Were you originally going to be a EE major?

Faria: Yeah, so let me explain that. So my brother was ten years older than me, and he got a EE degree. And then he went to work for the mainframe computer industry, which was thriving out in Massachusetts at the time with Digital and Data General and Prime and Wang and such.

Jenkins: Were those anywhere near where you lived?

Faria: Oh, yeah, they were all around where we lived, yes.

Jenkins: Okay. And so he would tell me about computers and what they were doing with computers. And at that point in time, I was probably a teenager, I decided that's what I want to do. And so I think I was highly influenced by my brother.

Jenkins: Good, good. Did your father do anything along those lines?

Faria: No, my mother and father were small business owners and were not in technology at all. But they fostered us to technology, so of my four brothers, three of us became engineers.

Jenkins: Were you involved in your parents' business at all?

Faria: Not really. I mean, just helping a little bit, but not really. No. No, one of the businesses was a liquor store, so we actually couldn't be involved .

Jenkins: No, but you could stock shelves and stuff.

Faria: Yeah, we did that. We worked in the back, yeah. Mm hm.

Jenkins: Because I had a similar experience where I learned about inventory and things like that when my father owned a small ice cream store type thing. And you do pick that up. And it sticks with you.

Faria: Yeah, you do. You absolutely do, and the accounting aspect of it, too. You know?

Jenkins: Yes, yes, tracking and everything. So your hobbies, at this point, we know you liked ice hockey, and you liked to tear things apart and rebuild them and so forth. Were there any other--

Faria: My other hobby was model building.

Jenkins: Oh, yeah!

Faria: And so I was fascinated with space. And so I built every rocket that I could build, and from a model perspective, from Gemini to Mercury to Apollo, right? And I really enjoyed model building.

Jenkins: Were they like the Revell Models, or-- with the glue.

Faria: Yep, exactly, the Revell Models, and you put them all together, glue, you paint them, right? And eventually you blow them up, right?

Jenkins: Exactly. Did you transition over to Estes Rockets and stuff at any point?

Faria: I never got that far. I did have some model airplanes and such that, you know, that you could fly, but never got too far down that path.

Jenkins: Interesting. So can you remember any-- you know, your brother was clearly an influence in terms of explaining things to you. When you were going to high school or early college, were there any teachers that you felt had like a mentoring?

Faria: Yeah, so in sixth grade, I had a teacher, Mr. Drew. And he taught math and science during that time. And I was really intrigued about the passion that he had, and how he taught the two disciplines. And he would spend extra time with me. You know, I had a lot of questions, and he would spend extra time with me after school, you know, teaching me math and science, more especially science without the textbook approach, right? And so we would chalkboard things, and we'd spend time talking about it, and I'll always remember the passion that this guy had for teaching math and science, and what I learned from him. So it really influenced me today.

Jenkins: I know that I've met a number of people in a similar relationship where they had the ability to see a scientific idea, or understand it at a non-mathematical level, and convey it to you in a very clear fashion.

Faria: Yeah, yeah.

Jenkins: Later on, the math gets mapped into it. But that's so important!

Faria: That's exactly what it was, Jesse.

Jenkins: You need to see that, yeah.

Faria: Right, yeah.

Jenkins: Yeah. So in college, what did you find the most intriguing and the most boring? In engineering?

Faria: The most intriguing was device physics. Okay, semiconductor device physics. Which led me into process engineering, which led me to Silicon Valley. I just-- I don't know, I became infatuated with it, and just really enjoyed it. On the other side, I hated Laplace Transforms, and I hated that theory and such, and I just didn't find it interesting, so, I remember Forier and Laplace Transforms, I always hated doing, you know.

Jenkins: Interesting. I don't know, I didn't have your fascination with three-phase motors. I had an AC machinery class in college, and I did okay in the class, but I think it's because the instructor thought-- he liked me, because I cut my hair.

Faria: Well, when I was at the University of Massachusetts, and I was doing Device Physics and everything, we got so intrigued with it is we and a few other guys, we actually created the first semiconductor lab at University of Massachusetts.

Jenkins: Oh, wow!

Faria: We got donated equipment and such, and we actually, our claim to fame, was we actually got the world's first transistor to work in that fab as well.

Jenkins: Oh, nice.

Faria: It wasn't really a fab. It was a room that was kind of clean.

Jenkins: No, I understand.

Faria: And, you know, you would go in there, and do boron deposition, and lay metal down and such. But we got a transistor to work at the end, and that was a great accomplishment.

Jenkins: It is.

Faria: We had a great time!

Jenkins: It is! I agree. It's a tricky thing to do.

Faria: Yeah, yeah. And of course in college you spend a whole night in the lab trying to work on stuff, because we just enjoyed it.

Jenkins: Exactly. I guess I went-- I started on the semiconductor path and went to, you know, I had the Device Physics class, which is one quarter, and we had a quarter where we went in and started doing rubylithes, and making resistors and things like that. It wasn't until the third quarter that I dropped out, that they actually made the transistors and stuff.

Faria: Yeah, yeah. Interesting, yeah.

Jenkins: I guess we did make diodes.

Faria: Okay, very good, yeah!

Jenkins: But it was a similar type thing. So when you graduated, you had your four-year bachelor's degree, and then you just drop everything and head out to Silicon Valley? Or were you spending a lot of time writing letters and sending resumes for . . .

Faria: No, I knew I wanted to come to Silicon Valley. And so almost all my job interviews or applications came out here. And I was fortunate enough to get a job with Hewlett Packard and as a process product engineer. So I came to Silicon Valley. Didn't own anything. Just came out here, and of course, Hewlett Packard was helping you get here, and started working for them. And the first product that I worked on at that time, they had an NMOS fab here in Cupertino, California. And my first product was a 64K NMOS-ROM. And we worked in the fabrication improving the process technology to improve the yield, as well as the product engineering and testing and such.

Jenkins: This is a side of your background I was unaware of. I was much more aware of your endeavors in applications later.

Faria: Yeah, yeah, where you and I met.

Jenkins: So how long were you with Hewlett Packard?

Faria: So I was with HP for about two-and-a-half years. And what happened was, you know, Silicon Valley is all about finding the right people, and a little bit of luck, and getting there. And so one of the founders of Altera, I worked in his group at HP.

Jenkins: Got it !

Faria: And during that time, I was an ASIC Designer at HP. And I was trying to simulate my ASIC, right?

Jenkins: Sure.

Faria: And he called me up one day, and says, "Why don't you come look at the business plan for this Altera that I went to?" And the business plan was a erasable programmable gate array. And so the whole concept of, "Oh, erasing it!" you know, so nobody knows your mistakes and you can reprogram it, made sense to me. And of course, I had a lot of admiration for this individual as well. And so they asked me to come join them as their first application engineer. And at that time I was, I think the 20th employee of the company. And so it was really early stage. So you went from this big HP, you know, free coffee and donuts in the morning, to a dentist office with 20 people.

Jenkins: No, I understand.

Faria: And you're trying to make programmable logic.

Jenkins: Was that over on Hamilton.

Faria: Yep, over on Hamilton Avenue. You know it.

Jenkins: So part of my homework this weekend, I fished out the write-up from a 2009 interview that we-- not an interview-- it was a group discussion where Steve Smith of the Computer History Museum got Bob Hartman and Clive McCarthy, and a number of other designers, and they chatted about the EP-300, almost exclusively for 25 pages of write-up.

Faria: That's, yeah, well.

Jenkins: And I want to mention, your name came up in that.

Faria: Okay, it did?

Jenkins: And I think they tagged the timeframe as about 1983 to '84.

Faria: '84 is when I joined them, yeah.

Jenkins: So they already had the basic EP-300 sort of fleshed out. And--

Faria: So an interesting story. So when I joined them, you know, they-- it was in fab at the time. And when I joined them, the chip was coming out of fab, and we also decided to make these development tools to be able to program a chip with Boolean equations, essentially. And we decided instead of putting them on a DEC VAX or some mainframe computer, we decided to put them on the PC. And the PC was just coming out at the time. You and I obviously were doing this together. And the PC was just coming out. So my first job as an application engineer was to go off and show these development tools that ran on a PC to customers. And but you'd go in with the PC, and the PC at that time didn't even have a hard drive. It was just two floppy disks, right?

Jenkins: Was it a Desktop PC?

Faria: A desktop PC. Eventually we had the suitcase compact model. But it was the Desktop PC. And we would go in and basically bring it all up, and set it up, and everything. And the engineers that would come in had never seen a PC. So the first 20 minutes, you would spend time on the PC, and you'd open it up and find the 8080 processor-- 8088 processor, excuse me, nd then the whole thing. And then put it all back together, and do the demonstration of the tools and such. So it was a lot of fun. And we used to, you know, tote those PCs all around the world, right, to do demonstrations. And sometimes they would work, and sometimes they wouldn't work when they would come up.

Jenkins: So was the software at that point named A+ or was it,that could be in it?

Faria: It was actually Alterans .The first software was a software called Alterans, which was a Boolean equation software. And then when we did A+, that's when we started introducing schematic capture, as well.

Jenkins: Was that developed inside Altera? Or did you go outside?

Faria: Yes. No, totally developed inside Altera.

Jenkins: The software development at Altera had some interesting aspects to it that I'm aware of, because I was on the other side of the coin at a competitor, and I don't want to jump too far ahead, but I want to come back to that as a thread. But the EP-300 was an interesting little chip, and according to the Hartman writeup they were targeting the PALs in the 20-pin package. And they wanted to make sure they were a superset of the PAL architecture. Which I think they could get, because although they were at 5-micron technology, it was still smaller than the current bipolar was--

Faria: That's right.

Jenkins: -- which the PALs were on. And what are your recollections?

Faria: Yeah, oh, yeah, so EP-300 is close to my heart.

Jenkins: Sure!

Faria: The key to it was we could replace most of the PAL technology, because the IOs were programmable. So you could make them registered or combinatorial, or latches, which is what it was. And then the basic product term structure, eight product terms, you know, eight product terms feeding into an OR gate, which fed the I/O structure. It was very similar to PALs. And so, and there was eight of them, you know, eight outputs essentially.

Jenkins: Now PALs didn't have that uniformity, did they, of having all eight, the same number of product terms at every--

Faria: It had different, yeah. Sometimes it had four, sometimes it had eight. Sometimes it had, I think, up to sixteen at one point if I recall correctly.

Jenkins: Okay.

Faria: But we then could emulate almost all of the PAL technology. And then we could-- and our differentiation was that we could replace all this inventory, because you didn't have to have all these unique PALs, because PALs were also bipolar at the time, so they weren't erasable. So our other big differentiation was we had erasable technology. And there was UV erasable at the time, so you'd have to, you know, put-- you know, program them, put them in a UV eraser for a while, then take them back out and such.

Jenkins: Oh, yeah.

Faria: But that's how we did it, and people actually started using them in production.

Jenkins: It was interesting to me in the Hartman discussion, they focused exclusively on the PALs. There was no mention in there of the other things lurking in the background, which was the arrival of the 22V10, and the 16V8. Which had the same basic idea! In other words, emulate those guys.

Faria: That's right. Yep.

Jenkins: But it didn't have-- I don't think they did the erasability part. The original 22V10 was a bipolar.

Faria: No. No, they did not. No, it was also bipolar. That's correct, yeah. Yeah, and then we built from the EP300, we built an EP600, which then went after the 22V10 opportunity. So there was 24-pin, and it could emulate 22V10 structures. And then from there we built a 900 and a 1200, and started building bigger. . .

<overlapping conversation>

Jenkins: Was the 1200 the--

Faria: The 1200 was actually the second device. So remember, the original business concept was a programmable gate array. So we still had to prove that thesis out. So the EP-300 was to show that we could build this stuff. And make it reprogrammable, and basically get customers to adopt it.

Jenkins: Proof of concept.

Faria: And then we had to go to the 1200, which then started to say we could build things much bigger than the industry ever did with PALs, and start looking at the gate array market. Though, it was a very small gate array, really in terms of what it was able to do, but it proved out that technology, and also it proved out the technology was scalable. You know, and from there, then basically, the company was able to reap more money, and you know, continue on.

Jenkins: I think the viewer or listeners of this will be-- they need to be aware that the gate arrays back in the early '80s to mid-'80s timeframe were not these honking huge ones that we have today. They were much more down-to-Earth, smaller, and people were just trying to make something that would be custom for their own needs.

Faria: That's right.

Jenkins: And so this market said-- oop, and by the way, the other thing was it was an unforgiving thing if you made a mistake, or your simulation was not complete, "Excuse me! You're going to have to pay more mask charges."

Faria: Right, there was a whole mask set share, and turnaround time, all those types of things, right.

Jenkins: Exactly. So your arrival time of your product going out in three months is now out to nine months or something like that.

Faria: That's right, that's right.

Jenkins: And you had something that could be erased in a few hours, or whatever the time was.

Faria: Yeah, yeah, that's correct. And you know, my-- we used to tell our customers, you know, or people didn't know about programmable logic that much. It's what do you do? And my comeback always was, "We sell time. And people pay for time."

Jenkins: Ahhh, good point of view.

Faria: So our whole focus was time to market.

Jenkins: And time is money.

Faria: Yeah.

Jenkins: Yeah. Okay, so you're coming from Hewlett Packard over to the startup world over on Hamilton. Which I think the other write-up described it as not quite an industrial area, but you were doing some testing and things like that right on the site.

Faria: Yes, yeah, yep.

Jenkins: And they said that there was some pump or something that--

Faria: We had the wafer test system in there, and we had the pump, you know, the suction pump for the wafer in the desk drawer. And yeah, we used to test the wafers as they came in. Not much of a clean room environment, but we tried to do the best we could, and that's how we tested the first silicon.

Jenkins: But the other things you guys did, and we got wind of it over at Xilinx, was you were using a PC as the basis of part of your tester, and that would save you a lot of money, didn't it?

Faria: Yes, yeah, it was huge. In fact, so, you know, you talk about creativity in a startup, as you've been through as well, and so one of the engineers that headed up product and test engineering. He realized that, "I could probably do this better by using the PC." Because we were using PCs for our development tools. So we had a lot of PCs, so he built a add-on card, right? A card that would go out, and you know, test the unit under test, and used the PC for the computation. And we started building these PC testers.

Jenkins: Any idea if he shot for a patent on that? It's a great idea.

Faria: I think he did actually. And I can tell you that those PC testers were used for years and years after, as well. You know, and eventually the complexity of the devices got beyond what we could do, and we had to go to more sophisticated testers. But we probably used them, Jesse, for 15 years, I bet, yeah.

Jenkins: Excellent!

Faria: Yeah.

Jenkins: So but things like that, that cost saving aspect means that you can make your cost of your parts less than your competitors, who were using the higher-end thing. You have less impact with having to go off and find capacity at a test house, where you might get pushed out of line or whatever. So that's great. You want--

Faria: And you're able to control--

Jenkins: You control your variables.

Faria: -- your destiny a little bit better.

Jenkins: Excellent. So one of the topics that came up in that other discussion was there was a conference, a tech conference down in Los Angeles.

Faria: Yeah.

Jenkins: And I'm going to raise the idea, because you were somewhat of a hero at that one. They mentioned they were looking for a really interesting demo, and you came up with the idea of doing a small emulation of T-Bird flashing taillights.

Faria: That's correct, yes, yeah.

Jenkins: And it just reminded me that, you know, you were saying when you went on customer visits, the people were more interested in the PC.

Faria: Yeah.

Jenkins: So yeah, you had the idea that people would be dazzled, and come to your booth. And they'd love it!

Faria: Yeah, I mean, you had to show off something that was visual. And so the concept of T-Bird taillights-- I'm not quite sure how I came up with it, but the concept of flashers, and the blinker that kind of sequentially went across, and brakes, and those types of things. So we came up with the demo, and then we built a small box that looked like the back of the car, in a way, right?

Jenkins: Oh, wow, yeah.

Faria: In a way. We tried to make it look like the back, you know.

Jenkins: Set it up.

Faria: But it was a small box. And then you would program the chip and then plug it in there, and then you had toggle switches to have it emulate brakes, or flashers or blinkers or what have you. And so people would program it and put it in there. And what was really funny is at times you'd do demos, and you would program the chip, you know, you'd go through the demo, you'd program the chip, then you put it in to show it really worked. And people would come up and actually unhitch the device, right?

Jenkins: Oh, really?

Faria: To see if it was actually in the box, it was just doing it, and we were faking it, or the device was really doing it. And of course, the device was, of course, doing it. So, the T-Bird taillights then took a life on its own inside Altera. It became the test vehicle for all of our new silicon that we would come up with, right?

Jenkins: I didn't hear that part. That was interesting.

Faria: And so, yeah. It was kind of a running design all the time that took on its life on its own.

Jenkins: In-house benchmark.

Faria: Yeah, exactly, exactly. So it was a lot of fun.

Jenkins: So it also came up that Leonard Nimo was going to be somehow involved in representing Altera , yep?

Faria: Yeah, yeah. So we used him. So our slogan was, "The logical alternative."

Jenkins: Ha-ha! Yeah.

Faria: And so we hired Leonard Nimoy for a one day-- well, to use his brand, okay? So we used his brand for a while in our marketing. But we brought him to a show in Southern California called WestCon at the time and we had a booth there, and it was really interesting. So, you know, we were going to meet, you know, Mr. Spock, and the whole thing. He came to our suite beforehand, and we got to meet him. And we had gone out the night before to-- it was Halloween night actually -- and we went out the night before. So you know, I'd say that we weren't feeling the greatest at the time he came to the booth.

Jenkins: Uh-oh.

Faria: But then we brought him down to the booth, and so he was the attraction. So we attracted a lot of people over, and then, you know, stop and do our demo while we had a lot of people at the booth.

Jenkins: Right.

Faria: And what I was fascinated about, and fascinating, I guess I could use that word here, was he was also a poet, and I didn't know this. There was more-- there were many people that brought his poetry book for him to sign to the booth that I never knew that he did at all.

Jenkins: Yeah.

Faria: And so, of course, you know, obviously, the Star Trek people came by. But the people that enjoyed his poetry also came by. And he was just a really nice individual, and you know, was trying to

understand the technology as best he could, and spent the day with us. And then did some photo PR for him, as well, with us. And then we used "The logical alternative" as our brand for quite a while.

Jenkins: I love it.

Faria: Yeah.

Jenkins: So one of the things, I think, that you're clearly a unique person, but one of the things I think that you're somewhat several deviations from the norm on, is how-- the total number of years that you had been with Altera. I mean, you were-- I know that you were with them in the early '80s, and I know that you were there for the transition to Intel, as they become the Altera Division of Intel. That's got to be pushing 30 years or so!

Faria: Yes, yeah. Off and on, I've been with them for 30 years. Yeah, yeah.

Jenkins: You know, that's a huge amount of time!

Faria: It's more than 30 years now. So I was with them for probably about ten years. And then I left for three years. I tried some other startups. Also started Synopsys' FPGA Group, as well, at the time. And then I came back. They asked me to come back and I just enjoyed Altera., and enjoyed the industry. So I went back to Altera, and then spent the rest of my career there.

Jenkins: So when you were with Synopsys, Synopsys got involved in a thing that I think has still got a lot of impact. A think it's called 'IP Exact'. Was that going on?

Faria: Yeah, that was going on at the time, but what I was responsible for their FPGA Group. And from an engineering and product standpoint. And we built a product called 'FPGA Express'.

Jenkins: Ahhh!

Faria: And the hidden fact behind it all, and I'm not quite sure Art (deGeus) will enjoy me saying this, but-- being the CEO of Synopsys-- but they, at that time, the NT environment was coming out on the PC. And they were not quite sure that it could actually replace the EDA environment, right, on Mentor workstations and such. So they port-- they wanted to port Design Compiler, which was their premier product, to the NT environment. So we ported Design Compiler and VHDL and Verilog compiler, and such, to the NT, and then masked it as an FPGA. You know, ee neutered it and masked it as FPGA.

Jenkins: So under the hood was really the--

Faria: Exactly, wo Synopsys got two things out of it. One, they got an FPGA tool that ran on the PC that they could sell. But also they were prepared if ever we, you know, if the industry transitioned to NT, from and EDA perspective, they were prepared.

Jenkins: You were ready for it.

Faria: That never happened, and so it took on its own life after a while.

Jenkins: Interesting. Let's go back to Altera. So you had your EP300, 600, 900 and 1200?

Faria: And 1800.

Jenkins: And 1800. Okay, so that's five.

Faria: Yep.

Jenkins: And they probably went through several process shrinks and so forth.

Faria: Yeah.

Jenkins: And got lower power and faster and all that sort of thing.

Faria: Yeah, a few, a few. At that time, you know, it was an EPROM technology, and the EPROM technology was not scalable. Also we wanted to get to an electrically erasable E-squared technology. So we then went to E-squared with our next generation family called Max.

Jenkins: Okay, now I want to point out, when viewing it from the outside, I didn't see Max as a singleton. I saw three things happening at once. Sam, Buster and Max, which were all three kind of cute male names, and it was like they brought them out all at once, is what it seemed like to me.

Faria: Yes.

Jenkins: Now, I don't know if that was--

Faria: Yeah, so what happened was we had transitioned from the classic devices, the first devices you mentioned, EP devices, to the Max series. At that time the Max series was still EPROM, and we showed that we could scale it even larger, and we were then eventually going to move it to E-squared which became Max 7000. But like any company with innovative engineers at the time, we wanted to see if we could do other things, as well. So Sam was a standalone micro-sequencer, so we built a micro-sequencing product, because we saw a lot of state machines being used in the industry. And Buster was a bus interface product.

Jenkins: Right.

Faria: So we knew-- you could argue it was the early days of transceivers.

Jenkins: Sure!

Faria: To some extent, right?

Jenkins: Yeah, yeah.

Faria: And we wanted to be able to create something that was very efficient on interfacing the busses from both a master and a slave environment. And so we started experimenting and doing these other things. But you know, they were more specialized, and they didn't of course, attract the customers that the general purpose devices attracted. And everyone had very specific needs that they wanted us to customize it to and such. And that wasn't our business. We wanted to make a generic device and sell it to a lot. And so, we experimented with those. We sold them for quite some time. But when you get back to 'where are you going to spend your engineering', we had a lot more work to do in the general-purpose PLDs and FPGAs. So, we stopped the development of the more esoteric devices and focused back on the general-purpose devices.

Jenkins: There seemed to be a clamor for them, or people really wanted them.

Faria: Yeah, yeah. In some of the functions that we had in Buster we eventually integrated into the general-purpose device as they evolved.

Jenkins: Okay, so you recognized your successes there and took advantage of it.

Faria: Yeah.

Jenkins: Now, so MAX of course became a big thrust. We've kind of skipped over the A Plus software, which-- what-- it supported the higher-end EP series?

Faria: Yeah so, it supported the higher-end EP series and also the MAX 5000 as well.

Jenkins: Okay so, was MAX PLUS, which was the one that I think put a whole face lift on it.

Faria: Yeah, then we basically transferred from the A PLUS environment to the MAX PLUS environment. And so, we rewrote the tools from ground up, and that became MAX PLUS.

Jenkins: And was that for MAX 7000, or did it cover 5000 also?

Faria: Yeah, it covered 5000. We made it backwards compatible. But it was 7000 on, really.

Jenkins: The thing that I remembered about MAX PLUS was it seemed to have a well thought out and very crisp user interface. And that seemed to be a primary-- what would you call it? That was a big factor to it.

Faria: It was the focus, yes.

Jenkins: I want to point out, in parallel, I had shifted over about this time to Xilinx from Signetics. And we had been struggling with software on how to make the software at Signetics and how to make software more customer friendly. And I got to Xilinx. And I remember going to an early software meeting where I said, "You guys are arguing in this meeting whether you should have your Windows step in and cascade down four layers deep or seven layers deep. You don't even have the option of pushing one button and saying just do it." And they said, "Our customers know it's not that easy." And I sat there, and I said, "You're leaving out a whole bunch of customers that don't want to get in and dig around in the dirt here."

Faria: Exactly, yeah.

Jenkins: And then you guys seemed to have something much closer to that.

Faria: Yeah, yeah. So, that's what we did is user interface is everything. As you know, the secret to programmable logic was the ease of use to get people to adopt it. And the development tools became

that vehicle to make them easy to use. And so, we took the approach. We wanted a one push button compile. And so, we had two options actually. We had the push button compile, which most customers used. And then we had okay, if you want to open the door and get under the hood, you can do that as well. And so, we had both. But we promoted the push button. And the push button worked most of the time. The devices were simple enough at the time that it could. And at that time, I think that's what differentiated Altera and Xilinx was Altera had more easy to use tools than Xilinx did.

Jenkins: Way.

Faria: Though Xilinx had more sophisticated or bigger devices. Right?

Jenkins: Yeah.

Faria: And so, and so that battle then continued on, in the tool environment. But Altera established itself as the easy-to-use tools, I think, ande branded that. And that went a long way in the industry.

Jenkins: Yes, it did because it meant you didn't have to be-- spend a lot of time learning the architecture and the tools to figure out how you're posing your problem to make it copacetic with both.

Faria: That's right. That's right. And you know-- as you know, the industrial base-- customer base was big for both of us at the time. And so, you had engineers that were doing motor design, three-- and basically motor controllers and things like that. They just wanted something simple because their real focus was the motor design. And so, we tried to make it very simple. And I think that's attracted a lot of people.

Jenkins: Absolutely, I watched it more than once where customers would come back over to Xilinx and say, "Well, over there, I just push the button, and the darn thing just worked."

Faria: Yeah, yeah, yeah.

Jenkins: "Whereas over here, I've got to do all this stuff."

Faria: Yeah, interesting.

Jenkins: We're sitting there going yeah, but, yeah, but, yeah, but, and they're going, "Excuse me. Over here it just worked."

Faria: Yeah.

Jenkins: Anyway-- so, you guys rode the MAX 7000 for quite a while.

Faria: Yes.

Jenkins: I remember Robert Bielby, was at Altera during that timeframe. I think he was somewhat involved in that.

Faria: Yes.

Jenkins: You were still in applications at that time?

Faria: Robert worked for me.

Jenkins: Oh, he did?

Faria: Yeah, yeah.

Jenkins: I didn't know that. Anyway, I noticed that about the time that Altera started to get into looking at the FPGA world and deciding that they wanted to start doing some effort there, I think was about the time that Xilinx was just starting its Virtex line or ending its 4000 family.

Faria: 3000 actually.

Jenkins: Oh, was it? Okay so, what was the early FPGA effort like?

Faria: So, our first FPGA was a product called FLEX 8000.

Jenkins: FLEX 8K.

Faria: So, what was happening at that time is the-- as programmable logic has been basically a duopoly with Xilinx and Altera having eighty/ninety percent of market share. It's a love/hate relationship between the two companies, but it fostered innovation, and it fostered it at a rapid rate.

Jenkins: I absolutely agree with that.

Faria: And I think that that was the-- one of the great things about the competition is both money-- both companies were generating money, so they could put money back into R and D. And innovation happened at a rapid rate. And that's still today, as well. The-- but we, at Altera, realized that we didn't have devices big enough. And Xilinx was capturing more of this gate array market, which is what we were really after. And we understood that our technology, or our PLD technology at the time, could only scale so large.

Jenkins: Sure.

Faria: And then you ran into power issues, and cost issues, and all the other things.

Jenkins: Right.

Faria: So, we knew we had to reinvent ourselves to be what's called an FPGA today, a look up table approach, and so, we were battling with the XC3000 family at the time and losing, losing out because we just didn't have the density. We then morphed and basically created our first FPGA. It was a big debate in the company to do that or not, but we decided to go create our first FPGA. It was called FLEX 8000.

Jenkins: Now, one of the things that we used to get a chuckle out of at Xilinx was that, for the early days, you still referred to your FPGAs as CPLDs.

Faria: Yes.

Jenkins: And I sat there, and I said, "I don't know what they're-- you know, they're just hanging on or what's going on there."

Faria: Yeah, interesting on that is, plus, at that time, we were worried about lawsuits and everything else. And how could you get sued on FPGAs if you didn't make FPGAs, right? And also, the company continued on to brand what was called CPLDs, or complex programmable logic devices, because it had came up with that term. It didn't come up with the FPGA term, Xilinx did. So, I think it also had well, we wanted to continue our brand, and eventually, the customer base adopted FPGAs as the natural description of these devices. So, we moved over.

Jenkins: Interesting. So, who was in charge of marketing back in that timeframe?

Faria: Yeah, a guy named David Laws who's affiliated with the Computer History Museum now.

Jenkins: Oh, yeah. No, I didn't know David was--

Faria: And I worked for David.

Jenkins: I didn't know David was--

Faria: Yeah, the VP of marketing.

Jenkins: I knew that he went over to QuickLogic later.

Faria: Yeah.

Jenkins: Or at some point he went over there.

Faria: Yeah,so, I don't think he ever went to QuickLogic, okay. But I'm not quite sure what he did after Altera, but yeah, he was our VP of marketing. And I worked for him doing applications. And you mentioned Robert Bielby and just to go back to that a minute. So, Robert-- I had both applications and product planning. And so, product planning is where you defined the next generation products, what they're going to look like, the future set, and technology you're going to put them on, and such. And Robert worked for me in that. And we hired Robert because we wanted to have people that understood system level design better. How are these things really used in a system? We have to have expertise in our companies to do that. So, we hired Robert. And Robert worked for me doing product planning.

Jenkins: Excellent. You had a lot of good people.

Faria: Oh, I had great people, yeah.

Jenkins: Through the years, that was one thing that outsiders wouldn't be aware that there was almost a continuing exchange of employees between Xilinx and Altera.

Faria: That's right.

Jenkins: And the legal department would be saying, "Don't you tell them anything."

Faria: That's exactly-- that's right, yeah. I think that what happened, and the same with you and I, is you got infatuated with this industry with programmable logic and innovating the next things with it. So, you wanted to stay with it. At the time, you felt like sometimes you couldn't move in one company because of the natural management structure that was in place or something. And so, you moved to the next one to get that. And there were employees, as you know, that ping-ponged back over time as well, right?

Jenkins: Yeah.

Faria: And so, we all were part of the thing, and we didn't want to leave it.

Jenkins: So, the FLEX 8000--

Faria: Yeah.

Jenkins: That was being supported by MAX PLUS? Or was that when Quartus is going to come-- or do you remember?

Faria: That's a good question. I think that basically Quartus also came with the FLEX 8000 because at that time we were transitioning both to a device, as well as a development tool. And I remember that was a big transition for the company.

Jenkins: Sure, yeah.

Faria: If I recall correctly.

Jenkins: Yeah because I was going to say I don't recall the details. But I-- was the FLEX 8000 the one that had an early ARM processor?

Faria: No, the FLEX 8000 was just a simple FPGA, look up table based FPGA.

Jenkins: But you did to an early endeavor with the putting an ARM core onto an FPGA. And I think it was before the arrival of Stratix and Cyclone.

Faria: Yeah, that was the FLEX 10000.Yeah, FLEX 10K.

Jenkins: As I remember, about the same time the folks at Xilinx were doing their-- what was it? They put the Power PC into a Virtex part. And at lunch, they would say, “Oh, the guys at Altera parked it in the middle,” or “We parked it on the edge,” or what-- I don’t remember. I’m sitting here going we’re all in experimental mode here. We don’t know exactly what the best place to do is.

Faria: Yeah, I actually don’t recall exactly which family we put it in. But yes-- yeah, we were all experimenting at the time.

Jenkins: Oh yeah.

Faria: Which was the beauty of the industry.

Jenkins: Because it was a lot of fun.

Faria: Yeah.

Jenkins: And customers would either tell you-- pat you on the back or slap you in the face, whatever choice you made.

Faria: Exactly. Yeah.

Jenkins: So, eventually, this family I think called Stratix-- am I jumping too many?

Faria: Yeah, so, basically there was FLEX 10000. That moved to APEX, which then moved to Arria-- no, moved to Stratix and then Arria and then Stratix.

Jenkins: Okay so, then I’m getting them-- I’m getting them a little out of order.

Faria: Yeah so, it was-- continued to have migration. And the CPLDs, as we called them, migrated as well.

Jenkins: Right. I remember there was the MAX 7000 family. Then you had a primary focus on FPGAs for a while.

Faria: Yeah, we did MAX 9000 as well, though, which was bigger.

Jenkins: Thank you, I had forgotten that one.

Faria: We did MAX 9000. And then that ended the MAX line. And we started doing the FLEX line.

Jenkins: Right. And then later on, MAX will rear its head as a name again for the MAX II.

Faria: That's correct, yeah.

Jenkins: Which was basically a low-power FPGA type architecture but still using the MAX for the smaller type density.

Faria: That's correct, yeah.

Jenkins: This is complicated. There's a whole lot of products released in the--

Faria: Exactly, and, like you said, both Xilinx and Altera, we were just innovating.

Jenkins: Oh, yeah.

Faria: And experimenting, to some extent, but innovating. And we had the luxury to innovate, I think, because the nature of our industry. And then, of course, we were very close to our customers, and Xilinx as well too. And so, you listened to your customers. And you did what they wanted. And I remember, we would start building pretty big programmable logic devices, pretty big FPGAs, what we thought were big at the time. And we're like, "Oh, nobody's going to fill this up," right?

Jenkins: No way.

Faria: And we put that out there, and it would be filled up in a day, right.

Jenkins: Absolutely.

Faria: And then we'd have to build something bigger.

Jenkins: Absolutely. So, that's sort of the corporate direction thing. But there were a lot of little anecdotal things that happened along the way. But one of the ones-- you mentioned Wescon from 1984.

Faria: Yeah.

Jenkins: But I want to say was it around the '91/'92 timeframe when they started having PLDCon?

Faria: Yes, PLDCon, that's correct, yeah.

Jenkins: And that one was an interesting one because along with that came the PREP benchmarks.

Faria: That's correct, yes.

Jenkins: And I was sort of a side player there. I remember Peter Alfke was involved.

Faria: From Xilinx, yeah.

Jenkins: As I recall, anybody who was in programmable logic that wanted to join up could join it.

Faria: That's correct.

Jenkins: And then if you joined up, I think you got the option of proposing a benchmark.

Faria: That's correct.

Jenkins: And to where everybody could propose one. And then the question was, "Okay, now everybody go run these benchmarks on your software with your parts. And tell us your results."

Faria: Well, basically, we all proposed benchmarks. And then we all collaborated to decide what the benchmark would be or the set of benchmarks would be. And of course, at least from an Altera standpoint, we would go back and run them. And we had Xilinx tools as well. So, we would go back and run them on the Xilinx tools and our tools. And then we would tweak the benchmark that worked best for us, or and then make that proposal back to the committee.

Jenkins: Sure. And I believe that exactly the same thing was going on at Xilinx.

Faria: Yes, I think so, and Lattice at the time too. And so, we were all doing that. And so, we battled, and fought, and discussed, about the benchmarks down to would it be a latch or a register, all these types of things. Eventually, we came out with a set of benchmarks, and for us, okay, at Altera, we felt that oh, we had the better benchmark, or we had the better architecture for that benchmark. Let's put it that way.

Jenkins: Sure, absolutely.

Faria: And we ran it against Xilinx. And then we ran it against us. And we were better both in-- from a performance standpoint. And because the industry was saying, "I don't understand logic elements and product terms. Can you just tell me a set of benchmarks, so I can measure everyone against each other?" And we felt, at that time, we had the better mousetrap, let's say.

Jenkins: Sure.

Faria: We were surprised that Xilinx agreed to it, and they did. As soon as you could publish your results, our marketing team took over and published the results and showed that Altera was better than anybody else on this set of benchmarks. And we ran with that for a while. And what happened at the end is PREP ended up dissolving because no one could then eventually agree to what the next set of benchmarks should be.

Jenkins: Okay.

Faria: So, I think that we did the industry an injustice at the time, but we were competitive with one another, and we wanted to make sure that we shined the best like Xilinx and Lattice did, as well. And so, we didn't carry on the benchmarks further. I think we could have done a better thing for the industry by doing that, but it was the competitive nature of the three companies, and no one wanted to relinquish.

Jenkins: So, from a different viewpoint of the same results, I recall-- and I actually had been assigned into the PLD group at Xilinx. And so, I was in strategic marketing then, and I had to actually run all the benchmarks myself on what had been the Plus logic family because Xilinx had bought those. But the thing that I recall at the end, when the benchmarks were released, each company had a marketing announcement whereby they declared themselves to be the winner in some obscure-- like—'We are the best in a product that doesn't have to be reprogrammed twice or something'. I don't remember, but I mean Actel, Lattice, Altera, Xilinx, QuickLogic, they all--

Faria: Everybody took a life of their own in that way.

Jenkins: A way of looking at the data, which was--

Faria: Which ended up further confusing the customers even more, right?

Jenkins: Absolutely, but it was kind of fun. Those were the-- kind of the fun days.

Faria: Oh, that was a blast. I mean, and again, it was back to innovation. There was no rules or boundaries, really. And you know we were-- our company's management gave us the freedom to do what we needed to do. And then I think that that just fostered more innovation, and fostered maybe some confusion with the customers as well. But we got through it.

Jenkins: So, that's a theme that you brought up earlier and you're bringing up again now. And I want to say that I totally agree with that. The thing that I saw was that every time there'd be a new development at Altera that was along a line that we knew customers were asking for at Xilinx, that we hadn't picked up that one on, suddenly we had to find a way to do a similar thing in our own way that would give the customer the same results. And I think-- I think that was going on in both companies.

Faria: Oh, yes absolutely.

Jenkins: And so, the end beneficiary was the customer.

Faria: Yeah.

Jenkins: Because you home in on a solution from two different companies that-- heading in the right direction.

Faria: That's correct, yeah. I mean we had the same customers in the big picture, and so, it all depends on which customer base we were listening to more closely at any given time was the features that really went into the products. And so, we would architect one feature, and Xilinx would architect another. They were both good. And then we'd figure how oh, we've got to get that one. And they've got to get this one. And it kept going on. And as I would always point out to people is that, internally anyways, not really to the outside world, was, at the end of the day, both companies can do basically the same thing in terms of what their chips were doing. And so, it really became a game of the development tools, a game of applications, and providing IP back to the customers, IP libraries, which spawned a whole other innovation. And I think that because we were able to innovate, and because our whole focus was in

getting the devices to customers, we destroyed the EDA industry for programmable logic. We did our own development tools. Xilinx and Altera, gave them away for two thousand dollars or less, so Mentor, Cadence, and Synopsys really could never get in. We then destroyed the IP industry. We would do a PCI Express core, give it away. You know Synopsys was trying to get eighty thousand dollars for the ASIC one, right?

Jenkins: Yeah.

Faria: And so, we kind of destroyed that industry as well for programmable logic. And then basically, as you got into higher level functions, more system level functions, optical--

Jenkins: Transceivers.

Faria: Transceivers and networking and things like that, it even further got like that. And so--

Jenkins: So, did Altera-- I'm not aware, but did Altera start using third parties to go purchase the IP from them because I know, at some point, Xilinx did some of that.

Faria: A little bit. We did a little bit of that. We would maybe start off that way, and then try to do it ourselves over time just to get a time to market advantage. And then--

Jenkins: Well, expertise.

Faria: Yeah, both Altera had a whole third-party network then for IP. And you could go get the IP from those players. The problem that happened was the customers didn't want to pay a lot for that IP. And so, that industry never was able to spawn off of programmable logic because it could never make enough money to re-put the money back into R and D. So, that industry never materialized, both from an EDA perspective tools, and then from an IP perspective, as well.

Jenkins: Yeah.

Faria: That forced Altera and Xilinx to do it themselves.

Jenkins: It's interesting. Let's see, so in terms of your involvement in the product development idea, I took the time to look on the USPTO website.

Faria: Okay, yes.

Jenkins: Under your name, and I found at least three entries there, where yourself and Craig Lytle were listed as the inventors. And do you remember-- want to talk about those a little bit?

Faria: Yeah so, we had-- if I'm correct, this is where we're putting-- I forget the exact patents that we had there. But it had to do with sequencers and things like that that we were putting inside the device. But my most memorable patent is a multi-chip module that we built. And let me explain what that was.

Jenkins: Sure.

Faria: So, we-- the biggest device that we could build at the time, we'd market it as twelve thousand gates, and we wanted-- and that was the FLEX 8000 device, and we wanted to build a fifty thousand gate, so we could basically do emulation of ASICs - prototyping of ASICs. So, talk about innovation! I had an idea to basically put twelve-- four twelve thousand gate devices together - connect them with a programmable interconnect chip, that was made by a company at that time and that had a thousand connections. And basically, put it on a multi-chip module. Then offer our customers a fifty thousand. Now, how twelve times four got to fifty thousand, it was a little bit of marketing there, but you know we created this fifty thousand gate device. I remember I went to the CEO of our company at the time, and I said, "I think we should do this, and we could do this. Let me--" and he said-- and again back to innovation and trust. He says, "Go off and do it, Don." So, we went off and built this thing. And it had all the challenges of interconnect. It had the challenges of power. It had the challenges of packaging technology and then the tools to basically route the designs among these chips, which had really limited interconnect. It wasn't a full interconnect topology to the chips. So, we built this thing and got it to work and sold them and such.

Jenkins: What timeframe on that?

Faria: This was probably 1991 or so, maybe a little later than that, okay.

Jenkins: Because I want to say twenty years later, that same sort of idea is still is going on.

Faria: That's what I was going to lead to, Jesse, the genesis of those things are used to build very advanced programmable logic devices today, right?

Jenkins: Right.

Faria: And in Altera, we started building multi-chip modules where the transceiver technology and the PLD fabric were two separate chips that we put together in a module with the programmable interconnect technology that Intel has. And so-- yeah so, it was funny. So, that whole concept was the early stages of how we build chips today.

Jenkins: For the viewer of this, one of the issues with some of these combined functionalities is that you require different processes. In other words, a real high-speed transceiver, typically needs to have some aspect of a linear analog type technology. And it's like combining EPROM, and E squared, and so forth on a logic die was hard to do. It was not trivial. Learning how to marry things together, that hadn't been, was a long time coming. And finding a way to make that happen, was important.

Faria: Yeah. So, that was probably my most memorable innovation that we patented.

Jenkins: Yeah, that's fun. So, let's talk a little bit more about the Stratix, Cyclone, Arria type families. Just to give a feeling for what they're about and how they came to be, if you don't mind.

Faria: So, we continued to evolve the architecture for programmable logic, for FPGAs. And of course, the theme was bigger, faster, cheaper.

Jenkins: Sure.

Faria: How do we build bigger devices, run them faster, and make them lower cost? You would get lower cost through process technology but also through architecture as well. And so, the process technology always delivered something that was lower power, lower cost. But the architecture had to play because there was a point of diminishing returns that was going on, we had to re-architect the devices over time as well.

Jenkins: Sure.

Faria: And so, basically, we also knew that we needed a low end, mid-range, and high-end family to address the thousands of customers that we had in different market sections. And so, that evolved to MAX being the low end, Cyclone being the mid-range, and then of course Stratix, being the high-range. And so, those three families started taking on a life of their own. And we would limit the density level of Stratix not to get into the cost structure of Cyclone.

Jenkins: Sure.

Faria: So, Stratix had everything associated with it to basically go after very advanced designs. Cyclone had a limited set to basically have the right cost profile for actually a different set of customers. And then MAX was really low end but the continuation of our complex programmable logic device family. And so, we basically evolved to these three product families. And so, it was interesting, we would have debates when we were architecting them on what should go into what. And of course, from an engineering standpoint, you wanted to put everything in Cyclone, but you know you wouldn't make cost. And so, we had to take things out that we knew were features customers wanted but that would hopefully force them to go to the Stratix and pay us more money. And so, and that exists today with the company as well. Right? And Xilinx did the same, right?

Jenkins: Yeah, they did, exactly.

Faria: They did exactly the same. Very similar because programmable logic sells to thousands and thousands of customers, and those customers have different needs. And so, we were trying to continue to accommodate all those needs. And so-- but at the same time, we knew that the money-- the real money was in the big devices. And so, we basically made sure we were focusing on doing the right things up there.

Jenkins: So, that's interesting. There was always-- I don't know about how it was at Altera. But at Xilinx, there was a cultural, probably still is, substructure where the most social respect was given inside the company to the designers of the very high-end parts. And the guys who were designing the medium ones-- I was in the CPLD business unit for a long time. And we were the peasants.

Faria: Yes.

Jenkins: And I just found it to be interesting that it's sort of like your personal esteem is tied to the margins on the products that you're involved with.

Faria: Yeah, at that point in time, I was doing product planning in the business units and such. And so, everything was equal to me. But maybe that existed.

Jenkins: So, was product planning separate from the business units? Or--

Faria: Well basically, product planning, the genesis of product planning came out of application engineering because who knew what the chips better was the applications engineers. You and I started our careers as product engineers, right?

Jenkins: Yeah.

Faria: And so-- at least in programmable logic, we started that way. So, I had both groups. And then as we migrated into business units, and I ended up having the business units at one point too. We kept product planning as part of the business units, and then at one point, we moved it to engineering as well, and then had people in the business units responsible to work with engineering in the product planning perspective. So--

Jenkins: It's interesting to watch the structure of the company evolve to meet the marketing needs and so forth.

Faria: Right, we always tried to keep product planning away from engineering for the fact that they would do best for what would be best for Silicon, not what would be best for the customer.

Jenkins: Absolutely.

Faria: And so, we kept product planning always in a separate organization. And it is today at Altera, as well.

Jenkins: I remember that, at an early product that I was involved with planning and so forth, I was asking some of the designers, "How come the diet size came out so much bigger?" And they said, "Well, the design manager sort of liked some of your ideas but wanted to make sure that, if some of the features didn't work as they were supposed to, we had the ability to use programming bits to turn them off." And I'm sitting there going the same-- the fact that you didn't trust the feature, resulted in a bigger die.

Faria: Right, right, that's funny. I never knew that, okay.

Jenkins: Yeah, anyway, that was kind of an interesting thing. Were you involved in the-- there seemed to be kind of a push in Altera's FPGAs. Xilinx was a big proponent of their Block RAMs, but I remember that Altera was pushing content addressable memories or CAMs to some degree. Is that-- I think the data comm world was after that type of thing.

Faria: Yeah. So I think that if you take step back. the evolution of programmable logic architectures, we didn't participate in the PC revolution, right?

Jenkins: Correct.

Faria: Well, we participated in the communication, that's true.

Jenkins: Right.

Faria: And so, as the internet evolved, right, which I think is one of the big reasons programmable logic was successful. As the internet evolved we took advantage of that. As wireless evolved, right, cellular infrastructure evolved, we took advantage of that. And so, we would listen to our customers and what their needs were.

Jenkins: Yeah. Right.

Faria: And at times maybe you got too fixated with one or two customers, to do what they wanted, okay, and CAMs were an example of that. We eventually went back to more general purpose memory that we had, but so it was really as, you know, this stuff was moving at a rapid rate.

Jenkins: Right.

Faria: The communication industry needed to use programmable logic because things were evolving too quickly, so, we would then latch on to some customers and to what they wanted to do.

Jenkins: Yeah.

Jenkins: And obviously you wanted to look at it holistically and say "Okay, we're going to do this and we'll make sure that it accommodates them good enough." Right?

Jenkins: Sure.

Faria: In terms of what we want to do, but there was times you got fixated a little bit too well.

Jenkins: I think the power PC endeavor, over at over at Xilinx was like that.

Faria: Yeah, it was like that. Yeah.

Jenkins: Where IBM's influence as well as Cisco's . . . and basically, once they finally got it out, the sales weren't there on it.

Faria: Yeah.

Jenkins: And it was like "Oh, we should've probably talked to more customers, and made a decision on that."

Faria: Yeah, as you noted, our first on-base product was a product called Excaliber, and it was interesting. Back to innovation, right? We had hired a gentleman that was running a UK design center, and he came. You know of course, ARM was based out there.

Jenkins: Sure.

Faria: And he came with the idea that we should put one of these ARM processors in, and he came and made a pitch to our CEO to do that, and the CEO granted him to go off and do it, right?

Jenkins: Yeah.

Faria: And that became the genesis of Excaliber, and I think that we then stopped that development because again, it was costly. We had to do a lot and we were missing the opportunity in the general purpose world to just do bigger, faster, cheaper FPGAs.

Jenkins: Right.

Faria: So again, it was something and Power PC maybe too, is ahead of its time a little bit in terms of the integration of processors with programmable logic.

Jenkins: Right.

Faria: But we had to make choices of where we were going to spend our R&D.

Jenkins: It turns out that the ARM path was a good call.

Faria: That's right.

Jenkins: But it was just a little early for the world.

Faria: Right, exactly. We went back to it after awhile.

Jenkins: I think Triscend, that was a little company that was tying it together as well, and they did an ARM one as well.

Faria: Yeah. Yep.

Jenkins: Okay. So your career, you were at Altera for a long time in both applications and product development, and was it at Altera that you started getting involved in the-- what do you call it? I want to call it the venture capital side of things.

Faria: Yeah. So I'll just give you a history of my career.

Jenkins: Yeah.

Faria: So I started off as we talked about, as a process product engineer, and that taught you the fundamentals of semiconductors I think, right. Then I moved to a design engineer doing ACIC design. So you're able to see, realize your circuits into real applications, right, and see your chip work, in a real design. And then from there I moved to application engineering where you assisted others to do designs, right?

Jenkins: Right.

Faria: Because you had the fundamentals of semiconductors. You had the fundamentals of design. So you could assist others. Then, from there I moved to product planning. Where then you then said “I’m going to help to define the next generation products.” Products that will be used two years from now. So, you had all the fundamentals leading up to that, and then from there and I went into marketing where you taught-- where you then learned about "Well let me sell the value proposition and why it's better than others," okay?

Jenkins: Yeah.

Faria: And the whole aspects of the game of marketing I should say. And then from there I moved into running business units. And so, that taught you how to run a company, how to run a P&L.

Jenkins: Right.

Faria: The profit and loss center, right? All the trade-offs that you have to make in order to basically grow your business.

Jenkins: Did you have a mentor in that area or did you just by observation, learning on the job, watching..

Faria: No, I had a mentor. There was a senior vice president named Jordan Peloski at the time.

Jenkins: Okay.

Faria: And he-- I worked for him for a number of years at Altera and he was a great mentor, and then also a mentor came on after, named Danny Berone that also mentored me. But Jordan was probably my most influential mentor I ever had in my career, and he was just, you know, he had the background in both technology and business.

Jenkins: Right.

Faria: And he was a very creative individual and he'd love to see people foster, okay, and develop on their own, and he taught me from anything on people management skills to technology. And so, I would say in my career, he was my mentor.

Jenkins: There are individuals like that sometimes don't get enough credit in this world.

Faria: That's right, yeah.

Jenkins: I remember Bill Carter at Xilinx, coming into one of the HR training things where they're trying to train people in management, and he was talking about an individual who had, after only 18 months on the job at this company, had basically given him his own budget and all these things and let him take the ball and run with it.

Faria: Right. Exactly.

Jenkins: And he said "I didn't know how to handle it but somehow or another he trusted me and he backed me in all this, and I grew because of it."

Faria: Right.

Jenkins: And I knew the guy that he was talking about, it was a gentleman named Bill Price, and the world doesn't seem to give them enough credit, to me.

Faria: Right, yeah, yeah.

Jenkins: The fact that you guys name them.

Faria: Exactly, yeah, and so, then I, just to follow on, so then I was managing business units for many, many years, and that taught you how to run a company essentially, right? And then I moved to corporate development and strategy where you looked at the long term vision and strategy for the company, and then that started leading into making investments and doing M&A (Merger and Acquisition). And so, we acquired a few companies at Altera, when I was doing that, mainly engineering companies.

Jenkins: Sure.

Faria: And then that led to venture capital, where now in venture capital you now invest in companies that have great ideas. Then you help them from all the experience you have to become successful, and you become part of their boards or their management teams in terms of assisting them and such. And so, I think from the fundamentals of the early days of process and product technology, how I evolved in my career, everything was a step to the next level.

Jenkins: Excellent.

Faria: And you utilized what you learned in the previous level in the next level.

Jenkins: Right.

Faria: It's been fun!

Jenkins: Excellent.

Faria: And now in venture capital I see all these creative ideas. You see all these all entrepreneurs trying to also do their startup companies and make it, and it's a blast, to be part of that now!

Jenkins: I don't want to wind this interview up so quick, because there's a number of threads

that I keep thinking of. One had to do with your silicon sources. You first got started back on Hamilton you had some-- was it..

Faria: Ricoh.

Jenkins: It was Ricoh.

Faria: Yeah.

Jenkins: Okay, and I know that at another point you were involved I think around the Max 5000, Max 7000 time frame with Cypress?

Faria: That's correct.

Jenkins: With Intel.

Faria: Yes.

Jenkins: And I think even..

Faria: And TI.

Jenkins: ...with TI. Yeah.

Faria: And TI.

Jenkins: So those were-- Cypress was the small one there. TI and Intel were huge players.

Faria: Yes.

Jenkins: And you guys were basically getting capacity on their fabs, correct? And they were second sourcing, at least in terms..

Faria: That's correct.

Jenkins: ...of there being..

Faria: TI and Intel did, yes.

Jenkins: Did the second source-- see, the second sourcing thing was something that the guys at Xilinx-- it originally started out with AMD and with AT&T, and very quickly decided they didn't like that and it seemed to me like you guys kept your relationships with those companies a lot longer than Xilinx did with theirs.

Faria: Yeah. So if you recall, and I know you recall, is that one of the things that programmable logic did was it was one of the genesis of the fabless semiconductor industry today. And so, we decided from day one and Xilinx decided, too, we were not going to build our own fab.

Jenkins: Yeah.

Faria: And we had a lot of pressure from customers, you know, to have your own fab or I'm not going to buy from you. How do I know I can get supply, etcetera, right?

Jenkins: Sure.

Faria: And we stuck with a fabulous model and..

Jenkins: Well you should ask the customer "Do you have a billion dollars that you can lend us first?"

Faria: Exactly, and so, at that time though customers also wanted to have a second source of your technology, right? That doesn't exist today, but it did at the time. And so, with our classic product family we second sourced to both Intel and TI, and utilized their technology as well, and they saw this program. The logic industry evolving. They wanted to be in it. So, we used both Intel and TI as second sources at one point. They both quickly saw the amount of support that has to go into programmable logic and I just think they thought the industry wasn't going to be big enough for them. And they both decided to exit out and basically sold the stuff back to us at one point. With Cypress, we did the Max-5000 product family with them. So we were doing the classic product family with Intel and TI.

Jenkins: Right.

Faria: And we did the Max-5000 product family with Cypress, and they became a second source for some period of time as well. We ran into technology problems with Cypress in terms of being able to yield our bigger devices and that eventually became the genesis of why we moved away from them. Right? And also, we didn't want EPROM technology anymore. They had EPROM technology. We wanted to get to an E-squared technology.

Jenkins: And who did you move to? To TSMC at that time?

Faria: TSMC, yes. We started with TSMC at that time I believe.

Jenkins: Okay. So I remember the Xilinx early CPLDs for-- that were originally the PlusLogic ones had been fabbed over at TSMC and somehow we got pushed out of there. And so, we were in a real big hurry to bring out what's called the 9500 family.

Faria: Yeah. I remember that.

Jenkins: Which was on UMC.

Faria: Yeah.

Jenkins: So it was an interesting thing.

Faria: Yeah. Yeah.

Jenkins: Now again, you've landed at Intel with Altera.

Faria: Yeah.

Jenkins: There was a little time after the EP300 and so forth, second sourcing with Intel. When they brought out their own, I think it was called FlexLogic and I think over in Roseville or something they had-- is that..

Faria: Yeah. So I-- you're jogging my memory now.

Jenkins: Sorry. Just turning on the neurons.

Faria: I can't remember. Yeah, I think Intel ended up doing their own architecture called FlexLogic, and I remember we bought it back from them. So we took it on. I don't know exactly the genesis of how they got it. Or if they acquired it or developed it on their own. I don't actually remember that.

Jenkins: It was '91, '92, '93 time frame.

Faria: Yeah, but they had a thing called FlexLogic.

Jenkins: And then when Intel wanted to get back out of the business the FlexLogic came back to us. We carried the product line for a while and then obsoleted it. Yeah.

Jenkins: It's interesting to me that Intel seemed to be..

Faria: I forgot all about that until just now.

Jenkins: But Intel seemed to be putting their toe in the water, with the 300 and then the FlexLogic came. I had interviewed some of the guys out at the FlexLogic thing and they said that the problem that Intel was having at that time is they would bring out a new processor and the processor needed additional support chips around it. And they couldn’t bring the support chips out in time for the customers.

Faria: Yeah.

Jenkins: So they wanted to have an intermediate, something to backstop it.

Faria: Yeah.

Jenkins: You can say "Hey, we've created some interfaces or whatever, with this technology, and when we get those final chips out you can use those. But here's something to keep you.."

Faria: Yeah, yeah. Interesting, yeah.

Jenkins: At least that's the way I recall it.

Faria: No. Yeah. I kind of forgot about that whole area. Yeah.

Jenkins: So it was interesting to me that when you guys had another relationship, or maybe you always had a relationship with Intel, that suddenly it became a marriage.

Faria: Yeah. No. I mean the relationship, actually when they sold us back the business, right? The relationship really ended. And it wasn't until the early-- the last few years that that picked up again. Yeah.

Jenkins: So one of the things that I'm seeing and I remember we did an interview with John Birkner about a year ago and he just made a broad comment that the direction of programmable logic today was not something he would have anticipated back in the early days of PALs and I'm just going to throw out some terms. We see data centers.

Faria: Yep.

Jenkins: We see artificial intelligence.

Faria: Yep.

Jenkins: And I see Intel just jumping in full tilt with that.

Faria: Yep.

Jenkins: And were they already seeing that when they wanted to acquire Altera?

Faria: Sure.

Jenkins: Okay.

Faria: Maybe not so much in machine learning and artificial intelligence.

Jenkins: Right.

Faria: I think that's evolved fairly quickly, but people recognize-- if you look at-- I think it's been a natural evolution, personally, okay? In terms of the vision that we get to or where we are today, the vision that we had or where we are today is sort of there. If again, if you go back to industry trends, we rode the communication revolution, right? In terms of wireless and wire line. Now what's happening is the Cloud is

evolving.Whenever there is a morph into a new era like this, things need to be innovated at a rapid rate. And so, programmable logic is all about time, all about time to market, right?

Jenkins: Yeah. You're right.

Faria: And so the advantages of programmable logic in the size of the devices now and the complexity of them are well-suited for what wants to be done today. And so, if you look at, as I've explained to other people before, is when you get to acceleration in artificial intelligence, they look for systolic arrays, very big, parallel pipeline engines, right? That's what a PLD is. That's what an FPGA is, right?

Jenkins: Yeah.

Faria: In terms of a big parallel engine.

Jenkins: And you can decide what you want your cell to be.

Faria: Right, exactly. And so, the architecture naturally fits to that.

Jenkins: Yeah.

Faria: And from, I can't speak exactly for Intel's management of why they bought Altera at the end, but obviously they saw the need to do acceleration engines, inside, together with the processor.

Jenkins: Right.

Faria: Inside the data centers, for a variety of reasons. And from big data analytics to accelerating memory, in and out of memory, right? And so, they saw programmable logic as a natural way to do that and do it quickly, and then look at their technologies, 14 nanometer, 10 nanometer, or 7 nanometer. They knew that they could drive this down Moore's Law more and basically bring the power and performance aspects to what was needed. And so, I think that's just a natural evolution of this whole thing and where we were doing wireless space stations back a few years ago, now we're going to do artificial intelligence, right? And who knows what will be next. And it's been fun to ride the industry waves. We didn't ride the PC wave. We were a little too late for that but we rode the communication and we're going to ride the Cloud wave.

Jenkins: Yeah, and the price point has just been a plummeting thing in the PC world, and that's not necessarily a ride you want to be on, 'cause it's going to be driving you to take your prices down.

Faria: That's right. Exactly.

Jenkins: So, I know that we've been focusing entirely here on your contribution levels and what you were involved in throughout this endeavor of programmable logic. You may actually hold one of the long term records of being..

Faria: Unfortunately, yes.

Jenkins: ...one of the long running things.

Faria: Well, all my peers are retired.

Faria: Including you.

Jenkins: It's probably a matter of choice for you at this point in time.

Faria: Maybe, yeah. I enjoy doing it.

Jenkins: But you're still out doing some creative things. I do want to-- I want to plant the seed now for a question I'll ask in a little-- I would like to learn more about your outside interests and your hobbies and stuff.

Faria: Yeah, okay.

Jenkins: But before we do that one of the things that I mentioned earlier I wanted to come back on, when I said your interest in power.

Faria: Yeah.

Jenkins: I happened to be interviewing Birkner a year ago, and at the time I didn't realize it. They would invite me over to interview at AnDapt.

Faria: Yeah.

Jenkins: As I had just retired out of Xilinx.

Faria: Yeah.

Jenkins: They sat there and said "This is the same commute for me." Anyway, but I was sort of intrigued at that little company in terms of having a modular, programmable power capability, and then finding out that I guess you're the prime VC behind it, right?

Faria: Yeah. So at the time AnDapt was forming, I was at Altera at the time.

Jenkins: Right.

Faria: And of course I knew Kapil (Shankar) for forever and in this industry, and it was interesting, is Kapil and I were having lunch at a restaurant one day and he said to me "Don, I have an idea, and when I formulate this idea, I'd like to know if Altera would want to invest it."

Jenkins: Okay.

Faria: And so, he eventually came back to me with the idea of a programmable power device.

Jenkins: Right.

Faria: Which is what AnDapt is and it reminded me exactly of the early days of programmable logic.

Jenkins: Yeah.

Faria: He's trying to do BOM (Bill of Materials) replacement for all these linear power devices,that Analog Devices has.

Jenkins: Yeah.

Faria: It's made through linear technology and such and TI and stuff. And so, its like yeah, this is beautiful, right? This is exactly what you want to do and now you can take it to this and this and this over time, right?

Jenkins: Right.

Faria: And really create a strong value proposition. So I saw it exactly as the early days of programmable logic. I was intrigued by it.

Jenkins: Yeah.

Faria: And at that time, so we at Altera wanted to invest it in it because we had bought a power line, as well for our company's Enperion. So we saw it as a complimentary technology to what we were doing with imperions. So it had strategic value to Altera.

Jenkins: Sure.

Faria: And Cisco also was then also an investor and Intel was an investor, for various reasons. Altera, definitely for semiconductors, right?

Jenkins: Right.

Faria: Altera had the interest in it, but Intel and Cisco had other interests.

Jenkins: Right.

Faria: And so, the three of us invested in the company, and then what happened-- and we all equal share in the company, and then what happened was Altera got bought by Intel.We had doubled our share, right? And of course the company needed to raise more money, and when another investor came in and we're all, the original investors are still there, Intel/Altera and Cisco. And now another investor, some other investors, are coming as well and it's fun to be part of that company.

Jenkins: Yeah.

Faria: I sit on the board as a board observer and it's fun to be part of that company to see what they're going through and it's the visions that you and I had all those years ago.

Jenkins: Oh yeah.

Faria: And they're struggling with the exact same things, right? Making the technology work but customers want to talk to them, which was the beauty of programmable logic, right?

Jenkins: Yes.

Faria: You never went into a customer that didn't want to talk to you, right? They were fascinated with programmable logic and they wanted to use it. Same thing's happening here. And I think that, you know, I hope they become successful. They have obviously, just like Altera and Xilinx, had its challenges to overcome. It had to do that through engineering and innovation. I'm sure this company will do it as well.

Jenkins: Well hearing the stories of early days at Altera doing the design software on a PC and stuff like that made me fondly think of the fact that when I was over there and chatting with John Birkner he points out that "Oh yeah. So I didn't have a tool to be able to solve these kind of simulation things at the time, so I just used a spreadsheet." And we talked about how he's running a simulation on a spreadsheet.

Faria: Yeah.

Jenkins: I'm sitting there going "Yeah. You always find a way, the greatest way to do it."

Faria: That's right. Exactly. John's a unique individual I must say.

Jenkins: Yeah. Well Kapil is, too. I'd like to say I'm mentioning John Birkner and Koppel is Kapil Shankar.

Faria: Yes. Yes.

Jenkins: And I guess Kapil's the..

Faria: CEO.

Jenkins: Okay.

Faria: Kapil's the CEO of the company and he was a CEO of a company called SiliconBlue, before that, which gets sold to Lattice. Then Kapil started another company and John's been with him, with both companies.

Jenkins: They pulled Rick Crotty out of Xilinx.

Faria: Yep.

Jenkins: Rick is one of the stalwart design type guys there.

Faria: Yeah, Jim Mulligan too, in sales.

Jenkins: Yes, the sales guy, but it's interesting that we all know the names of all the players, in the business.

Faria: Yeah, yeah. We could swap roles here and I could interview you and it'd be-- your background and career is..

Jenkins: Mine is much less..

Faria: No.

Jenkins: ...interesting and yours is..

Faria: It's fascinating. It's as much as fascinating as mine.

Jenkins: I guess the thing that I'd like to know is a little bit more about Don Faria.

Faria: Yeah.

Jenkins: Now did I pronounce your name correctly?

Faria: That's correct. Yeah. Not many people get it right. Thank you.

Jenkins: What nationality is that?

Faria: It's-- my background is half-Portuguese and half-Italian.

Jenkins: Oh, it is? Okay.

Faria: So Faria is actually a Portuguese name.

Jenkins: Okay.

Faria: So Faria. Yeah.

Jenkins: Faria, you don't happen to speak any Portuguese do you?

Faria: Uh, no I don't. No I don't. My father was born here. My mother was born here but their parents were born there.

Jenkins: So you're of the Mediterranean background, but transposed over to the east coast?

Faria: Yeah, exactly. I'm an east coast Italian guy, right?

Jenkins: There you go.

Faria: Everything's direct. Yeah, so outside of work, okay, probably the thing that consumes the most of my time or my passion is I coach and manage a wheelchair soccer team.

Jenkins: Oh wow.

Faria: So I have a son with cerebral palsy who's 30-years-old. And so, he got into-- and my son's got a Master's degree and he's just a normal individual but can't walk. He uses a motorized wheelchair for his mobility, and we play a sport called wheelchair soccer or power soccer. There's about 30 to 50 teams around the U.S. and we play each other in competition and have the cups and have a national championship and everything.

Jenkins: So transporting all the individuals to each other's sites for home games and stuff?

Faria: Yeah, so we travel on airplanes and everything, to go to different places.

Jenkins: That's great.

Faria: So in California, there's about six teams in California that we play each other on, and then travel to the Midwest and the east coast to play other teams. And so, there's a national championship every year. Last year we came in second place in the national championship and, at our level and I've coached and I was the head coach for many, many year. Then, I transitioned to the assistant coach so I didn't have to do all the bureaucracy of it anymore, and I could just focus on the team. Then, I help manage the program and it's part of the City of San Jose and an organization called Far West Wheelchair Athletics Association.

Jenkins: Just because I'm an engineer and, so are you, I have to ask a question: " As a coach do you actually-- have you learned how to operate a wheelchair to do that at all?"

Faria: Sure, yeah.

Jenkins: So you can go..

Faria: I can get in there and do that - not to the extent and the skill set that the athletes that play the sport have, but yes, during practice I can get into a wheelchair and play a little bit of time.

Jenkins: Sure.

Faria: So, I certainly can't master it like they can. So, yeah. But it's-- they used motorized wheelchairs on a basketball court, and they connect these big bumpers to the front of their chairs, and then the soccer ball is about half the size of a normal-- I mean twice the size of a normal soccer ball.

Jenkins: Sure. So you've got a bigger target.

Faria: 'Able body soccer ball' and there's four players on each team and that are on the court at any given time or on the bench, and very, very competitive. Very, very competitive. It's, you know, my team's all adults but we also have teams with youths on it as well. And probably one of the greatest joys I get in life, right, is having been around disabled people my whole life, because of my son, is to see these young

kids come that may be anywhere from five to nine years old, been in a wheelchair their whole life.Been stuck in a television, watching television or Gameboy or something.

Jenkins: Getting them out and doing something.

Faria: And they come out and they become completely different individuals.

Jenkins: That's beautiful.

Faria: And that's probably been a greatest joy of my person life. That program and seeing people foster in that program and seeing the parents realize that their kid can be an athlete, too.

Jenkins: That's great.

Faria: And so, that's been a good thing.

Jenkins: Number one, you're part of a team.

Faria: Right.

Jenkins: And you're out there and you're learning to compete.

Faria: Right.

Jenkins: And now your skills grow with all that.

Faria: And you take the management you've learned in the industry and you apply it to the team a little bit, and we have a motto on our team. It's team stands for **T**ogether **E**verybody **A**ccomplishes **M**ore.

Jenkins: That's excellent.

Faria: And so, basically everyone's involved. We talk about trust. We talk about communication. Right? We talk about the facets of what does it mean to be a team, right?

Jenkins: Yeah.

Faria: And we talk about the people that establish this are the people that win championships, right? And then there's no one individual on our team. It's all about everyone. And so, yeah, and it's been a lot of work.

Jenkins: This has been fantastic.

Faria: Yeah. No. It's great and I'll invite you to a game sometime. We play in San Jose and play in Berkeley and such. So you can come out and check out one of the games sometime.

Jenkins: Sure.

Faria: Yeah. So that's probably the-- and then I also-- I have a second home on a lake with a boat. And so, boating and fishing and things like that are things that I enjoy as well.

Jenkins: It's all in California?

Faria: Yeah, all in California. Yeah.

Jenkins: So when are you going to throw in the towel? No, this-- you know what? This will go public!

Faria: It's a good question.

Jenkins: Don's going to always be there.

Faria: Yeah. No, it's a good question. I thought seriously about it when Altera was being sold to Intel but I just still enjoy all of this, right? And I think that the world of venture capital is just a lot of fun. It's certainly not the pressure of a P&L, running a business.

Jenkins: Yeah.

Faria: In the days from Altera and Xilinx. You're competing with each other and winning designs and growing the business.

Jenkins: Right.

Faria: So it's a little bit different professional lifestyle for me that works for me.And so, I have a lot of energy. And so..

Jenkins: You've evolved into it.

Faria: Yeah. Until I don't want to do it, I'll do it, right, as long as I have the opportunity. And so, I think that I don't have a time frame actually.

Jenkins: I think you're a lucky man.

Faria: Yeah. I enjoy what I'm doing and God willing I can do it for a while. So..

Jenkins: That's beautiful.

Faria: Yeah.

Jenkins: We always have-- I'm going to say that this is like the final question.

Faria: Okay. Yeah.

Jenkins: Would there be any guidance that you would say-- I think the last statement that you just made sort was it.

Faria: Yeah.

Jenkins: I was going to say what would you say to guide a young person in the engineering world getting out of college? I mean it seems to be like you're a role model. What you did is sort of what you'd recommend.

Faria: Yeah. I mentor people and coach people as part of my work at Intel, and they always want to know "Well, how did you evolve," and I kind of explained that earlier in the interview process, and I guess my-- what I try to tell them is early in your career try to do multiple things, right?

Jenkins: Yeah.

Faria: Don't do one job, it's okay to change jobs.

Jenkins: Yeah.

Faria: Yes, it's fearful and yes you should give a job at least two to three years before you change so you-- the company gets something from you but you also learn the job, etcetera. But it's okay to change and to make those changes and you should do that. Use one as a building block to the other. Always try to follow your passion, right? Don't try to work for a paycheck.

Jenkins: Right.

Faria: Follow your passion. Do the things that interest you, and I also say you should always try a small company as well, and I think that-- here I am at Intel, right, a very large company. The early days of programmable logic that you and I did..

Jenkins: Hamilton Avenue

Faria: ...were the most fun, right? Were the most fun. Innovative and you really learned what your passion was and you got to do a lot of different things for the company.

Jenkins: Yes.

Faria: And so, you really understood where you wanted to head in your career. And so, I advise them obviously try multiple jobs but find your passion and really go after your passion. Even though it may be hard at time. Go for it and even though it may be "Well, I'm not going to make as much money if I try this and it's risky." Try and risk at least once.

Jenkins: I agree with you.

Faria: Yeah.

Jenkins: I agree with you wholeheartedly, sir.

Faria: Yeah.

Jenkins: I would like to say on behalf of The Computer History Museum, Don Faria, it's been my pleasure to get to hold this chat with you.

Faria: It's been my pleasure to have it with you after all these years we've known each other and I appreciate the trip down memory lane.

Jenkins: For the audience, we first met when we both had plenty of dark hair.

Faria: I had hair. Yeah. We've known each other what, 30 something years, right?

Jenkins: Yeah. Thereabouts.

Faria: Yeah.

Jenkins: Either way, thank you, Don.

Faria: Alright. Thank you.

END OF THE INTERVIEW

