Oral History of Armas Clifford (Mike) Markkula, Jr.

Interviewed by:
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Hollar: It's May 1st, 2012. I'm here with Mike Markkula, and we're going to do his oral history for the archives of the Computer History Museum. Mike, welcome.

Markkula: Thank you.

Hollar: So, let's talk about your upbringing, your birth, your education, your parents, a little bit about that.

Markkula: Well, I'm a fourth generation Californian. I was born right in the middle of Los Angeles at St. Vincent's Hospital in 1942. I went to John Burroughs High School in Burbank, basically grew up mostly in Burbank. And I wanted to go to college right out of high school, but I couldn't afford it. So, I went to Glendale Junior College for two years. And then I transferred to USC where I got a master's degree in double E [Electrical Engineering] in 1966. So, I have a B.S. and an M.S. in double E.

Hollar: When you think back to your high school days, can you think of a teacher or anyone who was particularly influential in helping you think about engineering or math?

Markkula: I had a physics teacher in high school that really got me going on electronics and physics and all that stuff. And I can't even remember his name, but he was really good. And that was stuff that I enjoyed doing, and the more I did it, the better I liked it. He probably encouraged me to be a Tommy Techie at that point, enough to cause me to start off in that direction. When I went to Glendale I took analytic geometry, and calculus, and chemistry, and all the stuff to go down that path.

Hollar: And why did you pick USC?

Markkula: Gosh, I was accepted at Harvey Mudd. I was accepted at Caltech, and USC. And I just went and visited each of those. And I did not like the ambience at Caltech at all. I guess I was more serious than most of the students at that point. But it just didn't click with me.

Hollar: Did it strike you as not— students weren't working that hard? Was that it?

Markkula: Well, no. They were just not applying themselves. They weren't serious about learning, and immature, I would say is the best word. Heck, I had to work and support myself to even be able to go to college. So, it just didn't sit well with me.

Hollar: Did you work your way through junior college and college?

Markkula: Yeah. Yeah.

Hollar: What sorts of things did you do?

Markkula: Oh gee, everything from sticking records into the sleeves, to technician, to—- I used to build stereos for people because I knew they knew what I was doing. So, I'd tell them how much it would cost. And I'd go buy the equipment, stick it all together. And I worked in a gas station. I worked in an auto body shop. I'm a pretty good painter. I've painted a couple of cars of my own. So, I just—- whatever I could do. I worked for a catering company that catered to movie locations. And that was interesting, but boy was it hard work.

Hollar: That's a classic L.A. kind of job.

Markkula: Well, living in Burbank, you have all those studios around there. So, there was that infrastructure available. And then you took whatever job you could get. I worked at Safeway, started out as a box boy, and ended up assistant manager in the produce department. You do what you can do.

Hollar: Was that influential? Do you think that, looking back on it, that always having to work and bootstrap your way up had an influence on you?

Markkula: Yes and no. Some of those jobs I really enjoyed. One of the technician jobs that I had was at a company called Research Craft owned by a gentleman by the name of Al Ellsworth [ph?]. And Al took a liking to me, I guess. He found out I was taking engineering and going to USC. And so, he took me out of the stuffing the records in the sleeves and gave me a job as a technician, and gave me some challenging projects to work on. And he'd leave me alone. He had a beautiful library of technical books. He'd say, "There's the books, here's the job I want you to do, and go do it. If you really, really need help, come and ask me." He was great.

So, every Saturday we would go down to the war surplus stores in L.A. And he'd say tell me when I get to a hundred dollars. And he would buy circuit boards, and relays, and meters, and you name it. And he had a room bigger than this room stacked floor to ceiling with different kinds of components, tubes, anything you might want, resistors, capacitors.

Hollar: Was this for no particular purpose?

Markkula: No, particular purpose. He knew he would build something out of some of it. <laughs> So, he would give me these jobs. Go mechanize all the record presses, make them automatic so one guy could run two presses instead of two guys running two presses. I did it. Took me whole summer, but I did it.

Hollar: And how did you go about that?

Markkula: First I had to figure out what the presses did. They're not very complicated. They have different cycles. And you would put the vinyl in the top, and it would— and you had to have the two halves of the record that it was going to press. And so it would fill that cavity up, and a certain amount of time at a certain temperature the vinyl would fill in the grooves of the record. And the biggest problem they had was what they call non-fill, where there'd be little bubbles or something. And the record groove would be imperfect because of little non-filled areas. Anyway, so once I figured out how that really worked and what made it go, I just built a box of relays with timers. And made that do what the guy running the press was doing. So, you just load one, start it, turn around, load another one, start it, come back to the first one, take the record out, load it.

Hollar: So, it worked?

Markkula: Yeah, it worked great. And it cut that cost, that part of the labor down by a factor of two.

Hollar: Did your parents have any strong feelings about your being an engineer or doing something else as a career?

Markkula: I don't think so. My dad was a very inventive guy. He was always inventing something. And my grandfather had five patents. So, I guess that tinkering mentality runs in the family.

Hollar: What were the patents in?

Markkula: My grandfather's patents?

Hollar: Yes.

Markkula: Oh gee, the most important one was a mechanism for attaching the chains that go around a railroad car with logs on it because the way they used to do that, the guy would have to go around to the side of the car where the logs were going to dump into the pond— the hold pond— and knock these chocks out. And about once a year somebody would get killed because he wouldn't get out of the way

fast enough, and the logs would roll off crooked or something. So my grandfather invented a system where you could knock the chocks out from the other side. <laughs> So nobody got killed anymore.

Hollar: Wow.

Markkula: So, it was a simple deal, but hugely important.

Hollar: Yes.

Markkula: You know the three-clawed gizmo you use to pull weeds in your garden?

Hollar: Yes.

Markkula: He invented that.

Hollar: Did he really? Your grandfather invented that?

Markkula: Yeah. Yeah. And well, they were all involved with either lumbering, or woodworking. Or he would manage the railcar shop for the Union Lumber Company in Fort Bragg, California.

Hollar: And was your father technical, too?

Markkula: He actually was. He wanted to be an aeronautical engineer. And when he was about 20 or so, 22, he moved from Fort Bragg to Los Angeles, actually to Burbank. And took a job at Lockheed. And he was going to work and go to school. Well, he ended up being a foreman on the production line for the P-38, and a number of other airplanes. The Constellation, if you remember that, the one that had three tails.

Hollar: Sure.

Markkula: Three vertical stabilizers. Anyway, he never got his degree in aeronautical engineering because his brother, who also moved down to L.A., had started an orthopedic shop that made long leg braces, and arch supports, and back braces, and all kinds of orthopedic appliances. And it was doing quite well, and he called my dad up, said— my dad's name was Mike. I'm junior. You've got to come down here and be my partner in this orthopedic shop. And so, my dad decided to do that and continued doing that until he died. But, the technology involved in building a long leg brace is pretty impressive. You have to know metallurgy. You have to know how dissimilar metals will wear because you can't have the

joint wear out in a funny way as you use that brace. You have to get the axis of the brace exactly right to match the axis of your natural joint. And then it has to fit like a glove. And it's all made from scratch out of stainless steel and different parts that they would bend and weld and put together. And then they had to cover it all with leather, so that it was comfortable. <laughs> It's really something.

Hollar: It's quite a piece of engineering.

Markkula: Yeah, it's a— and each one's different. And, of course, the Salk vaccine almost killed their business, which is a good thing.

Hollar: Sure.

Markkula: <laughs> But they did a huge business in long leg braces for polio victims. And, of course, the new business stopped, but the old business continued. People came from all over the country to have my dad build them braces. They wouldn't have anybody else do it. And I'd go down and work there on Saturdays sometimes. So, I learned a little bit about it.

Hollar: So that ties right into this final part here—- about engineering being a natural fit for your interests and talent. It sounds like you came from a family with that kind of background, and also that it just fit what you wanted to do.

Markkula: Well, I actually wanted to be a chemist, but I changed my mind about halfway through, decided I liked physics and electronics a lot more than chemistry.

Hollar: How was the department at USC when you were there? Was it good?

Markkula: Excellent. Really excellent. I think the education that engineers get at USC is tops. It's no nonsense. You must, must, must learn how to think. If you can't learn how to think, you're never going to graduate from the engineering school. So, you get out of there, you have some sense of confidence that you can solve almost any problem that's solvable because you know how to think it through. You know how to research it, whatever you have to do.

Hollar: What sorts of choices did you have when you got out of school? And what took you to Hughes?

Markkula: One of my professors at USC was an engineer from Hughes who was getting his Ph.D. And he was teaching a circuits course. His name was Norm Robinson. And I took his class. And I just loved it. And he was such a good teacher. I didn't have to read the book. I'd just go to class, and he would explain

it so well that I could work the problems. I could get it. It was great. And he and I just became friendly. And so, he got me a job at Hughes Aircraft before I had my Bachelor's degree. So I was the youngest member of the technical staff that Hughes had ever had. And I was the only member of the technical staff that didn't have a degree. <laughs> It was only for like six months, and I got my Bachelor's, but—

Hollar: So, you went to work as an undergrad?

Markkula: I did. I did. And I loved working at Hughes. They had some of the brightest most interesting people to work with. And we had really challenging stuff, fire control systems, and pretty interesting things that we did. The Blackbird is now retired. Do you know the Blackbird?

Hollar: I do.

Markkula: Aircraft? It's kind of fun because Kelly Johnson designed that airplane at Lockheed, where my dad had worked. And we built the fire control system for the interceptor version of that airplane, which you've never seen.

Hollar: I was going to say I didn't know there was an interceptor version.

Markkula: There was. There were three of them. And I had the velocity tracker for that. And we designed systems that did things. For example, we could see a signal twenty db down in the noise. Twenty db down we could track. And we had to do that because the closure rate was mach six. <laughs>

Hollar: So, you had to see it coming from a long way away.

Markkula: You got to see it coming from a long way away in a lot of clutter. And to this day, some of the things that we accomplished there, I think are— I don't even know if they're still top secret or not. But they're really impressive. And I loved working there. It was just a great place.

Then they— I guess they liked what I did well enough that they put me on the Master's fellowship program. So, that was a program where you're supposed to work twenty hours a week and go to school twenty hours a week while you get your Master's degree. So, I did that, but I went to work forty hours a week <laughs> and went to school twenty hours a week. It didn't seem like that much of a load to me because I loved doing what I did at Hughes. And I enjoyed the course work. So, I didn't sleep that much. Well— so, that's part of the story at Hughes. It was a great time.

Hollar: Were you always working on areas of these very high specialized airplanes like the Blackbird? Was that primarily what you—?

Markkula: Yeah, all the time I was at Hughes. They also put me in charge of the stores, which was— we would either buy or get free samples from all the different companies of integrated circuits, and specialized capacitors, and relays, and gosh darn who knows what. We had a huge big room. And that stuff was used for bread boarding and developing the systems that we developed. And they put me in charge of the whole thing, which I thought was really great.

Hollar: How old were you at the time?

Markkula: This was, must have been 1964. So, what was I? Twenty. No, twenty-two. So, we were— I was fascinated. That was about the time that integrated circuits were just coming out. And so, we had the leading edge technology of everything that you could buy for electronics. And, of course, the sales guys wanted us to have all that stuff because they wanted us to design it in so that they would get a production order. And that was a piece of it that I thought was a lot of fun.

Hollar: Who were you working with for integrated circuits at that time?

Markkula: Fairchild was a big piece of that, and probably the dominant ones. And actually when I first started working at Hughes, there weren't integrated circuits. There were 2N697s, I remember. And transistors were just making the transition from germanium to silicon. And the first ideas about integrated circuits were starting to sprout. And TTL and DTL and a couple of gates on a chip, that was exciting.

Hollar: Was it your job to incorporate those components into new designs, too?

Markkula: Yeah. Yeah. Most of the engineers had a chunk of the system. So, the thing was all pretty much specified, but then there were interfaces from the velocity tracker to the other parts of the fire control system. And it was a very complicated job. It had to go through all kinds of testing. We had a— what they call a shake table. And it was about a twenty-ton device that was run by these huge analog vacuum tubes. And you could shake a thousand pounds worth of stuff with this thing at any frequency at any amplitude. And you put these beautiful circuit boards and stuff on there with components sticking up. And you'd use a strobe light at the same frequency as the vibration. And you could see these things wobble. They'd just fall over. Stress test everything like crazy. So, it wasn't just design the circuit and make it work. It was design the circuits, make it work, design the mechanical configuration it was going to be in, and then make sure that it would withstand humidity, and temperature, and cycling, and vibration, and everything else.

Hollar: So, you had to know a whole gamut of things to be successful?

Markkula: Yeah, that made it fun.

Hollar: How many people were working on this project?

Markkula: I have no idea. That's part of the secret plan stuff. I— you only know what you need to know.

Hollar: And did you have to have a secrecy clearance?

Markkula: Oh yeah. That was the only downside is I couldn't go home and tell my wife what I was working on <laughs> because I was very proud of some of the stuff I did. You can't talk about it.

Hollar: You were at Hughes for a number of years, right? It looks like four years. And then you moved to Fairchild. Why did you make that transition?

Markkula: Really for all the wrong reasons. But it was the right thing to do. When I got my Master's degree in June, I thought, "I've been at Hughes for four years. And I love that place. And I like the people I work with, but I should see what else is available. Why not look around a little bit?" So, I went to one of these professional resume designer agencies. And put together a resume. And I went through the Sunday paper. And I sent out about 90 of them, I think, to RCA, GE, Bell Labs, Space Technology Labs, every company that I thought maybe I'd enjoy working at that company. And I thought maybe I'll get ten responses. I think I got 100%.

Hollar: And were the papers filled with classified ads for engineers at that point?

Markkula: Well, an engineer at my age with four years experience, member of the technical staff at Hughes was a hot item.

Hollar: Okay.

Markkula: That's why I got so many responses. So, I spent the whole summer flying around the country in some cases, and interviewing, and got a bunch of offers. But the one that really enticed me was at Space Technology Labs. They offered me a job running all of the satellite launches. I was going to have 400 physicists reporting to me <laughs> and a salary I couldn't believe. And I would be working for the director of the whole labs who was also the chair of the stock investment committee.

Hollar: Amazing.

Markkula: Or not committee, but the stock investment club they had there. And all of that stuff just— I said I've got to do this. So, I accepted that job. And I hadn't resigned at Hughes, yet. That afternoon I get a call from one of the guys that I had worked with at Fairchild in stocking the stores.

Hollar: This was the afternoon that you accepted the—?

Markkula: This is a funny story.

Hollar: Space Technology Labs job.

Markkula: So, matter of fact, you have this fellow's oral history, Jack Gifford is his name.

Hollar: Oh, sure.

Markkula: And Jack says, "Mike, you've got to come up and come to work at Fairchild as a product marketing engineer." And I went, "Jack, you're crazy." He says, "No, no, no, really you have to." I said, "Jack, I just accepted a job at Space Technology Labs." He says, "I don't care. You've got to come up and see what this is all about." And he was a pretty strong guy. And we had become fast friends over the years, actually.

Hollar: And had you put Fairchild on your original list?

Markkula: Fairchild wasn't even on my list. So, he said, "I'll be at the airport at 5 o'clock. Meet me at the airport, and we're coming up to Mountain View. And you're going to meet some people." And so I said, "You better have a fat wallet," is what I said.

Hollar: Because you were in a great position. You had all the leverage at that point.

Markkula: Yeah, well I thought, wrongly, that no matter what I did, I could get a job about that quick. By 1968, there were Ph.Ds pumping gas. We had this terrible situation. Anyway, this was '66. And so, I went up. And I went through Fairchild a bit, talked to some of the engineers, and some of the semiconductor design guys. And then they had a kind of cocktail party going on for some— I forget what for. And so, Jack wanted me to go to that. So, I did. And I met a guy who you also have, I think, an oral history of, and that's Floyd Kvamme.

Hollar: Yes, I just took Floyd's oral history about two months ago.

Markkula: Well, that's where I met Floyd. And I don't know what it was, but Floyd and I have been very, very good friends ever since. And I went to work for him at Fairchild. So then I had three jobs. And I hadn't quit—

Hollar: So, you hadn't quit Hughes. You'd accepted a second one and taken a third one.

Markkula: So, the next day I had to go and renege on the job at Space Technology Labs, which I did. And I told Hughes I was going to leave. And all of this time, my wife and I had decided to get married. And so, I said do you mind living in Mountain View? We were going to be living in Culver City, and we had it all— Well, of course, no problem. So, I changed jobs, and I went into a product marketing job. And I said if this doesn't work out, no problem. I can always go back and get an engineering job. Well, like I said, I think that was really incorrect. I think I'd have had a heck of a time trying to get an engineering job, if I didn't like product marketing or it hadn't worked out.

Hollar: Now, how was life as a marketing engineer at that point?

Markkula: I loved it. I just loved it. I had more darn fun. And I was very successful at it because I had enough technical background that the circuit design guys would talk to me. They actually respected my opinion. There were a lot of sort of ex-sales people and so on— this is the very beginnings of Fairchild and product marketing, and all that stuff. So, it just worked out great for me. And I ended up running all of the integrated circuit marketing at Fairchild. That was— after Bob [Noyce] and Gordon [Moore] and Andy [Grove] left, and Lester Hogan came in to run the company— anyway, here I am. I think I was like twenty-six years old. And I'm running all the marketing.

Hollar: And Fairchild was booming at that point, wasn't it?

Markkula: Fairchild was doing well. And I did well. For example, when I went there I took over linear integrated circuit marketing. And they had a market share of like 17%. Two years later, they had 35%. And we put together a marketing program and just blew all the other guys out of the water.

Hollar: What was the key?

Markkula: The key was application notes and a series of seminars that we conducted in all the major cities around the United States. It was a two hour seminar with a dual carousel projectors, and good circuit design information, and how to use all the different products that we had. And we would give them

a— actually there were two three ring binders full of these application notes. And then we carried samples, tons of samples. So whatever somebody wanted to try out, we'd give them a couple of samples. So they'd sit through this thing, and they'd learn something. And then, they'd get this set of books to take with them and some samples to go to work with, and it just— the other guys were just flat-footed— all the competitors were left in the dust.

Hollar: Where did you come upon this marketing ability that you discovered in yourself at Fairchild?

Markkula: Well, I went and took an American Management Association class in product and brand management. And I just thought the principles made sense. And I just put them all to work. And I read Peter Drucker's books, and I don't know.

Hollar: Self-made. You just decided.

Markkula: O.J.T.

Hollar: O.J.T. all right, got it. What was life like at Fairchild around Noyce, and Moore, and all the people who were there at that point?

Markkula: That's where I met Bob. The first time I met Bob I was shaking in my boots because we had some reliability problems with Zenith— with, actually, an IF amplifier that went in TV sets. And it has a package that we called the glop top. It was a big round thing that had pins on the bottom of it that would fit into a tube socket, so that they could plug it in where tube used to go. And it was made out of epoxy. And they would just glop the epoxy on top of the whole thing to seal it. And it didn't make a good seal. And so, they were having high failure rate in high humidity locations. And so, they started doing some testing in— I forget what we call them. Not just ovens because they were temp cycling ovens, but then they had water in them. So they'd go high humidity. And the things would fail like crazy. And the president of Zenith came out to talk to us about this and what we were going to do about it. And he wanted to see Bob. And so, I had to tell Bob what was going on.

Hollar: And you were aware of this at the time?

Markkula: Yeah. And that's how I met Bob. And what a great guy. What a great guy.

Hollar: What was he like, at that point, just at that point at Fairchild?

Markkula: Well, he always had that really deep baritone voice. And he was always calm. You were always confident, whether you were the president of Zenith or a lowly product marketing engineer, you could just feel the confidence and believe what he said and take heart that we'll make it right. We'll get it taken care of. He was just that kind of guy. He was probably the most comfortable person in his skin that I've ever met. Just a really great guy. We traveled all over the world together. And he could walk into a truck stop bar and sit down next to a trucker, and the two of them would have a great time for a couple hours. That's the kind of guy he is— was.

Hollar: And then the next morning go into a business meeting and be—

Markkula: Well, or go invent planar technology for integrated circuits. He was really a smart semiconductor physicist. Great guy.

Hollar: And Gordon? Were you exposed to Gordon much at Fairchild at that point?

Markkula: Not very often. Gordon and Andy were pretty much down in R and D labs. And that was in a different location. So, I didn't see them very often.

Hollar: You were at Fairchild for—

Markkula: About four years.

Hollar: And you were there during the time that Bob decided to leave, or Bob and Gordon left to do their own thing. What was that like?

Markkula: The first one to leave was Charlie Sporck.

Hollar: Right.

Markkula: And Charlie and Floyd went over to National. And then, some time after that, Bob, Gordon, and Andy decided to go start Intel. And I think they started Intel in '68. So, I had been at Fairchild about two years when they left.

Hollar: Do you remember what that was like?

Markkula: Yeah, I didn't like it very much at all. At the same time, I was— not because I was trying to, but I was rising very fast up through the ranks at Fairchild. And so, I was being very successful in my own estimation. And even though I didn't like some of the things that were going on there, it wasn't hurting me at the time. But I could see the writing on the walls. At some point, if that continued, that we'd lose all the good people. And then what do you have? So that's what it was like for me, anyway.

Hollar: Since you could see the handwriting on the wall, did it cause you to really look closely what was happening at Intel and National and other places, and try to think about what you were going to do next?

Markkula: Well, not too much. I had a view of keep your nose to the grindstone, and do your job, and do it well, and let the chips fall where they may. And I kind of did that. Jack Gifford left. And I helped him write the business plan for AMD. And Jerry Sanders got fired, remember? So, he and Jack got together to do AMD. They wanted me to come there. I said no way. I didn't think that was a good move. So, I was just— like I said, I had my nose to the grindstone. I was doing the best job I could do for Fairchild.

And then when Bob and Gordon and Roger Borovoy at Intel decided that they needed some product marketing done, they actually hired a guy by the name of Bob Graham. I don't think you knew Bob. And Bob called me up. And Bob and Don Valentine had worked together at Fairchild in the early days, and didn't care much for one another. Anyway, Bob just called me one day out of the blue and said, "We need what you know how to do. Would you consider coming to work at Intel?" And I said, "Yeah, I would."

Hollar: Why were you so quick to do that?

Markkula: That was two years later. It was about late 1969 or early '70. And Fairchild was just leaking talent. The good people were going to Intel, or National, or Motorola, or some place. But the environment at Fairchild was not conducive to attracting good people or keeping the ones that we had. And that's not to say there weren't some great folks there like Wilf Corrigan and a few others that I really admired and respected. But they weren't up to the challenge. So, for me to go to work for Bob, that didn't take— that was a no brainer.

Hollar: How big was Intel at that point?

Markkula: Oh, tiny, tiny. They had just built the first 1101s, which was a 256 bit memory chip. <laughs> 256 bits.

Hollar: <laughs> Yeah.

Markkula: And they were still messing around trying to decide whether they were going to go with MOS or bipolar. So, that was something.

Hollar: What was the vibe of the company at that point?

Markkula: Intel?

Hollar: Yes.

Markkula: They were still an R&D lab. That's what I felt like there. They didn't really have a sales department to speak of. They did have a sales manager, but that was about it. And when I got there, I said to the— they had a department called shipping and customer service. And it was run by a young lady. And I said, "What's the backlog?" She said, "What?"<laughs> And I said, "Don't we have a list of orders or something?" And, indeed, she did, but it was all hand-written in an accounting pad. And I went, "Uh oh."

Hollar: <laughs>

Markkula: So, that's what it felt like. It felt like an R& D lab. And it didn't feel like a semiconductor company.

Hollar: So, what was the new product marketing guy going to do coming in to that environment?

Markkula: Well, develop, just for starters, basic blocking and tackling. How about a data sheet for—

Hollar: For the new 256 bit—

Markkula: 256 bit memory chip. And what kind of other things do our customers want us to build, and can we ever get to a penny a bit so we can compete with core and on and on and on and on.

Hollar: Yes.

Markkula: So, there was plenty to do.

Hollar: How did the top execs at Intel, Noyce and Moore and Grove, how did they view marketing at that point?

Markkula: I don't think Gordon had much of an opinion one way or another. I think Andy thought it was completely superfluous. And Bob had a great appreciation for it, I think. So, I think they were quite different.

Hollar: What was the first thing that really worked after you went to Intel? How did it begin to move forward?

Markkula: Well, the very first thing that worked extremely well and stands out— not to say there weren't other things that worked well, too— was the EPROM— the double EPROM. It was called a 1601. This was the world's first electronically erasable and then programmable read only memory. And it was a huge success for Intel. And we made a lot of money on that product. And we did a 4 bit microprocessor chip set for calculators that we sold to a company in Japan.

Hollar: The Busicom.

Markkula: Busicom product.

Hollar: That's right.

Markkula: Yeah, you know.

Hollar: I do. And were you able to build marketing the way you wanted to build it at that point because you really were the lead marketing person—?

Markkula: Well, not only did I have marketing, I had all shipping and forecasting and customer services, that whole back end, and the product planning, that part on the front end, and forecasting. So, I had Andy, who was supposed to be the manufacturing guy, kind of in between. And Andy, he would get so mad at me. I'd get him to agree to a certain number of products, certain quantities that were supposed to be built because I had all the order backlog and all that stuff. And he'd say, yeah I can build it. And then I can ship it. And then he'd have a yield problem or something else would go wrong. And he wouldn't be able to. And, of course, I'm the first guy to point that out because I've got the order. And the customer's sitting on my desk wanting to know where his parts are. And so, that was embarrassing to Andy when the factory didn't do what it was supposed to do. And Andy's not the kind of guy that likes to ever be embarrassed. So, he and I had some knock-down drag-outs over that kind of stuff.

Hollar: So, you were the guy who had to continually break the bad news somehow, or you had to deliver the customer's dissatisfaction to Andy?

Markkula: Well, yeah. And it wasn't that I was mad at Andy. It's just— here's the issue. We have to resolve it. We've got to start some more wafers or do something to get this guy out of a bind. But I enjoyed every minute that I worked at Intel.

In particular, I liked the microprocessors. What started out was called a 1201, which ended up being the 8008. And I still have a photomicrograph about the size of that poster over there of the 8008 that I think is really fun to have.

Hollar: Could you see at the time this kind of amazing progression that Intel, in particular, as a company was going to make as the science of semiconductors became more and more advanced, and the demand was building for it?

Markkula: Yeah, we weren't quite at the point yet of a system on a chip. And that's— I could always see that. As a matter of fact, I remember a cartoon. It was a picture of a little quarter inch chip with these huge foot diameter cables coming on both sides. <laughs> What are you going to do to interact with these things if you have to have all these wires coming and going out? But the answer to that is you have pretty simple things, an input and an output. And it could be very complicated in between if you have everything you need for the system there.

Hollar: Yes.

Markkula: So, to me it was just—yep, Moore's law makes sense. What are we going to do with all those devices on the chip, and multiple technologies on the same chip, so we can do EPROMs on the same chip that we do the microprocessor, and so on? And that's where we are today. Just gazillions of devices on a chip.

Hollar: And it was all moving in that direction from the very beginning when you were there?

Markkula: Yeah.

Hollar: Did you continue to have a relationship with Noyce also?

Markkula: Yeah. Yeah. There's something— it's not on your sheet here. There's a ski company called Volant Skis that was started in 1982 by Hank and Bucky Kashiwa. And Hank was the 1978 world champ

skier, downhill. And I'll make a long story short. Bucky was getting his Ph.D. at the University of Seattle, but the interesting thing was he was the chief designer at K2, and made all the skis for Jean Claude Killy, and for his brother Hank, and really a brilliant guy. And he had invented a totally new and different ski technology. And I got to know them through Jean Claude Killy because I used to ski with him once a year. Anyhow, I met with Bucky and Hank. And I took one look at the technology, what he had done. And he had made a ski that was a torsion box. The whole ski was a torsion box. The top was a piece of stainless steel shaped like that. And then there was a bottom steel. And then you hooked them together. And so, the ski is a torsion box. So super stiff torsionally. And nice and soft longitudinally. And talk about ski and hold an edge. The best skis I've ever skied on. So, I got Bob and Arthur [Rock], and the three of us each put in $5,000 to start Volant Ski Company. And the fifteen grand was to buy some roller equipment so that Bucky could make up a whole bunch of test pairs in his garage. <laughs>

Hollar: How did that work?

Markkula: It was eventually sold to a company in Canada, who then sold it to Atomic. And they are still building skis based on that technology, but they've made some small changes. They're still good skis. I ski on them.

Hollar: Was that your first foray into venture investing?

Markkula: No. Bob talked me into one before that. It was a company on the East Coast that had invented a way to do ice storage for power, so that you could buy electricity when it was cheap, and then use it when it wasn't cheap because you had stored all that energy in these tanks that were full of this chemical that froze. And it worked good, but the company never got off the ground. Trying to sell something to the utilities is— not easy, very tough.

Hollar: You mentioned Arthur Rock. And Arthur was very much a fixture around Intel, wasn't he, in those early days?

Markkula: Oh, absolutely.

Hollar: What was Arthur doing, at that point, when you were there?

Markkula: He was on the board of directors. And I had met Arthur at Fairchild, but we'd never spent any time together. But, at Intel, since I was doing the forecasting and shipping and all that other stuff, it was common for the board to ask me to come and give a status at each board meeting. So, I would come up and do my presentation or whatever you want to call it to the board, and Arthur would be there. And about half the time he would go to sleep while I was talking. He wasn't interested in any of that part of it. And

then I learned a trick from him. He didn't like to do that, so he would take a caffeine pill, so that he didn't get so sleepy.

Hollar: Was it the marketing that he wasn't interested in?

Markkula: No, the details of the shipping and the forecasting, and this product and that. He doesn't get into that stuff. He doesn't care about it. But we became pretty good friends. And I've known him ever since.

Hollar: Did the caffeine pill trick work?

Markkula: Yeah.

Hollar: Yeah.

Markkula: Yeah. It's about the same as drinking a couple of cups of coffee.

Hollar: Today we call it five hour energy, I guess.

Markkula: Yeah, I think it's the same thing.

Hollar: And so, then in 1975, at the age of 32, you retire.

Markkula: '74 I think.

Hollar: '74. What led you to make that decision?

Markkula: Well, every year around Christmastime, I would take stock of my net worth, where I was. And I had set a goal to be financially independent, so that I could do what I wanted to do and not have to work for a company or so on. And two years earlier, I did that little exercise and I had far surpassed the goal. And I said, I'm not quitting. I'm having too much fun. <laughs> And so I said, okay, I'm just going to take my time, and I'm going to give some thought to what I would I do if I was retired. And so, for the next two years, I developed a list of 52 things that I wanted to do, and it was really getting exciting for me to do. And so, two years later I resigned and set about doing those things on my list.

Hollar: So you could start on the list of 52.

Markkula: Yeah.

Hollar: Intel, by the way, I wanted to remark on this for a minute, was quite focused, wasn't it, on employee equity and giving people a stake in the company and really having everybody share in the success of Intel.

Markkula: Yeah, and it created a lot of problems. They were really a pioneer in that regard. And believe me, I copied every bit of it at Apple.

Hollar: What were the problems that it created?

Markkula: Well, a line worker, for example, with a stock option, had no idea how that worked or what it really meant. And we had to literally teach classes in what it means to own stock in the company, and why is it different to have an option than owning the stock directly. And do you want to participate in the employee stock purchase plan, where you could buy stock for 15% less than its market value at the time you bought it. And why was that a good idea? Oh gee whiz. But once we got over those humps and employees understood that they were actually owning part of the company, it did what it was supposed to do, which was to align everybody's thinking to the best interests of the shareholders. And, of course, it's kind of out the window today because of some of the things that our government has done. But, I still think it's the very, very best way to run a company. If you didn't have to expense the options, it would be good.

Hollar: So, let's get back to your list of 52. You're retired from Intel. You have your list of 52. What are the things that are on your list, at that point?

Markkula: I'll just give you a few. Some of them are kind of frivolous, but they were important to me. One of them was, I'd been playing the guitar for almost twenty years. And I never learned how to read music. So, I wanted to do that. So, I went down to the music store on De Anza Boulevard, and I started taking lessons from one of the guys in there, who was a guitar player. And I learned how to read music.

I wanted to put something back, so I went down and got on the Cupertino planning commission. So, I was a planning commissioner for two years. And I actually enjoyed that. It was rewarding. And I met some pretty interesting people like John Sobrato and others.

Hollar: Was he just starting out, at that point?

Markkula: Yeah. And he was one of the guys that was presenting to build buildings and things. And I was on the planning commission. He tells some funny stories about that.

I went down to Regnart School, grammar school, on Bubb Road, and said, "I have a Master's degree in double E, and I can teach math. Would you like to have me come and teach math?" They said yes. So, I did that for a couple years.

I love building furniture and working with wood. So, I would build chairs and tables and stuff in my garage. There were a lot of things.

Hollar: And then, I noticed in the movie "Something Ventured" you said that one day a week—

Markkula: Every Monday.

Hollar: You would help a young company.

Markkula: I would— yeah, whoever wanted to call me up and have me help them in whatever way I could, I did, for free.

Hollar: What were some examples of things you were doing, during that period?

Markkula: One guy was building a soap company. <laughs> There were several semiconductor companies who called and would ask me to evaluate their business plan, or help in other ways. And there were a couple of them that said well you just might as well come to work here. I said no, no. This is Monday, not Tuesday and Wednesday. And so, I managed to not do one of those kind of things.

Hollar: Was it satisfying to you to do just that one day a week?

Markkula: Yeah, it was, because what I found out I missed was bright fiery eyed, fire in the belly people wanting to accomplish things. And that gave me a way to interact with people like that. And I enjoyed it a lot. That's why I kept doing it.

Hollar: So, let's turn now to your getting introduced to Jobs and Wozniak. There are so many versions of this story about how this happened. And I would just like for you to take me through how this came about and who was responsible for it.

Markkula: Well, it's pretty simple. Steve Jobs had worked at Atari. He was trying to find some money to build those 50 [Apple I] boards that he had sold and he needed to buy parts for. So, he knew Nolan Bushnell. So, he went to Nolan and said, "Nolan, how can I get financing?" And Don Valentine had financed Atari. So, Nolan had said why don't you go talk to Don Valentine. And Don knew that I was doing this every Monday help people out thing. So, he went over to see the two Steves. And I think you heard his view of that from the "Something Ventured.". But he came out of there saying he didn't want to have anything to do with the two—

Hollar: He didn't find them very appealing at all.

Markkula: No, and some place in the middle of all this, Steve had gone up to visit with Arthur, too. And Arthur was the same way. He just, ah— you know.

Hollar: These are two people you knew and whose opinions you respected.

Markkula: Yeah. So, Don just called me up one day and said, "There's two guys over in this garage in Los Altos who could really use the kind of help you'd provide. <laughs> And you ought to go see them." So, I said fine. So, he gave me a phone number. I called it. Steve answered the phone. I said who I was, and when could I come over and talk to them. It was the next day or so. And I went over and met them in the garage. I saw what Woz had done and what he was working on. And I went, "Uh oh."

Hollar: Why did you say that?

Markkula: Well, for years I had started out with the old IBM, I think it was called a 1600. It was a Fortran programmable box that sat on a desk. And I'd always had fun programming, whether it was Fortran or BASIC or who cares what. And part of the thing that I did at Intel was, I wrote the whole order processing system. And I did that on timeshare.

Hollar: You wrote the software for it?

Markkula: Yeah, the whole thing. And I used timeshare PDP 11s that they have over on Bubb Road. Remember the timeshare buildings on Bubb Road? And I did it that way because I could stop by on my way home and rebuild the disk drives and whatever else I had to do to keep the whole thing running. But that's how we kept both the forecast for Intel, and all the shipping information, that backlog, and schedules, and all that. And that ran on a Model 33 Teletype. You remember those? So, we had a Model 33 Teletype at Intel. And I had a Model 33 Teletype in my little office at home. <laughs> And we're going to get to it later, I suppose, but one of the things I wrote for Apple was a checkbook program. Well, I used to balance my checkbook on the PDP 11. <laughs> And so, I knew exactly what you needed to do.

And I had been using a ridiculously powerful computer to do the kinds of things that I could see you could do with the Apple II. And so, to me it was a no brainer. I was way ahead of it. And when we did the 1201, and the 8008, and then the 8080, I was just going like this: “Why don’t we go ahead and put them in a box so that you can do something with it?” And, of course, the reason was it was way too expensive then. And nobody had the brilliant idea of using your home television set for the display. <laughs> That took a huge cost out of it.

Hollar: Right. So, you saw this was obviously—

Markkula: I saw what Woz had done sitting there in that garage using an ordinary home TV. And he had color graphics even. And BASIC in ROM, integer BASIC albeit. It wasn’t floating point, but integer BASIC in ROM.

Oh man, I know what to do with this.

Hollar: What was the display like when you saw it? What was on the screen, do you remember?

Markkula: I can’t remember what was on the screen. But I had Woz show me what it could do. And eight colors, and there was low res graphics and high res graphics. I don’t know if you remember that, but the little quarter inch squares were one thing. Then there was a pixel-based graphics. And geeminy Christmas.

Hollar: So a lot of the things that you’d imagined at Intel and that you were even working on with this home checkbook program, suddenly all of it flashed before your eyes?

Markkula: Yeah, to me it was just like— oh good. This is great.

So, my plan was to encourage them. And I told them I’d help them write a business plan. And if the business plan was any good, I’d try to help them raise some money because I knew a few venture capitalists. So that was what I told them. And they didn’t say yay or nay at that point. But then they called up later and said yeah. We’d like you to help us write the business plan.

Hollar: Before we go there, I want to go back just one step, which was that— today to hear Valentine and Rock tell the story, it really has a lot more to do with them just not being sort of conventional people, Jobs and Wozniak, at that point. There was the whole bit about Jobs not bathing and having long hair and being rude.

Markkula: All true.

Hollar: Did that bother you? It didn't seem to bother you the way it sort of bothered them, and made them say, "I don't want to have anything to do with these guys."

Markkula: It didn't bother me. They were young, malleable. And at that point, I wasn't going to be part of it. I was going to help them write a business plan and see what we could do with that. And that would be that. That's what I did. I wasn't going to be running off to spend the next 20 years of my life <laughs> building a company.

Hollar: So, for you it was another Monday project. And these guys were who they were.

Markkula: Right, and I loved the Apple II. I just absolutely loved the Apple II.

Hollar: Yes.

Markkula: I just thought it was a brilliant piece of engineering. The circuit design was elegant. The Apple II, as it was when I walked in there, was the world's first single-board computer— the world's first. All the other computers that were made with 8008s and all the other stuff were multiple boards that were put together with connectors and stuff. It was the world's first computer that used semiconductor RAM. It was the world's first single-board computer that had slots. It had eight slots that you could plug in other things. It was the world's first computer that had BASIC in ROM. It was probably the only computer that's ever been built that had a built-in 16 bit microprocessor simulator in ROM. I could go on. This was one elegant, beautifully crafted design that Woz had done. And I'm a circuit designer. I know. <laughs>

So, I wasn't worried about that part of it. And the jump to use the owner's own TV that he already has as a display to keep the cost down. That was brilliant. At that point, there was no Rod Holt involved. So, there was no switching power supply, which is another major, major piece that made the Apple II a fantastic product.

Hollar: Did they know what they had at that point?

Markkula: No. I don't think they did. They were just having fun. And Woz just wanted his own computer. Simple as that.

Hollar: And turned out to be exceptional in the way he could design these things.

Markkula: And Woz did it again when I asked him to build the DOS, the disk operating system, for the floppy. That little card, today, is impressive. There's not an extra bit anywhere in that design. None. And it did everything superbly.

Hollar: From the time that you first met them and you had this kind of revelation, and you said— you just offered to help. And they didn't say anything at the time. What was the passage of time before they called you back and said yeah—?

Markkula: I think they called the next day.

Hollar: Did they? Okay.

Markkula: And said we'll do a business plan, and when can we get together. And it really wasn't Woz that was going to— it was Steve that was supposed to do the business plan. And I said fine. I forget what schedule we did. We committed to some evenings. And I lived in Cupertino. We had this little cabana out in the back, which was a good place for us to sit and talk and work out the details. So, we spent quite a bit of time. And I would give Steve the list of things that he needed to do, and then come back with it done. And he never would do that. <laughs>

Hollar: So, you were the driver of the whole process? You had to be because you knew what you were doing.

Markkula: Yeah, and I kept giving him what— but it was pretty obvious that neither one of them had any interest in writing a business plan. They just didn't want to do it. So, I finally said I'll write a business plan because I really wanted to see this thing go. And, in the process of doing that, I came to the conclusion that we could build a Fortune 500 company in less than five years. And I thought that would be really fun. It had never been done before.

Hollar: Now, with no market really to scope at that point because there'd never been anything like this computer before, how did you know that you could do that?

Markkula: I just knew it. And one of the things I said then was there would be more personal computers in people's homes than telephones. And guess what? It's true today.

Hollar: Yeah, absolutely. You had to have some faith that the two of them could do the things you needed for them to do if you started to build the company. How did you come to the conclusion that you could count on them?

Markkula: They were young, motivated guys.

Hollar: Did they have that fire in the belly you were looking for?

Markkula: Certainly Steve Jobs did. Woz was very reluctant. He didn't want to quit his job at HP. And I said, "Look, we're not doing this unless you're fully committed." And he said, "Well, I can work part time." I said, "No. That doesn't work either." And so finally he decided he would be part of it. And I knew that if I was going to go and— well, I hadn't got to that point, yet. But at one point, I decided if it was going to happen, I had to go do the marketing because I didn't think I knew anybody else on the planet that understood what it was going to take to introduce personal computing to the world. <laughs> And so— and I've told the story a lot of times— I said if you walked down the street in 1976, and stopped a hundred people, and ask them if they'd like a personal computer, the most common answer would be, "A what?" And so, that's where we were starting.

Hollar: As you were in this really intense period from late '76 to the incorporation of Apple in early '77, were you talking to other people like Valentine or Rock or people who would say, "I think we may have a tiger by the tail here"?

Markkula: The only person I talked to at that point was Hank Smith. Hank Smith had worked for me at Intel. He was the guy that actually introduced the 8080, and just a brilliant, brilliant guy. And I'll just tell you this little story. It should be part of this thing.

Hollar: Okay.

Markkula: But at some point you might interview Peter Crisp or Hank Smith. There was a board member on the board at Intel named Hank Smith. He was the representative of Venrock Associates. That Hank Smith and my Hank Smith just hit it off. They're both from the East Coast. My Hank Smith kind of always wanted to move back to the East Coast. He and his wife, Kathy, liked that environment better than California. And they became close friends. And then, the Intel Hank Smith found out he had terminal cancer. So, he went to Venrock and told them that my Hank Smith should be his replacement at Venrock. And that relationship bloomed and developed. And when the Intel Hank Smith died, my Hank Smith went to work at Venrock. And we were very close. And I loved working with Hank. And he worked for me at Fairchild, and then I hired him from Fairchild to come to work at Intel because I thought so much of him. And so, since he was the Venrock guy now, I just called him up one day and said, "Hank, I'm doing this. I don't need any money. If you want to play, fine. We'll take some of your money. <laughs> If you don't, that's fine. Why don't you come out and take a look." And so, he did. And he was the first board member that I recruited. And so, they put 300 grand in. <laughs>

Hollar: That's a great story.

Markkula: Yeah, like I said, it doesn't belong in this piece, but it's one you can stick away in a corner for later.

Hollar: Yeah, that's good to know. Thank you, Mike. So, somehow you got the business plan written.

Markkula: Yeah.

Hollar: And then what? How did the initial investment happen? And how did you kick it off? And how did these two guys, Jobs and Wozniak, who were not really tutored in business at all at that point, how did they and you come together and decide the business plan's ready, now we're going to go form a company and get started?

Markkula: Well, when we finally got to that point, I said to the two of them that, "Here's the way we're going to do it: each of us is going to have 26 percent so any two of us can throw the other one out so that we have some confidence that if somebody goes off the deep end, we can take care of that. And the rest of it will be used for stock options and recruiting top-line talent." And they thought that was a pretty good plan. So I had that part set up.

I went and talked to a guy that had worked for me again at Fairchild who then left Fairchild during the great exodus and went to National and his name is Mike Scott. And he's a Cal Tech physics grad, just a really, really brilliant guy and fun to work with and our birthdays are the same day, but I'm a year older than he is because of leap year. So anyway, we used to go to lunch every year on our birthday. So in '77, I asked Mike if he would entertain the idea of coming over and being CEO because I knew that he could manage Steve Jobs and Steve Wozniak and he would do a great job and I wouldn't have to worry about the manufacturing end of it because he was just really good at that stuff. He knew every resistor and capacitor that was out on that line at any point in time. He's one of those guys and he did a great job with the two Steves. So that freed me up to really go worry about marketing and that was enough for Scotty, believe me.

Hollar: And you said— I read this interesting part about the titles— he's the president working for you as the chairman, but you're the VP of marketing working for Scott, the president.

Markkula: Right, we did that on purpose.

Hollar: That's very interesting. How did that work?

Markkula: Great and it sent a real message to every employee that "It doesn't matter what your title is. It matters what you're doing and how you work with everybody else." We have to have a chairman, oh good, he'll be chairman. We've got to have a CEO, he's CEO.

Hollar: And Woz was still designing the product and Steve was doing what?

Markkula: Steve was worrying about getting the case to work because we had huge problems with the molds and we'd get the lids in and they'd be warped. And so there was plenty for everybody to do.

Hollar: And were you also putting the board together at that point too?

Markkula: Yes, but that was pretty well-laid by the first part of '77. And we had to do the power supply so we hired Rod Holt who designed the power supply, which was another brilliant piece of engineering. It was really, for its weight and size, highly efficient so we didn't have to have a fan; it was a great power supply. And it was enough capacity that you could plug in stuff in all eight of those slots and power all that; a tremendous design, just absolutely superb.

Hollar: Where was Rod Holt?

Markkula: I'm not sure. I think he had left Atari, I think he was at Atari.

Hollar: Were you the one who found him?

Markkula: No, Steve Jobs found him. [Al] Alcorn recommended him, I think is the way that went. Anyway, he agreed to come and do the power supply and he did. He is a personality, I'll tell you.

Hollar: And then you talked about— as you're getting ready to go to market at the West Coast Computer Faire and unveil it— that you were the one who asked Woz to build the disk drive, right?

Markkula: Yes.

Hollar: Because you realized tape was too slow?

Markkula: Well, no. Tape was just horribly unreliable. I mean you aren't going to put a lot of work and effort into anything and not be able to get it back. So as soon as you turn the power off, it's gone.

Hollar: And was Woz the kind of engineer that you could just walk in and say, "I need to do this. I think this is a good idea," and he'd start to work on it right away?

Markkula: For me, yes. But I don't know if that was true for other people. We always just got along just great. I always liked Woz and I think he returns the favor.

Hollar: Was the West Coast Computer Faire the key moment for the introduction of the Apple II?

Markkula: It really was; it really was. And I told Steve Jobs, I said, "I want the best booth in the house and we're going to do this up brown," and we did. You couldn't miss us. When you walked in that front door to the computer fair, all you could see was Apple and we had what everybody at that place wanted to see— "Oh, boy, look what they've done. Ooh, I want one of those."

Hollar: So this was very user-driven, wasn't it? I mean you were going directly to people who you knew would be wild about the Apple II and showing it to the right people.

Markkula: Yes, well, that was what the business plan said. There's nobody who's going to buy one of these things who isn't already a hobbyist, quote-unquote geek, which there weren't geeks then. And so the market to begin with was 100 percent the kind of folks that went to the Homebrew Computer Club and there was a bunch of them in Boston. I mean there was enough market to get us going so we just rifle-shot to the hobby market; we didn't think anything about anything else.

Hollar: And did you hit your goals for that? Did you hit your sales goals for that first . . .

Markkula: We hit the business plan month-by-month for the first 12 months, within $5,000. And it said that we would have net retained earnings in September; we did. One of the things I did was instead of just putting the money in, I just took out a line of credit with the Bank of America for a quarter of a million. And if we needed it all, fine we needed it; but if we didn't, it wouldn't get used. But I made a deal with the Bank of America guys who I'd known from Intel and other places. I said, "I want us to be treated like we've been with Bank of America for 10 years. I want you hold our feet to the fire, I'll make sure we make our payments on time, and everything that we do needs to be like a grown-up real company."

Hollar: Why did you do that?

Markkula: Because they didn't do that then. They treated a start-up like, "Uh-oh, we don't really want to do business with them." And I said, "I want a banking relationship; I don't want your typical startup banking relationship." and they agreed. So they got copies of the business plan; they were checking to

make sure we were doing what we were supposed to do and I wanted that. I wanted us to act like a big company even though we weren't yet.

Hollar: That probably applied a certain discipline to the operation of business that you were looking for it to do.

Markkula: It did. And that's what I wanted. You probably don't know this, all of the orders we took for the first six months were cash in advance. The customer would give us a check and we would give him a number and say, "That computer will be built in August 10th," whatever it was and we did that for quite a while.

Hollar: So it was a cash business from the very beginning.

Markkula: That's why we had net retained earnings in September.

Hollar: This was a whole new model, wasn't it?

Markkula: Uh-huh.

Hollar: A whole new model, a new product, a new user base, a new way to buy the product. I mean hobbyists, I suppose, had been in the custom of doing things a certain way for a while, but not in these volumes, right? Not in these numbers?

Markkula: Yes. And not something that ready-to-use out of the box. There was a company called Heath Kit where you could buy all the parts and make a stereo.

Hollar: And at the same time, you were writing software, weren't you? Were you writing software at this time as Johnny Appleseed or did that come a little later?

Markkula: No, I did that right away.

Hollar: Why did you do that?

Markkula: Because I wanted people to see that you could do something useful with an Apple II. So I wrote three programs. One was called Color Math, which was good for young kids to learn how to add and subtract. And one was called Finance, which did everything that the HP financial calculator did. It

would do internal rate of return and calculate an amortization schedule, all that stuff. By the way, these all had to run in 4K bytes of ram. <laughs>

Hollar: That's efficient <laughs>.

Markkula: You know an icon today is 128.

Hollar: I know.

Markkula: Four thousand bites. And then the last one we already mentioned, which is a checkbook-balancing program.

Hollar: Okay. How widely known was it that you were Johnny Appleseed?

Markkula: I don't think anybody knew that. I just did it.

Hollar: Did the company ever get calls? Anyone ever inquire and say, "That Johnny Appleseed writes pretty good software. Who is that Johnny?"

Markkula: I don't know if they did; I didn't get any. I still have an Appleseed Labs website that I mess with once in a while.

Hollar: I didn't know that. Appleseed Labs, that's really nice.

Markkula: I've got to take it down actually because the stuff that's on it now, it runs on OS 9. I haven't messed with it for a while.

Hollar: So what you hoped would come true came true because you went from — you didn't hope, you saw. What you saw would come true did come true from $170,000 in sales to a billion dollars in annual sales in five years. What was it like being on that kind of a rocket?

Markkula: Well, from day one, Scotty and I sat down and said, "We have to grow at an astounding rate and get large enough so that when IBM enters the market, they don't just squash us like a bug."

Hollar: So you feared IBM from the beginning?

Markkula: Yes, and we knew we had to grow just as fast as we could grow. So we made all kinds of interesting decisions based on that. For example, both Scotty and I had worked for companies who plateaued because their IT system wouldn't handle growing faster. So they'd have to slow down and replace the IT system and replace the order processing system, and then they could go on. So we said, "We're not going to do that." So we put in a billion dollar capability order processing system that would handle multiple distribution channels, multiple commission structures for salespeople. It was all there so we never had to stop. We didn't hit the ceiling.

And we said, "There is no way we're going to be able to use classical management techniques." We could figure that, at any point in time, less than half the employees would have been there more than six months. Well, I mean if you're growing that fast ... so we said, "We have to have a different scheme, a different technique for managing these people."

Hollar: How rapidly were you hiring?

Markkula: Geez, we more than doubled every year. They were behind the Good Earth, and we had about 30 people. And then we moved to Bandley Drive. When we moved in there, half the building was completely empty, we had ping-pong tables, and we had about 120. And by the end of that year, that building was completely full; we had skooshed up the cubicles and we had two or three buildings across the street and we still had <laughs> the original facility behind the Good Earth. We kept trying to get rid of it, then it'd be full of people because we didn't have any place to put them.

So what we came up with, we called it "management by values" and we said, "We're going to develop what Apple values are and we're going to make sure we hire people that share those values, then we're not going to have to look over their shoulder, that they're doing it all right, and make sure that they're implementing what the vision is." And an example of that is we put out a magazine, Apple Magazine; you probably got a bunch of them here.

Hollar: Yes.

Markkula: We could have put that out on newspaper paper, no colors, we could've done it black and white. But nobody had to say to the guy that was doing that, Phil Roybal— you may have him on one of these. He knew full color, not two-color, full color; good quality paper; well-written, make it worthwhile so the people will actually read it. And that's part of Apple values, which is never discussed. And nobody had to go to Phil and say, "Make it full color." So Apple values were super-helpful and we would go over those with potential employees and say, "This is what we care about. If you don't like these, then you probably shouldn't come to work here." And we'd say, "By the way, if you're the kind of person that gets angry when your cubicle shrinks over the weekend, you probably ought not to be here either." <laughs>

Hollar: And was that new to Silicon Valley, that ethos?

Markkula: Yes. Intel had a bit of it; they had the egalitarian culture there, which I thought was a bit stifling actually. I think the management by values worked extremely well for Apple, it really worked well. We had a guy by the name of Mike Vance— he is the person who originally came up with the phrase, "think out of the box," and you can get his books, he's written probably a half a dozen books. He was the guy who built Disney University, changed the culture at the theme parks— that their customers are not customers, they're guests and the place ought to be spic-and-span clean. Yes, Disneyland has been through that training class and it's part of what makes Disneyland Disneyland. Very smart guy.

We asked him to help us, and of course when we first did the values, we had honesty and integrity and all those kinds of words which mean nothing to anybody anymore. And Mike was very helpful in changing the way we worded the values to things like "We're all on an adventure together. We're going to be a good citizen in every locale where we have a facility." It's a whole different way of describing it and he was instrumental in helping us get rid of honesty and integrity.

Hollar: And tell the story in a different way.

Markkula: Yes.

Hollar: And then of course you said you used a lot of Intel's compensation approaches to things like the stock options.

Markkula: I wanted every employee to have some share of the company. I found out only recently that there were a couple people that Steve Jobs denied. Yes, I didn't know that. If I had known that, I'd have been all over it. So for the most part, every Apple employee had some number of shares of stock that they got from a purchase program or from an option.

Hollar: Just thinking about the three of you— you, Jobs, and Wozniak— how did your roles change and evolve in this tornado from 1977 to '81?

Markkula: Well, Woz really just wanted to be an engineer; he didn't want to be Steve Wozniak, managing this, that, or the other thing part of Apple. He just wanted to work in the labs and design stuff and so he continued to do that. And as far as I know, he's never to this day left Apple as an employee. He was out of it for a while after his plane crash because he had amnesia for darn near a year, but I think he's been an employee from day one to today, I think. And he's happiest just being able to work on what he wants to work on, and nobody's going to tell him yay or nay; good for him.

Steve Jobs always stayed interested and was always interested in making new products and he had a touch for coming up with products that people would want. And so his role continued to be more on the user experience side of it. He's not a circuit guy; he's not a technical person, but he's a very smart person and I think the Macintosh shows you that. But he was also smart, and people criticized the idea of having the pirates— remember the pirates and the big banner on the building and stuff? I thought that was fine because I wanted him to use as much of the Lisa technology as made sense. And for them to think they were pirating it away was just fine with me. <laughs> And I think the guys in the Lisa Department, they didn't find that onerous or anything.

Hollar: And then you, your role— you obviously had an operational role and also served as chairman. How did that change during this period?

Markkula: Well, it was unfortunate and Scotty's still a dear friend, but he had some really serious personal issues about 1981, just before that really, 1980, and it started affecting him at work. His demeanor was not good. I mean, he had some really difficult problems to deal with and I don't blame him for his behavior and other kinds of things, but it just became obvious that he couldn't run the company for a while at least. And so I got together with the board and we let him go and there just wasn't anybody else to run the company at that time so I said, "Okay, I'll do it, but the first thing I'm going to do is get a headhunter and start looking for a replacement." And so I ran it for two years and we interviewed quite a few people and we made an offer to one person who didn't accept. And then the next one that we made an offer to did and that was [John] Sculley. So I don't think the roles changed a whole lot. I was a different kind of a CEO from Scotty, but things were running pretty well in those days.

Hollar: Well, you were growing like crazy.

Markkula: We were growing. We had really good competent people all over the place in the company. We had great manufacturing folks. We had the peripherals division, which was wonderful, the guys that made the floppy disks and all that stuff.

Hollar: And could you still see IBM on the horizon?

Markkula: I could still see IBM. Matter of fact, the person that we made an offer to that didn't join us was an IBMer. It was a guy that wrote the business plan for the PC. That's how come I know the business plan for the PC was written on an Apple II <laughs>.

Hollar: With the change in the management structure in 1981 when Steve became chairman, was that a requirement? Was that a sort of necessary phase of the company, for that part to happen as well as Mike Scott leaving?

Markkula: No, but the board thought we should give Steve a chance to be chairman and see how he did. He was doing a good job at that time. He was interested in growing and learning more and I was fine with that. It didn't bother me any because I didn't think being chairman was particularly important; the only thing was that you had to know how to run a meeting so that people could get everything done and said and get out of there. And we had such a fantastic board with Henry Singleton, Arthur Rock, either Hank Smith or Peter Crisp who came later for Venrock, Don Valentine. We had a knock-your-socks-off board so I wasn't worried about it.

Hollar: And you had, with Scott's departure, big operational things you had to think about personally, I would guess?

Markkula: Yes, we were a pretty big company by then. I think we had more than 10,000 employees so it wasn't like it was a little undertaking.

Hollar: What was your impression of John Sculley at the time when he joined in 1983?

Markkula: I thought he was a really good choice. I thought he was bright and I thought he was motivated and I thought he grasped the most important parts of the technology fairly quickly. I was looking forward to having him take off and run with it.

Hollar: And since Apple had become such a big consumer company at that point, was it Sculley's consumer background that was important as one of the features that he brought?

Markkula: Well, he understood marketing and that was really important. And when we started the thing, I told the two Steves that I would stay there four years and that was '77. So '81 as time for me to leave, not take over the company and run it. And so when we found Sculley, I thought, "Good, this guy understands marketing. That gives me an opportunity to retire again and not have to worry about this thing." So, hell, I was just hoping he would be hilariously successful.

Hollar: Did he rely on you when he first came in for advice and guidance since you'd been running the company at that point?

Markkula: He did for a while, but not long. He didn't need to be coached much; he was running Pepsi, he was a big boy. And the company was in pretty good shape and if there were huge problems, that would've been a different situation. But he took over a nice, well-run company and figured out what he needed to know and learned it and he was off and running.

Hollar: It was also right about this time that the Macintosh Lisa development was happening and you referenced that earlier. As this was going on, first Lisa and then Macintosh, what were your views about it at the time?

Markkula: About . . .

Hollar: Well, I guess I'm asking sort of two lines of questions. One is— what did you think of the Macintosh first of all as a project, which was such a radical departure in personal computers to begin with. And then second, what did you think about the Macintosh in light of the Lisa, which have tried to do some of the same things, but really hadn't been very successful.

Markkula: Well, I was always a believer that we could ride a bike and chew gum. And to have two approaches going to me was okay— we'll find out which one works, and we can afford to do that. We don't have to bet the company on one or the other and be locked in and fail. We can try two things and have one succeed and if the other doesn't, so be it; well, we're in good shape.

I was happy to have the Macintosh program going because that was truly a departure to put everything in the same case, the first time that had been done, and there were some technical issues that had to be overcome. And I understood the engineering of that and the guys did a good job putting the display in the same box with the computer. It's not as straightforward as you might think. So I was happy to have both of those things going on. What I really wanted not to have happen is for them to bifurcate and not talk to one another. What I wanted them to do was collaborate and stand on each other's shoulders and not reinvent things, but use whatever made sense for each project. And that's kind of the way it worked out.

The problem with Lisa was it was just too darn expensive. And I still get comments from people who had Lisas or still have them; they love the darn thing. It was a great computer, but just too expensive and we couldn't get the traction in the business market that we needed.

Hollar: Was that an active discussion at the board level at that point— whether Apple needed to try to become a business-oriented computer company as well as this great consumer company?

Markkula: Yes, we kept trying and kept trying and kept trying and we just never succeeded. I have not told this story publicly, but part of the reason was that IBM literally threatened some of their customers that if they bought Apple computers, they weren't going to service their mainframes. And that was a big blow; I mean, you don't overcome that. And the IT guy says, "No, we can't touch your computer with a 10-foot pole."

Hollar: What were your thoughts when IBM finally did enter the PC market? Because you'd seen it coming for a long time.

Markkula: I thought it was a blessing in disguise and a double-edged sword. It legitimized the PC as a real product and I knew our sales would go up and IBM's would too. I think that Microsoft and their operating system, had they not copied our user interface, I think they would've had one heck of a hard time competing with us. But they did and we sued them and we lost. So it was good in that it legitimized the market for personal computers, but it was not so good in that we didn't have just one competitor, we had 20.

Hollar: Did you think the Macintosh was the computer that was going to break into other markets besides the home market?

Markkula: No, I really didn't expect the Macintosh to be a business computer. I expected it to be used for certain bits and pieces, but it didn't have color; it was just lacking a whole bunch of things that it needed to really work in the business market. And it was designed to be lower-cost and so some of those features were taken out on purpose to get into the price range of $2,000. Otherwise, it would've been a $5,000 thing and we wouldn't have sold any of those either.

Hollar: Like the Lisa.

Markkula: Yes.

Hollar: And unlike the Apple II, it wasn't an overnight success when it was introduced, was it?

Markkula: Well, it was and then it tapered off and then it started to grow again. And I think that was just— my impression looking back is that we got more developers to put out some really good applications and that set it back on the growth path. We had some evangelist guys that were running around the country; they did a god job.

Hollar: So as 1984 becomes 1985, that's leading up to the period when Steve Jobs leaves Apple. Can you walk through that period and give me your own thoughts about what was happening, what the dynamic was, and how that all came about.

Markkula: Well, I wasn't there managing and I think Steve and John were on a diverging path philosophically and Steve wanted to do certain things and John wanted to do other things. And John came to the conclusion that Steve wasn't working for him. Steve was doing what Steve wanted to do and

it was disruptive. And I think he made the only decision he could make, which is— he can't manage the company if Steve's going to run around and undo things and change it and cause him all this grief. So he reorganized and gave Steve a job that didn't have anybody reporting to him, and he had an office away from the main campus. He didn't fire Steve, but he made it so Steve had nothing to do so Steve decided to go off on his own. And I don't criticize Steve for wanting to do that or doing it even, but I just wish he'd done that himself, got something started and then thought about hiring people, whether they were from Apple or anywhere else and done it on the up and up. What he did was— he got half a dozen people to agree to go with him, and I felt that was unethical and not the right way to do it. He could've ended up with the same situation and done it like a gentleman.

Hollar: Can you talk a little bit about, just from a board member's perspective, Mike— and then I'm going to ask you for your own personal reflections on it— but from the perspective of a board member, this would seem to be the kind of thing that builds over time. I think of the analogy of a storm cloud on the horizon. You see this kind of dynamic working with Sculley and Jobs. Is there anything that anybody on the board, you or anyone else, ever felt needed to be done or could be done or should be done to try to stave it off or send it in a different direction?

Markkula: No, and John had advised the board that this issue was coming up. And I don't think John expected or wanted the board to do anything; he just wanted to make sure that the board knew what was going on and the board could make whatever decision they needed to make should the time come. And he finally decided that he didn't want Steve in the company, or if he was in the company, he didn't want him messing around with his decisions. And either he would have to let him go, or he would quit, or the board would fire John. So the board knew what was going on, but it wasn't our place to get involved. Boards don't do that. Boards are supportive and helpful when they can be. And I think the board did a good job there.

Hollar: And then just as far as your own personal reflections. You know, we see it all the time in Silicon Valley, don't we, the Founder Syndrome, the guy who starts the company, or maybe has the first idea stays with it, and stays with it for a good long time like this— seven or eight years— but then finally can't stay on for whatever reason. Did you expect that eventually might happen as you got started with Jobs and the whole thing progressed? Did you feel that at some point there would be a day when it all might blow up like that?

Markkula: Actually, I didn't. I was surprised that Steve and John couldn't get along, because they were bosom buddies for a long time. And it just surprised me that all of a sudden they disagreed.

Hollar: And they...

Markkula: But I mean, things like that happen. Not much you can do about it.

Hollar: You had seen Noyce leave Fairchild under similar kinds of circumstances. Did you ever think about that when you watched this unfolding at Apple?

Markkula: No. When Bob left Fairchild, it was completely different. Fairchild was a division, the Semiconductor Division of Fairchild Camera & Instrument. And they had put Bob on the board of Fairchild Camera & Instrument, and what was going on was the other divisions of Camera & Instrument were taking all the profits that Semiconductor was making and subsidizing the other divisions that weren't doing well. Which meant that Fairchild Semiconductor couldn't spend the amount of money they wanted to on R&D. And Bob and Gordon were savvy enough to know that that's the only way to stay ahead in the semiconductor business. You have to be inventing all the time. So Bob very much disagreed with that strategy that Camera & Instrument was implementing.

And I'd been told— I don't know this firsthand, but I've been told— that they offered to make him President of the whole thing. There was— I think there was a guy by the name of John Carter that was President. anyway, I don't know all this firsthand, so don't take it to the bank. But Bob came to the conclusion that there was no way that Camera & Instrument was going to stop taking all those profits from Semiconductor. And I think they had a man-to-man discussion, and he said, "Fine. If that's what you want to do, then I'm going to leave." And he did. So I don't think it was a knock-down drag-out. I think it was, "We're going to agree to disagree, and if that's what you want to do, then I'm going to leave." And I don't think he had funding for Intel at the time that that happened.

You know, I don't think that he and Gordon had planned a company. I think they just decided, "We're going to walk out the door, and then we'll go figure out what we're going to do next." And they had enough confidence in Arthur that I think they knew that they could get funding, no matter what they wanted to do. So I see it as a lot different situation. And I think that— I think it was only the three of them. I don't know that they took anybody else when they left. And when they hired other people later, but they didn't have any— a company to hire them.

Hollar: No place to bring them into at that point.

Markkula: Yeah, they got to build the company first.

Hollar: Yes.

Markkula: Maybe Roger Borovoy went with them. I don't know.

Hollar: Did your own working role on the board change that much after Steve left? Was that a period where people were looking to you? You were probably the senior director on the board at that point.

Markkula: No, I don't think there was— there wasn't a need for institutional memory. I think my role stayed about the same. I didn't want to be the Chairman. And being Vice-Chairman was fine with me in case Sculley got hit by a bus, you know. It just wasn't much different, so it was fine.

Hollar: And then your subsequent relationship with Jobs. I just wanted to ask that question here, because there's more to talk about. But from everything I've read and everything you've said, it seems to have remained pretty free from any kind of lingering upset during that whole period. Is that true?

Markkula: Well, he knew, but I thought— I never— I'm not a hold-back person.

Hollar: Was he talking to you during that period? Was he seeking your advice?

Markkula: Oh, yeah, he would call me up every two or three months maybe. And either ask me to come over and take a look at the new products and comment on them. Or he'd call me up just to, "Oh, wow, we just passed Sony in market cap, you know?" And he'd invite me to come to the developers conference and the Macworld things. So we had a relationship, but what is, is, you know? He did what he did, and that's what he did, and that's what he thought he had to do. I don't think it's right. Still don't. But we agreed to disagree on that one, I guess.

Hollar: On his departure. On the way he departed.

Markkula: Yeah, yeah.

Hollar: Yeah. So then the period of '85 to '93 is— from a business standpoint— is pretty turbulent.

Markkula: Yeah.

Hollar: Apple's getting competition from all sides. People are— the market's changing, personal computing is exploding. What was that like?

Markkula: Well, as you said, it was turbulent, and there were, you know, for a long period in there, I thought Sculley was doing a really good job and marketing was good. I just— I didn't have any real complaints. But at some point in that timeframe, I think John got bored with it, or got tired of running Apple. I didn't know what happened. But it just— to me it seemed like he just took his eye off the ball. When we'd go to a board meeting, and I'd ask questions about profits and stuff, he didn't know the numbers, it was just like he wasn't interested anymore. And I think it was true. And it took the board a couple of years to realize it that that was really going on. 'Cause it wasn't easy to see it. 'Cause it was a

little bit at a time, and we just didn't— we just couldn't believe that he was not running the company, which is what was happening.

Hollar: Did you ever get the feeling that maybe it was just too much? I mean, it was just— he'd come in from just a completely different background, and maybe it was just beyond him?

Markkula: No, I think he got interested in politics and other things. He was running back and forth to New York, and Washington DC. He just wasn't paying attention to the company. I think he was overconfident that the people running Apple and making the decisions would get it right without him, and they didn't.

Hollar: Do you remember when the board decided it finally had to come to grips with that? And how did you feel about it?

Markkula: Sad. Sad.

Hollar: What was the sort of catalytic moment? Or was there one?

Markkula: I don't think there was any one thing. You know, I just remember one of the board members saying, you know, I think it's time. And we all agreed. You know?

Hollar: Then, as I was doing research on this, Mike, I'd completely forgotten about this: very soon after Sculley leaves, there are negotiations with IBM. Suddenly IBM pops up, and a possible acquisition of Apple starts being talked about. How did that happen?

Markkula: You know, I don't know how it got initiated. And [Mike] Spindler was running the company then, and there were a lot of meetings, and I'm trying to think of the then President of IBM.

Hollar: Gerstner.

Markkula: Lou Gerstner. It was his idea to buy Apple for a song. His perception of what Apple was worth was down here, and our perception of what Apple was worth was up here. And we just— we couldn't get anywhere close to an agreement.

Hollar: If you'd been able to close that gap, did you feel it was a good move strategically for Apple?

Markkula: Yeah, I thought it could be as helpful to IBM as it could be to Apple. I thought it was a real win-win. Because our culture was hugely useful for IBM to grab some of it. You know, it would have been great for IBM. And we really had good technology and good product, and with the strength of IBM, I figured we'd no longer have that roadblock in the business market. So I thought it would be an absolute win-win. But we were just night and day apart.

Hollar: It's still a little unbelievable how in rapid succession that these things happened. It seems like Apple has always lived in a different time zone from every other company, because all of these things are happening in the period of about 18 months or two years. So it's the very next year after the IBM negotiations collapsed that Steve Jobs comes back.

Markkula: Well, you have to remember that [Mike] Spindler leaves, and he, too, had some personal problems, which was pretty interesting. And Gil Emilio takes over, and Gil is the guy that came to the conclusion that we needed to buy an OS, and we looked at all the ones available, and he and his team came to the conclusion that we should buy the next OS.

Hollar: Do you remember what it was about the operating system that was so attractive?

Markkula: It was well-written and it was strong. It was UNIX-based. And you know, the other one we looked at was Be. And Jean-Louis [Gasse] had done a really good job with that, but it wasn't finished. Steve had some pretty good people that would come along with it. You know, there were pros and cons for each. But I think they made the right decision.

Hollar: Was it your impression that Steve was really selling hard at that point, that he really wanted this to happen?

Markkula: You know, I wasn't involved in the details of that. That was Gil's baby. So I don't know how hard Steve was selling or not.

Hollar: And I just wonder if it was always assumed that if you bought Next, that Jobs would come back. That his return was part of the package. Was it clear at that time or was it?

Markkula: I don't think it was an issue. If he wanted to come back, fine, if he didn't, fine. I don't think—what we wanted was the OS. And Avie Tevanian.

Hollar: And then of course Avie did come in and wrote some incredible software.

Markkula: He's a wonderful guy, too.

Hollar: He's been here. We did a great interview with Avie and Gordon Bell together.

Markkula: Oh, that'd be fun!

Hollar: Yeah, it was very fun. And then, did you have any personal feeling about Jobs coming back, rejoining the board, coming back into the company?

Markkula: Not really. I was just trying to find a time where I could get off of the board. I was getting older, and with all the turmoil for the previous four or five years, I would say, "There's just not a good time, you know? It always seems like there's something awful that needs to be attended to, and how can I leave when that's going on?" And so I was thinking, "Great, we're going to get this resolved, and I can leave."

Hollar: And so on the 20th anniversary of the start of Apple, you do leave.

Markkula: Yeah, it wasn't quite the 20th. I never quite made it to 20. I think I left in '96. I don't know what the official date is. Maybe it's '97, I don't know.

Hollar: I picked that up from a couple of places, that it was January '97, although maybe he didn't get all the way to the day.

Markkula: It's possible. Yeah.

Hollar: So as you look back on your experience in that amazing 20 years, what individuals stand out for you that maybe we haven't talked about yet? Anyone else that you would mention that was really key?

Markkula: Well, Henry Singleton and Arthur [Rock] are the Mount Everests of intellect and experience and knowledge about how you make a great company. And they were, before Henry died, very, very close friends, and had very, very differing opinions about a lot of things. And to hear them discuss these things in a board meeting was just so valuable. It's just not measurable how much they contributed to Apple's growth. And so I would say that— outstanding? Yeah, those two guys are outstanding.

Hollar: And then, as an engineer, as you look back on the technology, how would you rate the technology over that 20 year period that Apple produced?

Markkula: I even liked the Newton. You know, a lot of the ideas that are in the iPad today really started with Newton. It was big and clunky and all that stuff, but it was pretty well-done for its day.

Hollar: And wildly imaginative, too.

Markkula: Yeah! And it had some really nice little applications that ran on it. And people that had them just loved them. And so even the failures, if you want to call Newton a failure, I thought were pretty good technology. I think Apple has been very, very fortunate in being able to attract some of the top technical people on the planet. I really do.

Hollar: And then the final thing I want to ask you about the Apple period, Mike, is— and I actually got this question from Donna Dubinsky when I talked to her last week—

Markkula: Okay, I can get even then.

Hollar: She said— have you read the Isaacson book?

Markkula: Yeah.

Hollar: From your perspective, what do you think he got right, and what do you think he got wrong?

Markkula: Well, somebody asked me that question the other day when I was doing the thing with Arthur. And my answer was, there are a bunch of little things in there that are not correct, that Walter should have probably got right. But he hit the spirit and the essence of Steve and Apple right on the head. So all those little things, they don't really matter. It just— things that I know aren't right. Being an engineer, I'd like to call Walter up and say, "Fix this, fix that, fix this, fix that." You know? He said I had a gold Corvette. I never had a gold Corvette. Where he got that I don't know. So really, the overarching book is very, very well-done and worth reading. And I think just great. But I'm sure that in addition to the little things that I know are wrong, there are other little things that are probably wrong, too. And I hope that doesn't detract from people reading the book. Because they don't matter. They're just little stuff. So I think it's a good book, and well-worth reading. And I enjoyed it.

Hollar: You've had another amazing— I guess we can call this your third career, couldn't we. This last 15 years from the time you left the Apple board till now. Let's talk a little bit about what you've been doing.

Markkula: Phase 3.

Hollar: Yes, Phase 3. The Markkula Center for Applied Ethics at Santa Clara University. How and why create that?

Markkula: Well, it was started in 1986. So it started ten years before I left the board, or eleven, I don't know which.

I had felt that we had raised two generations of ethical agnostics— people that were running companies that I knew, people that were in responsible positions in companies that I knew. It's not that they were unethical, it's just that ethics was not on their radar screen when they were making decisions. It was all based on the dollars and cents, or their own advancement, or this or that. Whatever the process. But ethics wasn't something that they thought about. And I didn't like that conclusion. And I was at a seminar at Santa Clara University, and the guy that was giving the talk said that they had thought about starting a center for ethics. And my little light bulb went on, so I went up after the talk and I said, "Are you really sure about this?" And he said, "Yeah, we actually wrote up some papers." And I said, "Well, I'd be interested in financing something like that. Can we get together?" And sure enough, I got about a five-page letter, and so I sat down with those guys and we designed the Center for Applied Ethics.

Hollar: When you think about the contributions that the Center's made, and what you hope it will also do in the future, how would you describe that?

Markkula: I will say that it is, without question, the most bang for my philanthropic buck that I've ever gotten. They have done marvelous work. Not just in business ethics, but in medical ethics, in educational ethics, in government ethics. It is today the largest ethics center in the world. And has reached— it goes all the way to Beijing. It's a very, very fine organization, and I'm really proud of what it's done. Nursing, I think. I can go on and on and on. They've really done a good job.

Hollar: Do you interact much with the students there that are going through it?

Markkula: I have in the past, but I'm not that active. As you know, I was a trustee there for 29 years. And was chair of the board for the last six. And I'm just trying to get off of the treadmill of having regular meetings that I need to attend. So my wife and I can say, "Well, it's Thursday, let's go play golf in Carmel." "Oh, no, I can't, I have a board meeting." So.

Hollar: You must be really pleased, though, when you see the students and the work.

Markkula: What really gave me a great amount of personal satisfaction is where the cafeteria is. It's called Bannon Hall. And there's a huge blackboard that's set up right by the entrance, and every day somebody from the center goes and puts a ethical dilemma type question at the top of the blackboard.

And the kids come in and they read that, and they post their thoughts. They post their answers. And reading that thing is more fun. And seeing how seriously those kids can get involved with it. It's just a little thing, you know? A little blackboard. But I think it's just delightful.

Hollar: And then you did Echelon, too. Another start-up. It seems like it grew out of your own personal interest in having a home work better.

Markkula: Well, the technology is ubiquitous. It's just like a screwdriver. You know, a screwdriver, you can use them anywhere in the world, and you can use them on your car, you can use them wherever there's things put together with screws. And the technology that Echelon developed is distributed intelligence control systems. So it works in any application where you want to control something. And you don't need a central intelligence to do it. You put the intelligence in each bit and piece that needs to be controlled. And that turns out to be very interesting architecture for that. Because if one bit fails, the whole system can continue to work. When you have a central control system, if that fails, you're done. It's all over. And so it works for lighting controls, air-conditioning controls, smart meters for the grid. The problem is the same— sense whether something's on or off or in-between. Turn something on or off or in-between, and communicate with all the other intelligent nodes. That's the same exact problem whether it's running a car or an airplane or a factory or a home or a building. So it's ubiquitous. It's a great technology.

Hollar: Where do you think this is headed?

Markkula: It's not clear right now. The biggest market that has some traction is metering, smart meters. But I'd like to see it take off better in many other areas. Building controls, that's going fine. That's a solid market. Street lighting is taking off on a worldwide basis. We got Oslo, we got many of the cities around the world are using that technology to control the street lighting. And it pays for itself in like two years. And it kind of cuts their power bills by 55 percent. I mean, so street lighting's going well. You know, the Honeywell's of the world build it in, and don't tell anybody it's in there. So when you buy a thermostat from Honeywell, you might be buying Echelon technology. McDonald's has specified that all the equipment that goes in any of their new kitchens has to be LonWorks compatible. So yeah, there's a lot of things. But nothing has really, really taken off like the meters have. I'd like to see that happen.

Hollar: And then the Jet Center, too, which is another thing I wanted to ask you about, especially since that's so local. What was your vision for that?

Markkula: That's another Bob Noyce story. I bought my first airplane in 1980, and hired a couple of guys to fly it for me. It was a little tiny Learjet, Model 36, which has enough range to go to Hawaii. And the two guys I hired— one of them still works for me, matter of fact— said, "Well, you're not going to be flying all the time. We should probably do a charter certificate, and rent the airplane when you're not using it. And

it'll keep us current and offset the cost of the airplane." So I said, "Fine. That sounds good!" And no vision, no nothing, just, "Oh, okay."

Hollar: Just practicality.

Markkula: Yeah, makes sense, let's do it. And so we started chartering the airplane.

And then we had to have maintenance because of getting a charter certificate— you have to have a Director of Maintenance and so on. And we wanted that anyway. So we had this little kernel of a business for aircraft management. And we had the charter certificate. And then other people would come up and ask me if I would manage their airplane and put it on my charter certificate. And the business grew. We ended up with 35 corporate jets, and personally owned jets. And we just ran such a tight ship and it was so straightforward. We weren't trying to make a huge profit, just make a tiny profit. And all of the maintenance stuff was passed through. We didn't tack on extra charges for that. And we've got the— I got a fuel sales permit from the airport so we could sell fuel. And so people would fly in and tank up and fly out. And so it just built a very nice little business, and it was called ACM aviation.

And one of our best clients, of course, was Mr. Noyce. He had a sea plane, by the way. That's another fun story, along with his other airplane. And Bob and I used to fly all over the place. So Bob had bought his airplane from Jim Lafferty, who was interested in building another FBO on the other side of the field. And so Bob, being my friend, said, "Let's all get together and see what comes out of that," because I already had the operation on the east side of the field. So we did, and Bob and I became the lead investors in the San Jose Jet Center.

And so we had those two operations going for, I don't know, 15 years. And at some point, we decided to combine them. Mainly because the airport wanted to get all of general aviation on the west side of the field, instead of the east side. And our lease was going to run out, so I said, "Great, we'll just put the two companies together." And so they did not have the aircraft management and the charter certificate, and we did. We had the fuel sales, they had fuel sales. So we combined them, and ran it that way for, I don't know, another ten years, whatever it was. And one day McCrary came around and they owned Atlantic Aviation, which is a chain of FBOs. And they said, "We want to buy this," and they made us an offer that was quite nice. So we took it! And that's the story of San Jose Jet Center.

Hollar: As we come to the end of this, I'm just going to ask you a few questions about— well, first of all, I'm dying to know, how are you doing on your list of 52 things that you really wanted to do?

Markkula: Pretty well. I still have a few left. But I'm doing pretty well at it. One thing that wasn't on there was playing golf. And I've added that since. And one thing that was on there was playing more tennis. Which I've stopped doing since we started playing golf.

Hollar: So you took that up as a hobby recently?

Markkula: What golf?

Hollar: Yes.

Markkula: Oh, no! Many years ago.

Hollar: Okay. And then just as you look back— you've got a huge career still ahead of you, it seems, but as you think about the lessons that you would take away from all of this to this point, what would those be?

Markkula: Well, I'll give you a couple. One is not my thing. It came from Henry Singleton. And it's just a simple statement. There are no secrets. And most people balk at that until you think about it for about an hour, and you will come to the conclusion that it's absolutely 100 percent correct. And wow, understanding that has simplified my life immensely.

And I learned that in a board meeting where we had an Apple employee that had embezzled. I mean, you'd never think we would— the way we ran that company that somebody would be stealing money from us, but there was. And we didn't know about it, and it was embarrassing that we hadn't caught it. And so what we were discussing was— it sure would be nice if we could just not say anything about this for a couple of weeks until we knew how to handle it, and knew how to do that. And we had this big, long discussion going in the boardroom, and Henry was just sitting there, you know, waiting until we were all through. And that's all he said, "There are no secrets." We put out a press release that afternoon. And that was the right thing to do. That was the only right answer.

But other things have come up in my professional career that have given me that same kind of angst— gee, I wish I could have some more time to figure out how I'm going to present this, or you make a decision on an employee that that employee really needs to go, and you want to put it off for a month. Uh-uh. Just understand that that's what you've got to do. So that's a lesson that I learned, and I'm indebted to Henry for that.

And my good friend, Doctor Noyce had a mantra that he would tell young folks, and it went like— you know, they'd be talking about what they want to do in their life, and he would tell them they should "create value; don't just rearrange it." And then he would say, "Be an engineer." And I really think that the idea of creating value as opposed to moving dollars around, to me, that is the only place there is true personal satisfaction is not somebody else has money and you take it, or some possessions and you take it. That's

not satisfying, but if you create value, then you can have pride in that. So you know, I credit Bob for having that mantra. He was a great guy.

Hollar: Those are two great observations. The last question, and maybe you wrote something down about this is: If you were giving advice to someone just starting out in an engineering career, what would it be?

Markkula: I think I already told you the answer to that one. Keep your nose to the grindstone. Do a great job. And let the chips fall wherever they may. You'll succeed. Really.

Hollar: Good.

Markkula: Don't worry about all that other stuff.

END OF INTERVIEW

