



Oral History of Larry Tesler, part 2 of 3

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Hsu: It is December 16th, 2016. This is Hansen Hsu, and I'm here with David Brock, and we are interviewing Larry Tesler again, for a follow-on to our previous interview. So I wanted to start by sort of going back to the counterculture and the Homebrew Computer Club and microcomputer scene. Were you the only person at PARC that participated in this hobbyist community, and how did you get into these hobbyist PCs?

Tesler: Well, I'm sure I wasn't the only one. Might have been the first one, but I doubt that even. I can remember a few. Ron Crane, I think was involved, and he was involved for a while before I found that out. David Thornburg was definitely involved. And at the very beginning, there was one other. It might come back to me, but I don't remember who the fourth was. But I remember there were four of us at the very beginning. And gradually a few more got onboard, realizing that these so-called hobby computers were gonna be evolving very fast. And how did I get into it?

Hsu: Oh, yeah.

Tesler: Well, first it was the Homebrew Computer Club. And I attended, I think it was the second meeting that they ever had.

Hsu: Wow.

Tesler: It was at Peninsula School, where my daughter went to school.¹ I knew the meeting was coming, because my next-door neighbor [Fred Moore], we lived next-door, at the different times we lived in the same place. But we were friends, and he gave me a flyer, letting me know about the first meeting. And I thought it was a little silly that everybody—he said, "Everybody will be making their own computer." I said, "You mean everybody in the world?" He said, "Yeah, everybody, everybody's gonna have one, and they'll make it themselves." I said, "I really doubt that." So I didn't attend the meeting. A couple weeks later, I was at Peninsula School, attending a board meeting or something, and saw a lot of people arriving at a time of day when things should have been all closing up. And I went over to see who it was, and somebody told me, "Oh, it's the Homebrew Computer Club." And so I went, "Well, I'm here anyway, I'll go to the meeting." <laughs> So I went and spent maybe half-an-hour. What happened at that meeting has been written up in histories. But it may be—well, I was just there for a little part of it. And but gradually, I got more and more roped in, and attended more of their meetings.

Tesler: My girlfriend at the time got involved working on *People's Computers Magazine*. And she talked me into writing a couple of articles. First I wrote them with a pseudonym, because I didn't know if I should

¹ Larry Tesler adds: According to Steven Levy's book, *Hackers: Heroes of the Computer Revolution*, the Peninsula School meeting was the fourth in the club's existence, not the second.

tell PARC management or not, but they were pretty innocuous what I was writing. Then it turned out it was okay to put my name on them, so I did a couple under my own real name.

Brock: What was your pseudonym?

Tesler: I don't remember. <laughter>

Brock: It would be a hard tell--

Tesler: I only used it once or twice.²

Hsu: So your girlfriend was into sort of this “bring computing to the people” scene already as well.

Tesler: Yeah, a lot of the people I knew in hobby computing were involved in it because of education. And Alan Kay had chosen education as a domain that would be very interesting to put his ideas into. And Adele Goldberg and other people that ended up at PARC started out by working for Pat Suppes at Stanford in his Computer Literacy projects. And I had been involved in those, too. When there was a time-sharing system that he set up and you could play text games on it. Yeah, Pat Suppes had a company that he set up. It was located in East Palo Alto. And there was a teletype interface. And Bob Albrecht had created one, People's Computer Company. And I knew him, oddly enough, because his wife and my wife at the time, worked together at General Mills Research Institute in Palo Alto. Even then companies were starting branches in Palo Alto just to get the innovation bug, and that was 1970—early 1970s maybe? Maybe before that. And it was late '60s. So I had multiple tie-ins. And the main difference between me, though, and others at PARC was that I could see that we were going too slow. <laughs> And it wasn't the fault of the people at PARC, it was headquarters, and there were people at headquarters who realized that, too. That this thing was going to get away from them, no matter how great a personal computer they made, they'd have a real battle. And so that's when they decided they needed to partner with Apple. And didn't we talk about that last time?

Hsu: Not yet. We're going to get to that. We're going to be spending a lot of time talking about that. But before that, I wanted to quickly hit on the NoteTaker project. How did the NoteTaker project relate to this microcomputer scene? Or was there any relation?

Tesler: Well, you have Doug Fairbairn, so.

² Larry Tesler adds: It turned out that I never used the pseudonym. The editor—my girlfriend—Phyllis Cole—handled it something like this way: “The ‘we’ of this article refers to a group of computer professionals—including this magazine’s editor—who have purchased a PET as part of a project aimed at integrating computers into the daily routines at a local school.

Hsu: Right.

Tesler: So I'm going to give you my—he roped me into it. He had a theory that software people could do hardware if the hardware tools were sufficiently good. And the hardware tools available on the Alto were pretty much ahead of their time also. Chuck Thacker had built a circuit design program called SIL, S-I-L. And it took advantage of the graphic display, and as he started developing this program, it became pretty clear to people that this was a good way to do it, and he should know. So Doug asked me what I would like to work on, and offered me to do a little hardware. So I said, "Well, I've done almost no hardware in my life. I mean, I attached a joystick to my Commodore PET, and made it move the cursor around or something." And that was about it. And that was, again, more software than hardware. But he said, "Well, we'll have you do the CPU card, the main board." And 'cause the Notetaker had several cards. And it turned out he was right to choose that one. It was pretty simple, and Intel had documented quite well how to do it. And we had a stitch weld machine. Did I talk about that before?

Hsu: Yeah, you mentioned that.

Tesler: I think we did. So what was the question really, because we did talk about Notetaker last time.

Hsu: Yeah, well, you've talked about Notetaker with AI before. I guess my question was, was there any connection to the fact that you had a Commodore PET, you had been involved in microcomputers and Homebrew. Was there any connection there?

Tesler: Yeah. Yeah, there was. When I started doing the hardware for Doug, I started paying more attention to the hardware discussions in the hobby computer magazines. There was usually some little bit of hardware, a little bit of software. It varied with the publication. But when we wanted to do an Ethernet card for Notetaker, Doug came to me again and said, "This has to be done partly in software, because it turns out that there's a limit of 25 chips per board in the Notetaker. And there are a hundred chips in the Alto Notetaker card. And some of those have to do with the Alto interface, but some of them just have to do with the Ethernet. And now when I say Ethernet, this was a really early Ethernet. It was three megabits per second, instead of ten megabits per second, like the first one that became used by people. But we were, just within PARC, using this three megabit per second. And the, let's see, so I went to one of the computer magazines. I think it was *Byte*, an early issue of *Byte*, and somebody had written an article about how to implement a—I want to say a State Machine—I hope I'm not using the wrong phrase³—in software. And it was for a different application than networking, but it gave me an idea about how I should do it. And I was able to develop software that did that aspect of networking in—wow, that's a long time ago. <laughter> —that did it fast enough, it could keep up with the input stream, because a lot of the stuff going by on the wire, it was not for you, it was for other machines. And so the first thing you do is compare the address with your own address to see if it's for you or not. Or if it's a broadcast packet where

³ Larry Tesler adds: I meant a Phase-locked Loop.

you would take—everybody would take that. And so if you actually write the code that would get the byte, compare the byte, branch, and then what would happen at that point is you would lose the next byte or two, you'd fall behind. And so part of it was a hardware solution of a buffer, but it turned out that was one of the reasons that there was—that there were a lot of chips, that they were these small memories. And so instead, we buffered just a little bit and we were able to keep up with the stream in software. And that was just standard techniques of unwinding, unwrapping loops, and keeping track of your state somehow. So there, that's a case where I went to the hobby computer literature to solve the industrial strength problem. <laughter>

Hsu: Wow. That's interesting. What needed to be changed to port Smalltalk to Notetaker?

Tesler: Well, there was—Smalltalk had a system library, and it was some kind of Alto code, and had to be rewritten for whatever we were using on the Notetaker in terms of an operating system. And I don't actually remember what it was. I think it was something that you probably couldn't even call an operating system. But because it was a hundred percent dedicated to just doing Smalltalk. But was it Kim McCall who did that? Bruce Horn might have been involved, but I think it was Kim McCall, and he was—somehow he got volunteered by Adele to implement the Notetaker version of Smalltalk. And so I helped him at various places. He would come by, run a problem by me. And they were luckily things I could usually solve. But I don't remember any details whatsoever. <laughter>

Hsu: Okay. What were the most important outcomes of the Notetaker project?

Tesler: Well, unintentional, the unintended outcome was that Adam Osborne was visiting PARC to see what was going on. They invited him into a room, conference room where he sat for a couple hours. And behind everybody else facing him, but he was looking straight at it, was a large enlargement of a Notetaker. And it gradually dawned on him that this wasn't a computer you could buy commercially. It's got to be one of PARC's prototypes, and that he could, just by staring at it for a while, he could figure out what was going on. Two floppy disk drives and sort of a wide and flat kind of suitcase form factor. And he went back and designed something similar. Actually, I think the Notetaker had maybe only one drive and he had two, or vice versa, but it was pretty close imitation of the Notetaker. And that was the Osborne 1, and it would've been a real winner, I think, except he made the famous mistake of being the first company to ever pre-announce your product strategy and timing, that in six months or something, there's going to be a new Osborne machine, Osborne 2. So you should rush out and buy Osborne 1's. And everybody's going, "No, I should wait." <laughter> And they waited, and the schedule slipped, partly 'cause he suddenly had less money to work with. And then the whole company just fell apart. So it was an early Silicon Valley burst of bubble, short bubble of portable computing. But Compaq came along and they did a portable that did very well. But all those machines by today's standards would be too heavy to even bother to carry around. You just wouldn't do it. They were reclassified as luggage, eventually. You could carry it like a suitcase. You don't want to carry it into a meeting and open it up and set up. Then the GRiD came along. The GRiD was really qualified as a laptop portable computer. And it also had the form factor

that caught on. The screen in the back, keyboard on the other panel, and the two panels fold to each other.

Hsu: So Dan Ingalls had said publicly that without the failure of Notetaker, Smalltalk might not have been made public. And Adele Goldberg told us that she felt it was the Apple demos that motivated her to try to make Smalltalk public. So for you, what do you see as the motivation for Smalltalk-80 and making that public?

Tesler: Well, I can see why Adele said what she said, and that was true for her. That's why she was interested in it becoming public. From my point of view, it's a little hard to say, because by the time those decisions were being made, I was already gone and working for Apple.

Hsu: Oh, okay, right.

Tesler: So that put me in a different situation. But fortunately, they chose Apple as one of the four companies that they were going to license Smalltalk to, to get started, and give those companies an advantage, and if Apple was going to do something, they would rather we did it in Smalltalk than some other language. But Smalltalk was way too slow at that time. It took decades before it was something that you might be able to ignore the slowness. And so that, it was just unrealistic. But let's see, why make it public? Well, because Xerox didn't have any proprietary use for it. Like, no one ever came up with anything that Xerox could do with Smalltalk that would be best done if it was kept secret and proprietary. It needed to be something that other people could have. And then there was at least a chance that it might catch on. But at least the ideas in it would spread. At the time, a few people who had been summer interns at PARC knew about it. It was the 1975 *BusinessWeek* article that talked about—I think talked about Smalltalk a little bit. And but at least it talked about some of the ideas that went into Smalltalk, like cut/copy-and-paste. But it just seemed very natural to make it public and maybe even open source. I'm trying to remember if there were any government funds involved in the development, because if there were, that would have been another reason you need to make the fruits of your work available to people, was the feeling at that time. If it's government funded.

Hsu: Right. So had you left already by the time they were working on Smalltalk-80, did you have any input in Smalltalk-80, the trend--

Tesler: Well, Smalltalk-80 was under development when I left. And trying to remember if it was, an early version was probably even done. If not, Smalltalk-78 was pretty similar. And I don't remember having to learn much, if anything, to be involved with the writing of the books.

Hsu: Oh, right, yeah.

Tesler: In the initial issuance of the books, I was the author of two chapters, I think—Garbage Collector and Compiler. Dan Ingalls had originally written the compiler, but it had a bug in the decompiler that couldn't be fixed. Just couldn't be fixed, because of the way the decompiler was architected. So I figured out a different way to architect it, and built a decompiler that was better than the one that Dan had done. But it also required redoing the compiler over. Not required, but I was able to make the compiler and the decompiler share data structures and if you change one, you're changing the other at the same time, that kind of an advantage. And then the—we had a garbage collector and we also had a reference count type of storage manager, and you sort of chose one or the other when you built your Smalltalk. I guess we were torn about which was the better thing. And there were other people at PARC working on better garbage collectors, Peter Deutsch and some others. But for Smalltalk, we wanted one that was pretty simple. But there was no kind of standard way to implement a garbage collector. A lot of people did it the way early LISP did it. But at that time, people were beginning to figure out that there are better ways of garbage collecting than were popular at that time. And so anyway, I wrote those two chapters, and I later went back to find them, and couldn't find them in the second edition. And one or both of them, I can't remember now, but one or both articles were removed in the coming out of a second edition. So I might have been in a persona non grata for PARC Management for a year or two, and that, "He left and went to Apple," and you know, whatever.

Hsu: Right.

Tesler: But yeah, I never asked Adele, "What ever happened to my chapters?"

Hsu: Right, but you did also contribute to the *Byte* Special Issue on Smalltalk.

Tesler: Yeah, the *Byte* Special Issue, I wrote an article on the user interface. And I think people were more comfortable with my doing that, because other people contributed from the Smalltalk group as well to the user interface, but it was clear that I was the guy that was—that spent my hours thinking about that. And so I'd be able to write the most useful article.

Hsu: So I don't know how much you had to do with this next question, but what was the origin of Model-View-Controller?

Tesler: Okay, if you ever have a chance to talk to Adele Goldberg, or you have, she knows a lot about it. There was a Norwegian--

Hsu: Trygve Reenskaug.

Tesler: Trygve Reenskaug. Yeah, I'm trying to remember what he did. He worked at a company—I don't think he was a professor—worked at a company that did simulation and he got fascinated by—somehow learned about Smalltalk and got fascinated by its ability to do simulations in this nice object-oriented way. Which resembled Simula, which he was, I imagine, aware of—had to be. And he wanted to try out some different architectures for simulation. And I don't know if he came in with the idea already formed to do Model-View-Controller, or just something a little vaguer than that, and he just needed to have the tool to play with and experiment. But anyway, after a few months, not very long, he had a prototype running, where you could build a user interface that was more modular. Up to that time, user interfaces were pretty integrated. And integrated with the functionality. Not always, but usually. And when they were modular, the modules were whatever the programmer wanted, and the next guy—the guy at the next desk doing a different simulation might have different objects. But with Smalltalk, he felt that you could have models which were the actual data that was changing, kind of. It's like the database of a lot of programs. View, which is the renderings, graphical renderings of particularly quantitative information—graphs and charts and tables and other different visual representations of the same data. And so the model didn't change when you switched views, but the view of that model kept changing under the control of the user through the controllers. And the controls would be—controllers are things that would—you could tell it, "This is gonna be a table, this is gonna be a line graph, or whatever," it was some kind of control that allowed you to do input of your functionality, of your commands. And actually, I didn't like it very much. And for what I was doing, at the time, I was building the Smalltalk browser, and it didn't fit very well, Model-View-Controller paradigm. And when I got to Apple, I developed, with a couple teams I put together, some object oriented frameworks, and we kept the Model—we called it a document, because that was more often what it was on a personal computer. I kept Views and I had Controls, but it wasn't all assembled in the same fashion. And there was another object that MVC didn't have at the time, which was a frame. And the frame, or a set of frames, could be put together to represent a more complex set of views that interacted with each other. And the Smalltalk browser, multi-pane window, was an example of where a frame was an important thing to have. But in, say, a drawing program, you'd have a frame with a pallet in it and another frame with the drawing in it, and then that was, I think, done with nested views in MVC. I can't even remember now. And Model-View-Controller's still around. I suspect it's, certain aspects of it, are universal and others are variable based on who did it.

Hsu: Right. Huh. So it's had a pretty big impact on the software history?

Tesler: Smalltalk?

Hsu: Model-View-Controller.

Tesler: Oh. Model-View-Controller, as I said, is pretty standard and when somebody builds an object-oriented framework, one thing is kind of de rigueur they just have to do is MVC. Because lot of people are taught it.

Hsu: Right.

Tesler: In college and it's the first thing they learn, the first object-oriented framework they learn. So even though it doesn't cover every possible thing you needed, it's among the things that you use in a lot of applications.

Hsu: Right.

Tesler: And I think the question then is do the users know that this came from Smalltalk?

<laughter>

Tesler: And I think probably not. Probably a lot of people don't know that. They don't know that the first IDEs were in Smalltalk. They don't know that the first frameworks were in Smalltalk. But the Smalltalk group wasn't interested in being the most popular. They were interested in being the most enabling.

Hsu: Uh-huh. Huh. So how did this idea of Model-View-Controller make its way into education, into academia? Did it go there along with Smalltalk?

Tesler: I think MVC is described in one of the books.

Hsu: Right.

Tesler: One of the Smalltalk books. And that's how it first got started. But once there was, it was in Java, then anybody that learned or anybody that developed a new language and knew MVC from Java would've been thinking, "I got this from Java," not, "I got this from Smalltalk."

Hsu: Right.

<laughter>

Tesler: But the Java people got it from Smalltalk.

Hsu: Right. <laughs> Okay. So let's start talking about some of the demos. So did you participate in the Futures Day demos?

Tesler: Doesn't ring a bell. Tell me what that is.

Hsu: That was the demo that was in Boca Raton, I think, that was for the rest of Xerox.

Tesler: Oh. I know what you mean, and I was never invited to those.

Hsu: Oh, okay.

Tesler: Yeah.

Hsu: What about the demonstration to the Xerox executives? There was a little simulation thing that was done that Adele put together.

Tesler: Oh, yeah. And the—and I think MVC was shown there. And in fact, she built a little toolkit on top of MVC that made it really easy to do certain kinds of simulations. And very quickly before those executives came—it was a very short project, a few days, as I recall—Adele and some others she pulled together at PARC, mostly in the Smalltalk group, developed a demo that the executives I think probably appreciated in part. The parts they got they appreciated and there probably were other parts that they didn't really, couldn't relate to it. But I don't remember the details. That would be something hopefully Adele would remember. Dave Robson was probably involved in that.

Hsu: There's a funny story about--

Tesler: Yeah.

Hsu: --a demo to the CIA that appears in "Dealers of Lightning" where--

Tesler: Halloween?

Hsu: Where he says <laughs> you dressed up in a trench coat.

Tesler: Yeah. I'm afraid it wasn't even Halloween.

Hsu: <laughs>

Tesler: And so there was one of the senior managers at PARC, in, early in his career, had worked at the CIA.

Hsu: Oh.

Tesler: And we were looking for customers who would be paying customers. And people that'd be willing to pay a premium for a futuristic machine that you really can't buy off the shelf yet. But for a price, you could have one—just like PARC decided to get every employee a machine and Xerox decided to get a lot of people on their Ethernet. And CIA can probably afford to justify spending a lot on something that would enable their trade. So somehow we all found out that he was bringing this entourage of people from the CIA, maybe six of them or something. And that was at a time where there was something in the air politically where the CIA was the bad guy. I don't remember what it was, but it was something that was an issue. And so I decided that I didn't want to interfere with Xerox getting the business, and didn't want to make a big protest, you know, outside the window or anything. <laughs> That... But I wanted to make some kind of statement without speaking.

<laughter>

Tesler: And so I came up with this idea that I would just show up for work in a trench coat with a kind of costume that a spy would wear in a cartoon. Yeah.

Hsu: <laughs>

Tesler: And then I, when I got there, I realized that, "I don't even know where they are."

<laughter>

Tesler: "How they going to see me?" But sure enough, at lunchtime, they went to the employee cafeteria. And I think they'd been warned.

<laughter>

Tesler: I went over to the table and said, "Hello," introduced myself. And made some attempt at a joke, which I think they outdid in their reply but I don't remember what we said to each other.

Hsu: <laughs>

Tesler: But they were amused.

<laughter>

Hsu: Well, let's get to the meat of it. Let's talk about the Apple demos. So from your perspective, how did that whole process begin? I mean, Adele has said that there were--

Tesler: Yeah.

Hsu: --multiple, there were two separate demos and then there was the second day and that was when all the secret stuff was demoed and she arrived late because... <laughs>

Tesler: Right. For years I had—what do you call? Selective memory <laughs> of. I thought there was one demo. There were definitely more than one. Everybody but me remembers more than one, and when they started talking about the difference, I remembered, “Oh, yeah. Couldn't be a difference if they were the same demo, could it?” So I had just run them together in my head. But it also had to do with the level of involvement. Adele was very involved in all the planning of both. And there was also a meeting, executives meeting. And I went to part of that, I guess. I remember being there. I remember what Steve Jobs said, so I was clearly in the room. But we weren't demoing anything, but we were talking about demos that had just recently happened or demos that were just about to happen. I don't remember. And other people don't really remember that meeting as the one I remember. <laughs> And so it's a little hard to—you guys would be doing a service <laughs> if you got all the pieces and put them all together. I think Al Kossow was trying at one point to sort it out and run his theories by Doug Fairbairn about how many--

<laughter>

Tesler: How many times we all got together and what we did.

Hsu: <laughs>

Tesler: There's a photograph that I ran into.

Hsu: Hm.

Tesler: I think it was before I was last here. Or after. Just after I was last here, I think. I was trying to find a picture of some of the Apple executives whose names I couldn't remember. In case I got asked about it at this interview here.

Hsu: Oh. <laughs>

Tesler: And while I was looking, I put in some names of people who I knew were there at the same time, and "pop," this picture came out, which was kind of sort of familiar. I wasn't in it, but I looked at it for a while and recognized, "Well, there's Steve Jobs. There's I think Chris Espinosa." Anyway, I started identifying the people and then finally I think the one I was trying to remember at the time, which will maybe come back to me now when I think about it some more. And yeah. It was Tom. Last name not here yet. [Whitney] Anyway, after a while I realized these were all the guys that came to the demo. And this picture is of them on their way to the demo.

Hsu: Oh.

Tesler: <laughs>

Hsu: Wow.

Tesler: And I couldn't prove it, but I think I sent it to, I guess it was to somebody in the picture. I think Chris Espinosa or Bruce Daniels. And I said, "Do you recognize this picture? And who's this--" one person I couldn't identify, whatever. And I think he said, "You know, you might be right. But I need to go back to my notes and look at that photo again and see where I got it from." I think I just found it on the web.

Hsu: Oh, wow.

Tesler: On an Apple alumni sort of site. Somebody managed to get this photo and they were about to leave the building and come over to PARC or they were at PARC and just walking down the hall and somebody turned around, took a picture. Don't know. But I'll try to get that, and remind me if I don't get it to you. <laughs>

Hsu: Okay. Yeah.

Brock: We certainly will.

Hsu: That would be amazing.

Tesler: No. Of course, it might have been something from the Computer Museum's archives.

Hsu: <laughs>

Tesler: You may already have it, is my point.

<laughter>

Tesler: But maybe not, maybe didn't know what it was.

Hsu: Right. Huh.

Tesler: Or maybe did and wasn't, I wasn't looking at the captions or something. Anyway.

Hsu: Right. Huh. So--

Tesler: Sorry. We lost the question. Which was?

Hsu: Yeah. I mean, I was actually interested in, like, so "Dealers of Lightning" says that Roy Lahr, the corporate Xerox venture person had met with you even before the demos to sort of gauge your, sort of ask you--

Tesler: Yeah.

Hsu: --you know, how important it would be to have this Apple partnership. And that's what got the ball sort of rolling on that whole process to get the demos.

Tesler: Right. There was a small group of people in the executive offices of Xerox East Coast, and who were sure that this was not going to go well if we just kept doing personal computing the way we were doing it. We weren't going to become a factor. And we didn't want to lose all this research that we'd done. Roy was the main instigator and certainly the most active member of the group. And he spent a fairly large, for a business development type of person, a fairly large amount of time, with PARC people and this, working on the PARC or the Xerox relationship issues. But on the first visit he came out, I was told

about the reason that these people were here from headquarters and a couple of the names. And the one I most remember, of course, is Roy. And the purpose of their visit was to find people who have knowledge and/or an opinion about the personal computer movement or whatever you want to call it. The hobby computing. And whether it's a threat of any kind. And when they got there, they went around, they ran into a pretty big wall of resistance where everybody said, "This is just, compared to what we're going to do, this is Mickey Mouse stuff. And it can only help because people will see how little you can do with it and be more interested once they see what we come out with." And that was pretty much what somebody early on must've come up with as an attitude and the attitude sort of spread to the people who were in denial about what this was about. There were people who just recognized that this wasn't what PARC was trying to do. Other people may be trying to do this. It's fine. There's no connection. And then there were a few of us who thought, "This is a big problem." And we were just being unrealistic about—well, and then our speed in 1975, this BusinessWeek article, which probably was read by a lot of people who got into the PC business. It was out from since 1975, and here it was 1979 and we didn't have a lot more to show than we did at that time, because we were banking on, "Oh, the Xerox Star is going to solve the problem." But the Xerox Star was designed for offices of many people tied together with servers. And it was very expensive in its initial incarnation and it just wasn't in the same game. They weren't playing the same sport <laughs> as Apple was playing. So at that time, let's see. I think I answered you.

Hsu: Oh.

<laughter>

Hsu: Okay.

Tesler: Remind me if I left out--

Hsu: No. I think that's--

Tesler: --part of it.

Hsu: That's pretty good.

Brock: So when they came to PARC, these kind of Xerox executives who were concerned about maybe we'll just call microcomputers--

Tesler: Yeah.

Brock: --for lack of a better term. <laughs>

Tesler: Mm-hm.

Hsu: They identified you as the guy who--

Brock: They found you, who shared--

Tesler: I think they--

Brock: --their--

Tesler: Yeah.

Brock: --concern.

Tesler: They told me that they found a few.

Brock: Okay.

Tesler: Of us. And I think that may be where the four came from that I mentioned before, how many were we? Around four. A half a dozen at the most. Who were—I'd go to Homebrew Computer meetings or I read the Personal Computer magazine <laughs> all the time or I read Byte. And it isn't something to ignore. It's something that should be affecting our strategy. And Roy identified who those people were. He wanted to meet us in person and make his own judgment. And the rest of the lab, a lot of people thought we were pariahs. And so Roy was at these meetings and organized them. And the meeting that I know I was at that other people haven't talked about, the demos is what they all talk about, because Steve Jobs paced around the room and all that stuff, but the meeting was to talk about ways we might work together. And--

Hsu: You and Apple. Xerox PARC.

Tesler: Xerox and Apple might work together.

Hsu: And Apple people were there?

Tesler: Oh, yeah. Apple people were there. It was probably about 50/50.

Hsu: Wow.

Tesler: And the meeting was at PARC. And in an executive conference room, I guess. And then... But at one point, Steve got very animated and he'd been there mostly listening to the negotiators basically. Running ideas back and forth. And he got very impatient with that. Said, "Wait, wait, wait, wait. This isn't going anywhere, and it won't go anywhere unless we tell them about the Lisa." Did I go through this last time?

Hsu: No. No.

Tesler: Maybe not. Okay.

Hsu: But this has been reported in "Dealers of Lightning."

Tesler: Ah.

Hsu: Yeah.

Tesler: Okay. I haven't read that in a long time, but I believe you.

Hsu: <laughs>

Tesler: I'm sure it is.

Hsu: Yeah.

Tesler: Somewhere.

Brock: We'd love to hear you--

Hsu: But he didn't report that this was in a meeting that was separate from the demos.

Tesler: Well, it was not a room where the demo was happening.

Hsu: Oh.

Tesler: It's possible that we had just left the demos and came into the meeting to talk about it.

Hsu: Oh.

Tesler: Or maybe we were planning the demos and maybe decided to do the first one that day or something. That's possible. I don't know that they were the same day or different day. But I thought they were a different day. There were more people at the executive table--than there were in the demo room.

Hsu: And was this during the initial demo or the subsequent demo?

Tesler: It might've been between the two. It might've been, you know, since I don't remember most the discussion.

Hsu: Yeah.

Tesler: But what I do remember was that Steve felt like they were just kind of talking business when we had important things to talk about. <laughs> And how can they partner with us on the Lisa? Help us on the Lisa. And Roy was more than anything, you know, happy, more than happy to help Apple get things done. And a lot of other Xerox people were not very happy about the idea that we were going to help them. But we worked out the deal where—or they worked out the deal. I wasn't involved in the negotiations. Where--involved the million dollars of stock, I guess. And involved a sales partnership with Xerox's Latin American sales organization. Sold Apple equipment at the beginning, when Apple had just a U.S. presence. Just they went into one or two other countries. But Latin America was not a dense enough, hot enough market to go after. There was no way that they were going to sell consumer computers in Latin America. But Xerox could sell business computers. And they went into every company to sell and deliver and install and maintain copiers. So they had the entrée into these places. So that actually went on for a few years. I never read about that anywhere.

Brock: No, I've never heard that.

Tesler: But Apple Latin America was really Xerox Latin America.

Hsu: <laughs>

Tesler: And... But the things that made a huge difference were, somebody at Apple would want a mouse and they would contract an industrial designer to build one and have it done in a year or something. And in the meantime, we needed mice. And you couldn't just walk into a Byte Shop and buy a mouse. So... Yet. I mean...

<laughter>

Tesler: But so they would call Apple and say, "We'd like to buy some mice." And Roy would get on it and find a way to do it. In the end, what he did was, he would connect us up, connect Apple, with the little company that was manufacturing the mice one at a time. And increase their volume by adding Apple as another customer, instead of just, you know—did I have—did I get the companies mixed up?

Brock: Just a little but we--

Tesler: All right. Well, let me--

Brock: You can follow. Yeah. Yeah. <laughs>

Tesler: --do it again. Is that when Xerox needed a mouse, they went to this company run by a guy named Tat Lam, and they were manufacturing mice. When Apple wanted to get a mouse and called Roy Lahr, his solution was to give permission to Tat Lam to sell mice to Apple.

Hsu: Okay. Huh.

Tesler: And then we wanted some fonts. And so once again, got a phone call to Roy Lahr <laughs> and next thing we knew--

Hsu: This was—are you at Apple already?

Tesler: --there's a magnetic tape or something full of characters. You know, it's... And yeah. Those happened when I—I found out about them when I got to Apple and saw that they had mice and fonts.

<laughter>

Hsu: Oh, my God.

Tesler: “Where’d you get those? Hope they’re legal.” They said, “Yeah. We got them from your employer.”

Brock: <laughs> There’s one thing about that million shares that Xerox took in Apple that has puzzled me. Which it seems that Xerox got rid of that stake in Apple immediately, like--

Hsu: Before the IPO.

Brock: --just immediately preceding the Apple IPO.

Tesler: Just after.

Brock: Oh, it was just--

Tesler: In other words, they sold—as part of the IPO, they had such a tiny stake that they were, I guess, not subject to the six-month freeze. But I’m not sure about that. It’s possible they had to wait six months, but I remember them announcing that they were selling, I think, at the beginning.

Hsu: Oh.

Tesler: So it was either at the IPO or six months later, but I’m pretty sure it was at the IPO. And no. They didn’t sell it earlier to Apple or something. I really don’t think they did that.

Brock: Oh.

Hsu: Okay.

Brock: Because one thing that we read seemed to suggest that, which seemed strange. But...

Tesler: Yeah. It may be in an annual report if you can dig one up. Of one of the companies. Or both.

Brock: Good idea. Hm.

Tesler: About the shares.

Brock: May I ask just a--

Hsu: Yeah.

Brock: --a few quick follow-ups, Hansen?

Hsu: Sure.

Brock: Had you known Steve Jobs and Steve Wozniak from Homebrew before you encountered them in this fashion in the Xerox-Apple relationship?

Tesler: Well, I knew of them. Just because they were already pretty famous in the hobby place, hobby area. When I—I remember there being a Homebrew meeting I went to where somebody in the open announcement section said, “We’ve got this little hobby machine running, and at the break we’re going to be demoing it in the lobby.” And at the break, everybody rushed to the lobby.

Brock: <laughs>

Tesler: And I couldn’t even get close. But they were pretty, everybody was pretty excited. There was a day when Apple did that, when Steve and Steve did that. I do not know if that was—I didn’t catch the name of the company or the people on that day. There was no reason for me to think much about it. But I, one time, I walked by a Byte Shop and in the window it said, “Apple I for sale, \$300.” And on sale \$300. So I went in and said, “What’s the usual price?” It was 500 or 600 before. And, “Well, why is it so cheap? You having trouble ‘em getting sold?” He said, “No, no, no. The problem is that they’ve just announced the Apple II. Haven’t you heard?” I said, “No, I haven’t heard.” <laughs> So I went and read articles about it. Went, “Ah.” And then I said, “You know, this Apple I might be worth a lot of money someday. Maybe I should buy it.” And I went, “I really can’t afford it.” So I didn’t do that.

<laughter>

Tesler: Couldn’t afford to—I couldn’t imagine stuffing it away somewhere for 30 years or something.

<laughter>

Tesler: Try to wait until it's valuable. Then my girlfriend was involved with—I said this magazine, which she had taken over editing from Jef Raskin, who--

Brock: Oh. Okay.

Tesler: Before he went to Apple, he started the magazine. And then he went to—he had to leave it in order to go work for Apple. And then he turned it over to--

Hsu: To People's Computer?

Tesler: Yeah. People's Computers. And then he turned it over to Phyllis Cole, who happened to be my girlfriend, and she had me write the articles, et cetera. And then she got hired by Apple to manage the writers. They had documentation that—well, Jef Raskin had put together a group of people to write stuff about the products for the customers. And he didn't want to do that anymore, so he wanted to hire Phyllis to do that instead. So he hired her and she ran the writers for a while.

Hsu: Oh, right.

Tesler: After a while it split into separate groups for Apple II and Lisa and Mac and... But when it was all one group, it was Phyllis managing it. And so the first year she was there—she was employee Number 32—first year she was there she went to the Apple company picnic and I was her date.

Brock: Oh.

Tesler: And I kept thinking, "Well, maybe I'll meet Steve Jobs." But he didn't seem very approachable. And he was always surrounded by people.

Hsu: <laughs>

Tesler: And he was interacting with all these people, and the more I thought about it I was—I didn't know what to say to the guy. And so I just let it be and met some other people instead. And yeah. So that was, it was some examples of contacts that I had.

Brock: You mentioned Bruce Horn, who had worked on the NoteTaker project. And he had gone to Apple before you; is that correct?

Tesler: No.

Hsu: I read something that indicates that--

Tesler: Couldn't be.

Hsu: --actually you were the one who convinced him to join Apple after you had left, so... But Adele remembers differently, so I'm--

Tesler: She thought he had already gone?

Hsu: Yeah. Her recollection was the Bruce Horn was part of the Apple contingent at the demo, and that she, she was mad about it because she knew that Bruce was basically asking all the right questions. But according to Folklore.org, he writes that he didn't join Apple until after you had already recruited him to come.

Tesler: Oh, yeah. No, it was impossible. Because she may be thinking of somebody else.

Brock: Oh, that could be.

Tesler: Trying to remember who could've been there that was ex-Xerox.

Hsu: Tom Malloy?

Tesler: Tom Malloy, definitely, would be an example of a person who had just joined Apple at that time. Late 1979. And...

Hsu: And was he on the Lisa team also?

Tesler: He was the manager of the Lisa word processor. LisaWrite.

Hsu: Right.

Tesler: He's a good friend of mine. I can ask him. I think he told me once that he was at one of the demos, now that I think about it. Because I didn't remember him being there. And he may know who went, so if you want to mark it as a—after-meeting question.

Hsu: Yeah. For sure.

Tesler: I could follow up with him. There's a funny story about him with mice. When we were trying to do the mouse for the Lisa, we were arguing about how many buttons. And Jef Raskin and Bill Atkinson and I wanted there to be one button. And most everybody else was concerned that that wouldn't be enough. And at that time, it was enough. But maybe later it became justified. You can do more with that button. But at that time, people could never remember which button to press. Now it's habit. People do a little better. But I was arguing for one button and he was arguing for two. And one day after years had passed and we got together, he said, "Larry, I have to admit, you were right. One button was the correct thing to do." And I said, "No, Tom. I have to admit that you were right. Two buttons would've been the correct thing to do."

<laughter>

Tesler: And we both knew what we meant.

Brock: Right.

<laughter>

Brock: Oh. And this is a little—I was just curious. You know, you had mentioned when you were first hearing about Homebrew and your friend and neighbor was saying, "Everybody's going to build their own computer in the future," and you had skepticism, did you ever build one or did you wait until you could buy one? The first--

Tesler: I waited.

Brock: Okay.

Hsu: <laughs>

Tesler: I never built a computer.

Brock: And that was your—your first microcomputer, was that Commodore?

Tesler: Well, my first microcomputer was Commodore PET. And quickly followed by a TRS-80. And yeah. I think I bought the Commodore PET and Phyllis bought the TRS-80, so that we'd have both covered.

Brock: <laughs>

Tesler: Those were the big competitors at that point.

Brock: Great.

Tesler: But in terms of did I ever build my own, I have to say that I did, I did design the NoteTaker main board.

Hsu: Right.

<laughter>

Tesler: But that didn't feel like what I meant by build my own computer. I didn't have it at home.

Hsu: Right.

<laughter>

Hsu: So you mentioned Jef Raskin, who you knew through Phyllis. What was your relationship with him, and was it because of that that Jef knew about Xerox PARC and convinced Steve to come to the demos? Because that's one of the stories that's been reported. Is that it was Jef that actually convinced Steve to come.

Tesler: Yes. I've heard that. And I think it's correct. That Jef was, during the demos, was acting a little bit like the host. Like, he'd set it up. He had spent time at PARC years before.

Hsu: Oh, he had been at PARC?

Tesler: He'd been at PARC. I'm trying to remember the capacity he was in. I think he was an intern while working on his Ph.D., something like that. And he and I knew each other previously, a little bit. But we didn't spend any time together at PARC—he reminded me at one point [of] that. I mean, we'd say "Hello" to each other in the hall and talk a little bit but never got deep into anything, and... But he was unaware that there was a one-button mouse. The reason was that we didn't actually ever build one. We just took mice and just told the people to, "Ignore that button. It doesn't do anything."

Hsu: <laughs>

Tesler: But--

Hsu: This is at Xerox?

Tesler: Yeah.

Hsu: Okay.

Tesler: And it was obvious that you could just not have the button there at all. I don't remember if we maybe even took the plastic of the button out and left a hole, but we were, our software, some of it, was designed for use with a one-button mouse. Even though—and the other buttons were just there for when you ran other applications. But anyway, he wanted the meetings to go a certain way, the demos to go a certain way and—but he didn't really seem to have any ideas about how to steer the conversation to the way he wanted it to go. At the very end when we all went out in the hall, he came over to me and said, "That was great. We need to--" basically he was telling me that what he was going to be doing was getting them to see that certain things that they saw were extraneous and other things were more important. And that wasn't what they were apparently initially taking away. What he was advocating was not to have a mouse, just to have a keyboard. And like the CAT device that he finally ended up building, that was completely driven by the keyboard and focused on home applications that required almost nothing but text. And that's what he thought that Apple should build. But he didn't want to argue it in front of everybody, and... But he had convinced Steve to go to the demo. Steve had heard about PARC from other employees who had done internships and so on, but he never actually saw it. And Jef realized that he had to see it with his own eyes to get the right neurons going in Steve's brain, and... But I didn't know that at the time. There were some unexplainable behaviors of his that later it made sense to--

Hsu: [Behaviors] Of Steve?

Tesler: That yeah, made sense to why Jef said what he said and why Steve got there in the first place. And it all fit that version of the story.

Brock: What was Jef Raskin's agenda? Like, what did he feel was the essential part, the distributed computing aspect?

Hsu: And the networking aspect?

Brock: Or...

Tesler: Well, yeah, that's a good point. He didn't seem to think that networking was fundamental. I don't know if he thought it was something for later or nothing important at all. I'm not sure what he was thinking at the time in that regard. But his agenda was, I think, to get Apple convinced that we should have fonts and interactiveness. But he was very text-oriented in those days. If you had to take your hands off the keyboard, if you had to deal in a different medium, we weren't ready for that yet. I'm not saying that he never thought a PC should do that. It's just that it was really important to him to get a device that sold for a few hundred dollars. And I think he just was able to rule out all these other features as being doable for a few hundred dollars. And he was right. They required more memory, faster processors, and more complexity. But they also weren't exciting enough for Steve, so...

<laughter>

Tesler: He [Steve] wanted the thing that should cost \$500 but instead costs \$2,000.

Hsu: <laughs>

Tesler: And he did that many times.

Hsu: <laughs> Yeah. <laughs> So I think Adele has said that you did most of the initial demo. Or at least one of the demos. Can you remember, like, what things you did?

Tesler: Maybe the second demo.

Hsu: The second one?

Tesler: I remember Adele stomping out of the room after she gave a demo and Alan Kay denies it seriously. But Alan also says that he was at one of the demos.

Hsu: Really?

Tesler: And I don't recall him being there. I thought he was on--

Hsu: Hadn't he already left?

Tesler: A leave at that—yeah. I thought he was on a sabbatical sort of leave at that time. And... <laughs>
But, you know, maybe he--

Hsu: Dropped by? <laughs>

Tesler: Dropped in and sat in the back and I didn't even, you know, think much of it or something. But yeah, no. He described the scene as if he was there. Was like, "Okay."

<laughter>

Hsu: Do you remember which applications were shown?

Tesler: We mostly showed Smalltalk.

Hsu: So Smalltalk.

Tesler: We were trying to get away with, "Well, we'll just tell them all about Smalltalk, and they're never going to want to build it, because it's so slow." And then putting it on these even slower computers. We'll meet the letter of the agreement, but not the spirit. And...

Hsu: So the browser?

Tesler: Yeah. I think I—well, we had to show them the browser, because they wanted to see, "What is it like to change a program? How do you edit a program? How do you test a program?" So at one point, Dan Ingalls was giving a demo and he was dragging windows around. And when you dragged a window around, it left kind of tracks on the screen, until you let go of the mouse, and then it would fill in the missing stuff. Oh. And then scrolling was another thing he saw, and when you scrolled, it would move a little bit of what you were seeing on the screen. And oh, no, you couldn't scroll continuously. You had to scroll in jumps. You'd click something and it would jump. Anyway, he kept complaining that they weren't smooth. And Dan said--

Hsu: Steve did?

Tesler: Steve was complaining that they weren't smooth. Everything was jerky. And so Dan said, "Well, that's just because this is a slow computer. Once we're on a faster computer, we'll change the code a little bit. It's really easy. It's one line of code. To change it." And Steve said, "One line of code?" Dan said, "I'll show you." And he went into the Smalltalk code browser, found the line of code pretty quickly, because he'd done this before. And made a change. I think it was to the—I'm not sure if it was scrolling or dragging windows around or whatever. I think it was dragging the window to fill in the gap. And he changed the line of code. Didn't have to run a compiler or anything. And just tried again. And it did it the other way. It was slow, as he promised it would be. But actually not too slow, because we were using a fast computer. I think it was a Dorado that it was running on. And so it was fast enough you could get away with some of these things, but we just wanted to be consistent from machine to machine. So we weren't doing that.

Hsu: Right. So the demos were on a Dorado rather than an Alto?

Tesler: I remember them being on Altos and several of the other people who were in the demos have remembered that at least one of the demos was on a Dorado. And it's possible. It was not a—you could barely tell the difference.

<laughter>

Tesler: The computer was faster. But it didn't look very different than... So...

Hsu: Huh. Were other applications like the galley editor also demonstrated?

Tesler: The what editor?

Hsu: The galley editor.

Tesler: Oh, Gypsy or... Yeah.

Hsu: No. I think there was a galley editor done in Smalltalk that had a paint, like, I think it was like a page layout and there was, like, a paint program part of it. I guess that wasn't something that was part of your area?

Tesler: Well, I did—I worked on the galley editor with Tim Mott. It was called Gypsy and it was made to create galleys for books. One font, <laughs> but bold, italic and underline variations on characters. And we had no hyphenation. But...

Hsu: But Gypsy wasn't part of the demo?

Tesler: I would've thought that I would've demonstrated Gypsy because it was in use at Ginn in a public, almost public place. It was an office that thousands of visitors came to for other things. And they walked by the Alto running Gypsy. I mean, it wasn't that secret. And it was mentioned in the 1975 BusinessWeek article.

Hsu: Okay.

Tesler: So I think I probably demoed Gypsy during one of the demos. But other than Smalltalk, there wasn't much else to show. I doubt we showed SIL. We might have shown Markup or Draw. But I don't remember.

Hsu: Okay. So what was your impression of Bill Atkinson during the demo?

Tesler: Yeah. He was a little bit excited, visibly. He was more excited than was visible, but he knew this stuff. He had studied before he came and he knew what he was going to see. And he had questions already prepared. And he asked them and got his answers. I remember when I was demoing, and maybe other people, but this the sort of thing that you remember <laughs> when you're doing it. He was, like, right there.

Hsu: <laughs>

Tesler: With his head right next to mine. Bending over. Looking at things and pointing and asking about stuff. Just almost an invasion of space, you know.

<laughter>

Tesler: Not quite. Just... It was... And he was careful to articulate the questions. And kept things clear. But he, he stood out from everybody else. In what way? Let's see. Yeah. He was prepared and wanted to ask the questions. These meetings were kind of awkward for most everybody. He was the only one probably that felt just real comfortable there. But especially for the PARC people we were always worried that we're giving away too much. And so it was somewhat uncomfortable. And the Xerox, I mean, the Apple people, who thought that this was a distraction and they want us to build the Lisa that they had in mind, not the Lisa that, not the Lisa based on what we just saw. And... That's all I have to say about that.

<laughter>

Tesler: Before when we were talking about Bruce Horn, I said I was sure there was no way he could've been at Apple already. And because when I first got there and I went to visit Jef Raskin, because he wanted to tell me about Macintosh, and he wasn't allowed to tell me until I actually worked there. So I went and he told me about it, and then he introduced me to the group. And Bruce Horn wasn't in the group. It was months, maybe a year, before Bruce Horn was in the group. So that's why I'm sure. I think that theory that it was Tom Malloy—oh. It was another guy. Rick Tiberi.

Hsu: Rick Tiberi.

Tesler: T-I-B-E-R-I. He, I think he worked for Tom Malloy. And I think he left PARC or Xerox also.

Hsu: Hm.

Tesler: And Tom had left Xerox earlier, and he went to Zilog. Didn't work there that long. And moved to Apple to work on Lisa. Rick, I think, had worked on—I just don't remember what he worked on. I know he was, hung out, with graphics people. But I don't remember what he actually worked on. Maybe he worked on the word processor and that's why Tom hired him, but I'm not sure. But he might've been the person at the demo.

Hsu: Hm. Okay. Hm.

Tesler: Because he was an ex-Xerox person.

Hsu: Right. Hm. So besides you, who else inside PARC was in favor of showing Apple, like, everything? Because there was definitely, you know, Adele and there was her camp who were very much against showing Apple everything.

Tesler: Right. Well, we all were.

Hsu: Oh, you too.

Tesler: I didn't want to show 'ems—I didn't want them to see everything at all.

<laughter>

Hsu: Oh, okay.

Tesler: It was after the demo or during the demo that I suddenly started thinking about, “Geez, maybe I should work at Apple.”

Hsu: <laughs>

Tesler: I had broken up with Phyllis Cole at that point and I didn’t really want to work in the same company as she was working, <laughs> was kind of my reason at the time for not going there, and... But after seeing the reaction of the Xerox people, you know, the Apple people to the Xerox demo, I started thinking about, “Well, maybe that would be a good place to work.” But I didn’t interview there initially. When I decided, well, when the NoteTaker got canceled, or, well, when the NoteTaker got hopelessly ignored.

Hsu: <laughs>

Tesler: Maybe it wasn’t even canceled. I decided, “I don’t want to ever go through this again.” <laughs> Trying to sell the NoteTaker to the company. And so I interviewed at a couple of other places, ROLM, which was a telephone switching kind of company.

Hsu: R-O-L-M?

Brock: Yeah.

Tesler: R-O-L-M. Yeah. And—oh. And I think it was Doug Englebart’s group.

Hsu: Oh. SRI?

Tesler: I think so.

Brock: Or Tymshare by then.

Tesler: Yeah. But maybe—that must’ve been a different time. How could that be almost 1980? Yeah, 1980.

Hsu: Yeah.

Brock: They were still going at Tymshare.

Tesler: Yeah. That's a—I'm not sure how that, I'm not sure when that visit was, when I talked to them about a possible job. But then while I was looking for a job, I got a call from Phyllis. And she said, "If you ever think of maybe being interested in working at Apple, I know who I should introduce you to." So I said, "Please do that."

<laughter>

Tesler: And she introduced me to John Couch. And then he introduced me to Tom Whitney. That's the name I was trying to remember before. Who basically kept running the Apple II when Lisa split off and John Couch ran that. But that hadn't happened yet. And during my interviews I met Steve. And Bruce Daniels. Spent a lot of time with Bruce Daniels and Bill Atkinson.

Brock: And were they describing to you something that they wanted you to do or was it you describing to them the sorts of things that you were interested in doing? How did you circle around that or figure out what you would do?

Tesler: They wanted to know what I wanted to do, and mainly because they wanted me to come there. And just vaguely because here's a guy that, he didn't give the main demo. That was Dan Ingalls' demo. But he—and he [Tesler] didn't build Smalltalk from scratch, but he did lots of other things. And he could be an elder advisor, mentor, to these other people. Vaguely. There was some vague "why we ought to have him here."

<laughter>

Tesler: And for me it was, I was used to PARC and SAIL before that and a lot of freedom to research any area I want to or work on any project I want to. And it was going to be a major change to walk into a place that the product is overdue the day it's named.

Hsu: <laughs>

Tesler: And just a high-pressure, but a lot of opportunity, place to work. And so the solution we came up with was, there was a research group that had two people in it that were technology experts but thought not to be product experts. Turned out one of them was quite good at making products. Bruce Daniels. The other guy was a numerics guy who was very good but very focused on a very narrow area that was

important. Because if you were ever going to have a floating-point processor, you wanted a guy like this to be there to make sure you're doing it right.

Hsu: <laughs>

Tesler: But anyway, so I was in the research group and I said, "Can I help out with Lisa?" And they said, "Oh, sure. We'd love you to help out with Lisa." So I got there and I went over to the other two guys and said, "Do we have meetings? What do we do here in this research group?" "Well, we could have a meeting. Sure."

<laughter>

Tesler: So we had a meeting. Got together. Talked about it and talked about why companies have research groups and what can they contribute. And the conclusion at the end of it was, "Apple doesn't need a research group yet."

<laughter>

Tesler: "It's way premature. We just need to get products out the door and that way we can eventually pay for development of new ideas. Right now we have ideas; we don't have enough people to make them work." So we announced that the research group had disbanded and we all went to work for Lisa.

Brock: <laughs>

Tesler: And that was the first week. And then after that I got very involved in the Lisa user interface running usability studies, working on the, or reviewing the manual that, or the specifications, that Bill Atkinson was writing. And became a central person in the Lisa group.

Brock: How did they react to your decision or your request? I can't tell which it was. <laughs> To join them. I mean, did they—because I could easily see--

Tesler: Lisa?

Brock: Yeah. In the Lisa group, that if I had been working on it for some time and I felt like this was a project I had been with from the beginning and here come these, you know, here comes you from the outside and the other people from the former research group? I mean--

Tesler: I think most of the people viewed us as welcome, and... But with concerns.

Hsu: <laughs>

Tesler: Are we really product people? Can we do that? And are they going to change any, will we change any decisions that they've made already?

Tesler: But they're used to that, because remember, this machine had no mouse before the demos. And now they have a mouse. I mean they're certainly—and these are the people that like the changes but maybe they didn't know exactly what changes Larry and maybe Bruce were going to make. And so there was some wariness there. But they basically like the idea. Not everybody had strong opinions about things. They just wanted to know what does the project need to get done? Just tell us and we'll do it. But some people had agendas.

Hsu: How much of the Lisa interface had been designed by the time you joined?

Tesler: Well, based on what Bill had seen at PARC during those two demos and he—yeah, he was busy designing something, getting advice from Jef Raskin. And running them by the ex-Xerox people, the groups that had several ex-Xerox people in them. And when I say running it by them, we were—employees had to sign this thing saying we don't know the secrets of anybody—we're not going to tell anybody else's secrets to you. And they take that pretty seriously. And so when I got there, actually, the first couple of weeks in the group I pulled aside a couple of the ex-Xerox people. And I said, what do you do? I said, I can see that you're not telling people how it's done at Xerox. They said, "No, no, we can't do that." But when you have—when somebody suggests something that's in the Xerox designs, not the products but the projects that they did, the prototypes they did or in the coming Star product that was still not shipped yet, but was launched about a year later, how do you stay within the rules? Do you say no comment? Or what do you do? They say, basically, we react. We don't initiate. So we don't tell them we could have a dialog box that has these things in it and that's the best solution. And we proved that at Xerox. None of that is to be disclosed. They would say, "Hmm, well, that's an interesting thought. I wonder would it pass the test of users trying to learn in a new product" or something? They just didn't disclose that Xerox had such a thing. But if somebody independently thought of it, if they thought it was a good idea they'd say so. And so when the Apple people ultimately saw the Star, first of all it's quite different. But they could see that the things that were different were things that they had thought of themselves. And some other things that they had thought of themselves had already been thought of at Xerox. And now for the first time they could tell what was what. But, yeah, that was a little tricky to manage.

Hsu: I mean that sort of gets into this whole debate about how much of a copy of the Alto or of Smalltalk was the Lisa and how much was original? And you got people on both sides saying, "Oh, it was all

completely stolen.” But then Bill Atkinson is saying, no, like “I invented region clipping. I thought that Smalltalk did it but actually they hadn’t done it.”

Tesler: Right. He did what he thought Xerox had done and sometimes he was wrong and he did better. But there’s a difference, remember I was talking about the Star. You were just talking about Smalltalk. There’s no doubt that Smalltalk influenced the Lisa and the Mac. But there’s plenty of doubt that Xerox Star influenced the Lisa and Mac. In fact, the Xerox Star is probably the only software in this—that belongs in this story that did not use cut, copy and paste. But Smalltalk did and so did Lisa and Mac and that’s pretty fundamental. They had a move command with a mode in it.

Hsu: On the Star?

Tesler: Yeah.

Hsu: So the Star had been developed, I guess, it was OfficeTalk was the software system on the Star?

Tesler: No, OfficeTalk, I believe was something on the Alto that was done by Jeff Rulifson and Patrick Baudelaire, I think. I think Dan Swinehart was part of it at one time and then he kind of split off to do Woodstock. But I’m pretty sure OfficeTalk was a Jeff Rulifson thing.

Hsu: So the stuff that influenced the Star was much more out of CSL rather than Smalltalk itself?

Tesler: Right. It wasn’t very influenced by Smalltalk. In Star, they ran their own user studies and came to different conclusions partly because there were hardware differences. They were subtle and it took us a while to understand why we were getting different results. But it basically came down to accuracy of the mouse or of the pointing device and wobble. But part of it also was just cleverness is what I’m thinking but it’s just coming up—when you push down the mouse button and drag and let go on a Mac or Windows or on Lisa in those days, that selected a range of characters. If your hand wobbles while you’re drawing that selection you get a phenomenon which is unpleasant visually and makes you feel out of control. The more accurate the mouse, the better. But even though we had mice of similar accuracy we had a little clever thing in Gypsy and Smalltalk that they didn’t have in Star. I think they thought it wasn’t reliable. It wasn’t a reliable indicator. But as you dragged the mouse along the line, you could drop into the next line or go up to the previous line a little bit. If you went into a little bit, it didn’t—it acted like you hadn’t got there yet. And so you basically doubled the zone that you can be in to draw a horizontal selection. Doo, doo doo. If you got a little kind of, a lot to the far end of the line above say, or the line below, more than half way into it then it would say, oh, okay he really wants this to be part of the selection and it would add those characters. But if you just stayed within the range—within the height of the characters that you’re drawing on it would—that’s what Star did in their user tests. And in their user tests that was too hard to keep it in that little zone from the middle of this character to the—or just—I’m sorry. From the top of this

character to the bottom of this character. That was just too difficult for people to do it with the accuracy of the mice they had in those days. So we ended up with a different solution to selecting multiple characters. They had a click at the beginning and a click at the end.

Hsu: The Star did?

Tesler: Yeah, Star did with a different button, extend the selection. They had an extend selection button. And I said, why don't you just use little this heuristic? And they went, "It's not perfect. We want it to be perfect." But in modern interfaces you can do both. You can shift select and that started with the Lisa also. You can shift select to extend a selection. I don't think we had that in Gypsy but I'm not sure.

Hsu: So you also started the user testing on the Lisa when you joined.

Tesler: Right. It turned out that there were usability studies before that, run in the Apple II group.

Hsu: By Chris Espinosa.

Tesler: Chris Espinosa was one of the people involved. Yeah. And Chris and I gave a joint talk here at the museum when I was leaving Apple in 1997. And that might be in the archives here.

Hsu: I'll look for that.

Tesler: I wanted to get clearance to have historical documents. And so what I worked out with Apple was anything that you show at a public demo that [was] approved by the management before you could go present it, you'll be able to publish or whatever you want. And so Chris and I made a joint presentation to cover both Lisa and Apple II and Mac usability studies. And we talked about that. And if you can't find it I think I might be able to help track it down.

Brock: Fantastic.

Hsu: We'll look into that.

Brock: Making a note to search that out for sure.

Hsu: So what was the nature of your collaboration with Bill Atkinson on the user interface? What was sort of that back and forth like?

Tesler: Right. You're probably thinking about the time when it was rapid iteration. It has an acronym these days RITE, R-I-T-E, rapid innovation testing—yeah. R-I-T-E, rapid innovation testing. I'm not sure if the E stood for anything [Rapid Iterative Testing and Evaluation]. And the way we did it was, we would be told a user interface problem by somebody on the team, should we do it this way or that way? And we'd argue and we weren't getting anywhere. It's like this is—we'll run a usability study. And so Bill would go home that night and stay up all night and implement both ways of doing it. And then he would come in and demo it to me and I'd say fine or no it needs to be changed a little bit. And he'd go home and get some sleep in the daytime. And when he came back in at the end of the afternoon, I'd say okay we've run three users on it and this is what they found and--this is what we found, so we want to go this way instead of that way. And we did that for a few weeks straight, [Bill] almost killed himself doing this. It was a freak car accident that he was not awake enough to respond to and ended up in a hospital. It was—there was something like a flatbed truck in his driveway. And he drove his sports car under it. And on edge I guess he couldn't see it was there, in his fog of afternoon but morning for him. Anyway, he must have realized at the last moment what was happening and threw himself down on the passenger seat and ended up alive in Los Gatos Hospital where his father was a doctor, but I think no longer. I can't remember that part. Anyway, he can tell the story better than I. But I remember I got a—he told the paramedics, "Call Larry Tesler and tell him I'm going to be late for the meeting."

<group laughter>

Tesler: So I went what? I got the message.

Hsu: That's amazing.

Tesler: Yeah.

Brock: I did have one thing before we move on to—I was just looking down ahead on the question list is where—which was the whole desktop metaphor which I understand was on Star. That is now so—if there's something beyond ubiquitous, I guess the desktop metaphor for personal computing is. Your thoughts about where that came from and how you engaged with it?

Tesler: Well, first of all, it's used to describe different things. The minimum, I think, that would make it qualify is that different documents—there's documents and there's folders. But remember, the initial Macs didn't have folders. Well, maybe they did. They had—I'm not sure they did.

Brock: Yeah, I can't—I want to say that they did but then I'm trying to...

Tesler: But certainly the Lisa had folders. And...

Hsu: So you mean the original Jef Raskin version of the Mac did not have folders?

Tesler: No, I meant even the real—the first Mac that shipped, because I thought it was—or maybe it didn't have a complete implementation of folders. When you got a dialog box for a menu item that was either an open or a save dialog box, there was, if you were going into and out of folders I don't think that was implemented on the initial Mac is what I'm saying. But I could be wrong. Anyway, setting that aside, let's start over. Let's start over the answer. Some desktop metaphors have file cabinets and some have folders; most have folders. Some have literally a desktop, a place to layout your documents. And some though have trashcans or other things like that, that are used to manage files and printer icons and icons for the entire disks. So there are variations. But they all fit into the idea that they'll be common objects from an office. It's really more of an office metaphor and common things that are in an office, and in particular the ability to lay down documents in stacks. But then it goes from there to different choices that different designers make and different results. I would say that the main credit for that would go to Alan Kay because first of all he called it a desktop metaphor and he had overlapping windows which he thought of as overlapping documents. And at least he wanted that metaphor to be there that if you thought about having a stack of papers that you're going to be working on, maybe in an inbox or something, that's different from the document you are working on right now that's taking more space. And maybe those other documents are peeking around the edges of the one you're working on, you know, that kind of thing. So I think I would give that to Alan. There was a drawing of a more extreme version of that, that Jeff Rulifson and I put together which is, I think, lost. We have the document we put it in, and with a large blank on the page where if we had graphics capabilities on our printer we would have printed the diagram. But it was basically a desk in perspective and file drawers. And in the drawers, folders and on the floor, a wastebasket. And in the later years General Magic's Magic Cap Desktop was very similar, as if they had seen the picture but, of course, they hadn't seen the picture. We'd both seen offices.

<group laughter>

Tesler: So that idea was to extend what Alan had done with just documents lying on desktop to having a whole office and a metaphor like that. So Jeff and I put that together, never followed it up, except now that I think about it OfficeTalk might have played around with some of those ideas.

Brock: You did that when you were where?

Tesler: Jeff and I did it when we first came to Xerox PARC in 1973. In February '73 we joined on the same day or a week apart or something. And Bill English was our manager. And he said, "Why don't you two just get together and just dream of how things are going to be in the future, where are we headed with this technology and as far in the future as you want to go." A great thing for a manager to ask people to do. And Jeff and I hadn't known each other at all. So we got to know each other and worked on this together. And he was reading a book that had icons in it. We mentioned that before. And I had been playing with cut and paste. And we had seen Alan Kay's demo when we got there of overlapping

windows. And so we came up with this idea. I actually found the electronic version of the manual, or not the manual, of the memo that we wrote, a white paper. It was really kind of a white paper that we wrote and evolved over a period of months gradually tweaking it. I've got a printed copy. I've had that for a long time but I never had the electronic files. And today I realized it was on the worldwide web in a password protected place for me to clear it for publication so people don't get in trouble for using it and sort of waiving copyright.

Brock: And that, the idea of this strong visual metaphor—I mean picture of an office, would be you would use your pointer, your mouse to open a drawer of the desk, put something in the wastebasket, pull a folder out, put it out on your desk.

Tesler: Exactly.

Hsu: So yeah, we're starting to get into the Mac part of the story. One of the things that I think you've been quoted by Steven Levy as saying that the tension between the Lisa and the Mac team was exaggerated.

Tesler: Yeah, that's what I said.

<group laughter>

Tesler: Well, I think it was exaggerated. There was—so what do you want to ask me right now?

Hsu: Well, maybe from your perspective, what were the two different teams? Did they see themselves as specifically competing because Steve was sort of kind of poo-pooing Lisa at the time or something?

Tesler: I think it was set up, maybe not—what's the word? Premeditated. But set up as a competition so that we'd all work real hard. But beating the Mac team I don't think was a motivation of the Lisa people and maybe a little bit the Mac team might have seen it as a mission to try to beat the Lisa. But the Lisa was about a year ahead in terms of when we got started and when we finished. So although when we finished we probably shouldn't have declared that we were done. We probably should have taken another year to make the thing more affordable. But if we waited another year then we would have come out at the same time as the Mac and that would have been kind of bizarre. So anyway I think a lot of that is exaggerated. From a personal point of view, I had a very good relationship with the Mac team. And for several months near the end I was over there at least once a week, usually every Friday and they would go out together for sushi and I went with them. But before I did that I spent an hour or so looking at the latest prototypes and commenting about the usability and them telling me why things were the way they were and who they should talk to in the Lisa group who had been down this alley before. And the two

groups—well, the Lisa group helped the Mac group. Indirectly the Mac group was helping the Lisa group because things were improved that we gave them. They'd improve it and send it back. So it was more of a competition at the VP level, I think, than it was at the individual level.

Hsu: Since you were the usability person you were already sort of weighing in and you were already giving them some help.

Tesler: Well, yeah. Bruce Horn had been assigned to work on the Finder. And he and I were very friendly. I mean as you know I sort of set it up for him to go there. And I worked together closely with him at PARC. So it was—he always was eager to show me stuff, show off, get input, see my opinion about things. And yeah, I think I got to be friendly with everybody in that group. Whenever they have a Macintosh reunion or anniversary celebration or something they invite me. And still--I was an extension of the team, I guess.

Hsu: Right. But you were never a formal member of the team?

Tesler: Well, after the Lisa was cancelled and the division we were in that the Lisa—what was left of the Lisa got incorporated into the Mac team. And I had been in Lisa and ended up in Mac, so--. But by that time there was no competition anymore. Mac had won long ago.

Hsu: Right. So after you had joined the Mac team what were you working on then?

Tesler: So this was when the Lisa team was no longer existing. And so first, the biggest problem that the Mac people had was that they didn't line up a lot of third party developers to do applications. They also didn't have enough memory and they didn't have enough disk drives and so on. But the big strategic issue was they didn't have applications. And our biggest competitor, IBM PC, looked like it was going to have a lot of applications. So the engineering—well, just the management of the Mac division—let me back up. They had developed—the Mac people had developed a kit for developing applications, ways of using the underlying facilities. "API" we'd call it now.

Hsu: Was that the Macintosh Toolbox?

Tesler: Yeah, right, they called it the Macintosh Toolbox. And people had to do a lot. The programmers had to do a lot in order to get an application going. On the Lisa we had an even worse situation with applications. We just weren't getting applications. We never even asked anybody to develop for the Lisa. It was going to be part of the theoretical concept of the Lisa was that it was all you're going to need. It didn't need third party applications. And so there I decided that I would do something like Model-View-Controller but not exactly the same.

Hsu: So, like, the framework?

Tesler: ...build a framework, yeah. And so I put together a small team of people that wanted to work on such a thing, and we did something called a Lisa *ToolKit*. And it was an object-oriented thing, but we didn't have an object-oriented language. <laughs> And we couldn't use Smalltalk. It was too slow. So I developed a—or just designed a language called Clascal, Pascal with classes. And it was very much the kind of thing that, like C++, or Objective-C, they were taking C and adding object-oriented features to it. We were taking Pascal, which was what the Lisa was built in, adding object-oriented features. And one application got built on the Lisa using our ToolKit, and again, it was very fast to develop, and it was done by a company called Compugraphic in Boston, and they announced it. And a week after they announced it, we cancelled the Lisa. And they were fuming. They spent a lot of money on an advertising campaign and [we] took it away, and we—Steve Jobs was there in person to defend us and say, "You should develop—or take the application and get it running on the Mac. Because we're definitely behind the Mac. We're 100 percent behind the Mac." And they said, "No. You might do it to us again, and besides, the screen's too small and the machine's too slow. More memory. You need more memory. You need a little more speed. You need a bigger screen." And anyway, they wouldn't do it, and—but in the meantime, other third parties had seen the demo of the Compugraphic, Write 'n Set it was called,⁴ W-R-I-T-E, apostrophe "N," S-E-T, Write 'n Set. You could...

Hsu: Write 'n Set.

Tesler: Yeah, you could take your application and—or your document, I mean, and you could, essentially, typeset it, digitally typeset it. And it was a lot like PageMaker, Quark, and so on, and the reason it was, was because the PageMaker and Quark guys saw it when it was announced, and it influenced them tremendously. So that's why, very quickly, the Mac had desktop publishing programs. Because other Lisa developers who hadn't gotten the head start, didn't have any gripes against Apple, just were able to do that. So, basically, what happened next is that Steve Jobs came into my office and—oh, no. What happened next was that the Macintosh team said, "We want something like that on the Mac so that they can develop applications faster. People can develop applications faster. And we don't want to replace the Lisa—I mean, the Mac Toolbox, but we want to supplement it by something like the Lisa ToolKit, a Mac ToolKit, object-oriented tool kit." And so we started the project that became MacApp, and it was an object-oriented framework for writing Mac applications. And the Null program was one line of code, basically, and if you wanted a feature, you just basically found a class that had that feature and then you subclassed it and filled out the details of what was different about your application than the normal, and for that we needed another programming language. So because Clascal wasn't going to catch on, so I decided we should get Niklaus Wirth, the inventor of Pascal, get his endorsement of an object-oriented Pascal. And so to do that, we co-designed it. So we knew each other a little bit and I'd

⁴ Larry Tesler adds: I think Write 'n Set was a suggested name but they marketed it instead as the "Personal Composition System", "a bundled hardware and software package that enables novice users to typeset any Lisa application [sic] on a Compugraphic 8400 typesetting machine." See InfoWorld, v. 5, n. 41, October 10, 1983, page 19.

been in his class at Stanford when I was an undergrad, and when—so we got together and not in person, even, I think. We just traded emails, and eventually got together having a final meeting in Switzerland, in Zurich where he was based, and co-designed MacApp, and it was—Object Pascal it was called.

Hsu: And Object Pascal has eventually grown into Delphi? Is it still in use today, to some extent?

Tesler: Yeah, Object Pascal was still—was, kind of, copied without objection by a couple of companies. I'm trying to remember the name of the...

Hsu: Borland?

Tesler: Borland, yes. Borland did a very popular version of it, and—yeah, that's right. So I think that answers your questions.

Hsu: So then, Apple essentially just put it out in the public domain, the language? Or...

Tesler: Oh, yeah.

Hsu: Did they own the...

Tesler: I'm trying to remember if we actually published an article in a journal or magazine or something. But mainly, the developer program people, when there was a developer conference, we would have—the first time it happened it was announcing the Lisa ToolKit and Object Pascal—or the Mac, I'm sorry, the Mac ToolKit and Object Pascal, and—MacApp and Object Pascal. And they persisted for years. We launched it in 1985, and it must've been 10 years that it was still used. In fact, we did a C version. The second version was based on C++ instead of Object Pascal. And that's the one that went longer.

Hsu: And most notably, Photoshop was written in MacApp.

Tesler: Yeah, I'm trying to remember if it was a Pascal or a C++. I thought it was Pascal, but that would require—it doesn't make sense. It would have to have been C++.

Hsu: So how big of an impact did MacApp make in the development community?

Tesler: I would say relatively small. If it weren't for Photoshop, Apple would've abandoned it in three or four years, instead of supporting it for ten or something. Because of that one application, it was such an

important application, Apple had to keep it alive. So the concept of an object-oriented framework, of course, was adopted everywhere. But some frameworks are purer than others, and that a lot of developers were annoyed at how pure the MacApp was, in terms of its faithfulness to object-oriented ideas. They wanted to do things their own way and with their own control structures, and not the way that it was built in automatically into MacApp. And we purposely built in these strict structures because it would help make applications more consistent with each other. And, of course, that wasn't as important to the developers as differentiating their application and providing functions that their domain needed. So the main industry reaction after a few years of using it was, "This is too strict. It's too limited." So today's frameworks tend to be more like Mac Toolbox, only with object-oriented structures. But they would be a file management framework and a 3-D graphics framework, and it would be a, kind of, assemblage of object-oriented frameworks and they shared some things. But they weren't all subclassed off of one—well, yeah, the big test, is you have a class Object and you subclass everything off of class Object, and in Smalltalk they did that and we did that also in the Lisa ToolKit, and I think in Object—rather, in MacApp. But people didn't like that. In Java they do it, too, like we did. Object is a real class.

Hsu: So the third party reaction that you cite as one of the reasons, were there other reasons that MacApp, sort of, fell by the wayside?

Tesler: Well, it just didn't have enough adopters. That was the real reason.

Hsu: Okay.

Tesler: And again, it would've folded even sooner if Photoshop didn't have to be kept alive.

Hsu: And I think you mentioned you didn't use Model-View-Controller when you designed Lisa ToolKit before. So what was the different paradigm for how you designed Lisa ToolKit and MacApp?

Tesler: Well, first of all, we used end user terminology for document instead of model, and view is fine. And controller, we had instead a class command and everything—yeah, command—I think it's obvious what it did. Command had a name and it had parameters, and so it did what you expect it to do. But the other cool thing about it is that every command object—well, the ancestral Command object had Do, Undo, Redo. And when you first recognized that the user had chosen something from a menu that was a command, then you would create a Command object, and then you would tell it to Do. And then, if the next operation the user did was Undo, you'd go back and tell that to—same Command object that is still around, Undo, and it would know everything it had to do to—it would have all the data it needed to get things back the way they were before. And in those days, you could only undo one level, so that was all we had to do. But, you know, things have evolved from there, but I know a lot of frameworks don't have that concept of a command that has a Do and an Undo, and they have to handle Undo a different way. So

I thought that was—that was invented by Larry Rosenstein, who was in my group at Apple. He came up with the idea of the Command object.

Hsu: And your partnership with Niklaus Wirth was pretty smooth, working on that? Like, he was pretty open to the idea of extending it with object-oriented extensions?

Tesler: He was proud of it. There was one funny thing that happened when I visited him in Zurich. I arrived when he was in the middle of teaching a class. I arrived at ETH, and I knew that he wanted to debate something with me. Even though he was going to help me, he really didn't believe that object-oriented programming was the right thing.

Hsu: Oh, right. Because he had been working on Modula?

Tesler: He said the reason is that when you invoke a method, then you don't know which—there'll be a different version of that method for every subclass. And so you don't know, when you're debugging, which one is going to be the one that's running, or when you're thinking—when you're debugging in your head, you know, before you actually have debugged the real code. But if you are debugging and you see somebody—you call a certain thing. You don't know which version of that's going to get called. And I was thinking, "How can he live without this?" So when I got there, I had an hour that somebody said, "You should meet so and so person," and this was somebody who liked Smalltalk a lot. And so he wanted to help me. And so I said, "Could I see the source code for how you handle the fact that different objects have different code for the same thing?" And this is before he had an object-oriented language of his own. And so this was, I think, Modula-2 or something that was the language they were using, had no—had modules, but it didn't have classes and subclasses. So I said, "Can I see the place where this happens?" And I gave him a specific example, and he ran through the code and—oh, yeah, when he was showing me some code, I said, "I want to see more. How did that happen?" And so it turned out that they had a data structure that had one entry for each class, each sub—well, they didn't call them classes, but for each kind of thing in the program, and a procedure pointer for each one. And so when you wanted to say, do a delete, you would call the delete command of the correct kind of thing. And then, it would do that by indexing into this structure. And I said, "This isn't any better than what we're doing. This is worse. Because you can't check types—when—the language doesn't support the checking of types. So it would just have to trust you that this procedure pointer points to a procedure with the correct arguments." And so I said that to Wirth and he just—he went—so he had been doing—complaining about object-oriented programming for years without ever getting the fact that what he was doing had this—whatever problems we had, he had worse. And a few months later, he announced his next language, which was an object-oriented language, cleaner than Object Pascal. But Object Pascal was his first venture into object-oriented programming.

Hsu: So then, he used that experience to design the next new thing <inaudible>.

Tesler: Yeah, that's when he realized what the whole point of it was. Nobody had ever said that. I'd never heard anybody say it, either, outside of the Smalltalk team. We knew that. We knew it and we took it for granted, and I think other people took it for granted, also.

Tesler: So is there anything about a different subject, Newton?

Hsu: We do want to get into that but I don't think we have enough time to get into the Newton, yet. Should we just save that for another session?

Tesler: Next time? We can do another time, sure.

Brock: If you're okay with that, Larry, that would be great. Because we're very interested in getting that story right. That's another one where it seems like there's this kind of—what is it? Everybody getting the different perspective on the elephant, or whatever it is. And also, to talk to you more about—then seemed like the right time for Apple to have a research function or this Advanced Technology Group.

Tesler: Yeah, ATG has got some interesting stories. Newton is a very painful story, which I don't mind getting into. But the worst part about it, I think, was the book that got written. What was it called? "Defying Gravity."

Brock: I have not read it.

Tesler: I think, "Defying Gravity." It was because of, quote, "Newton," gravity. And this was soon after another book had come out about something else. Somebody had written a book about the Data General experience doing a next generation innovative product, and they had...

Hsu: Oh, *The Soul of the New Machine*?

Tesler: *Soul of the New Machine*, yeah. And so they had the author spend a lot of time with the developers throughout the whole process. So the marketing department at Newton got the idea that—thinking this was going to be a successful product, or unsuccessful like the Data General was, actually. "We're going to get somebody to be with us and write a book." Well, by the time they found somebody, he said, "Well, I don't have a lot of time. I think I can, maybe, come by once or twice and spend a few hours. But I've got an assistant who will spend a lot of time there." Well, the assistant didn't spend much time there, either. And he interviewed me for, like, an hour, and you can tell how little I communicate in an hour, so. And then, he wrote this book. It's fiction. I mean, he wasn't there. He tells stories about times when he wasn't

there and his assistant wasn't there. He's telling the stories from the employees who they interviewed. This whole idea that—written by the guy who was...

Brock: Was there.

Tesler: ...inserted in the team, you know [is a fiction]. And so just a lot of stuff that's incorrect, and certainly, there's very little that I was able to communicate to him in the little time we had. So the stuff that he talks about with me is—well, what I did one time is I got the book—I got a copy of the book and a red pen, and I just started putting marks on everything that was wrong, and it was just completely covered with red marks.

Brock: Oh, my gosh.

Tesler: But there were some major themes in the book about the mistakes I made. Some of those were really correct and, you know, obviously really mistakes and I don't deny them. But there was stuff there that just didn't happen or that got misinterpreted or missing key points or, you know—anyway, the book didn't do well. The product didn't do very well, either.

Brock: Well, I've...

Tesler: And I think it was my unhappiest failure in my career. But they made it worse with this book.

Brock: Well, maybe...

Tesler: It was bad enough being there, but it's worse if you're not there.

Brock: If that is the existing treatment that has been published about it, maybe that speaks to the desirability of actually, you know, spending some time talking about it so you can get your—you know, your...

Tesler: Side of the story.

Brock: Your account. You know, if it hasn't come out already, and in light of subsequent events, what has happened with...

Tesler: Smartphones, yeah.

Brock: Smartphones. I mean, it takes on, kind of, a greater importance. Because it is, you know, the smartphone before the smartphone, if you will, or a lot of the basic, you know, again metaphors, it seems. You know, it's when one saw the iPhone, you thought, "Oh," you saw many elements of the Newton or in Palm or whatever. So I think, from our perspective, if you're up for it, I think that would be great to do.

Tesler: I think if you interviewed some of the people who gave more input than I did into the book, they would admit that it was not right. Anyway, maybe we can dive into that one day.

Brock: That would be great. We would certainly love that opportunity.

Hsu: So should we just wrap up or do we have time for one more question? We have 10 minutes on this.

Hsu: So, I guess, maybe, wrapping up, maybe this is a good time to, sort of, wrap up the story of Smalltalk. Sort of, how do you see Smalltalk's greater impact since the '70s and '80s on object-oriented languages, software engineering, user interfaces, and this, kind of, curve of dynamic object-oriented languages being really popular for a while and now seem to be—there seems to be a movement away from that again?

Tesler: Yeah. Well, one influence that I think Smalltalk had was on design patterns. And I think the reason I think that, is that the MVC framework, what now is called the MVC design pattern, and—but the other aspect besides just that one example is that Kent Beck, who's main known procedure for—or process for software development, he called Extreme Programming, and it's an Agile method. And so when you look at Agile methods, you're looking at the way the Smalltalk team ran at Xerox and a little bit the way the Smalltalk team ran at Apple. Because, remember, we had a license to Smalltalk and hired Kent Beck to work on it. And I think he was influenced as one of the contributors to the Agile movement. He was influenced by Smalltalk and even a little bit by MacApp, in terms of making design patterns an important element and making rapid development and rapid iteration a method. So it's had, I think, an influence on the process of development, as well as the tools of development. There are just system level things that Smalltalk did that caught on. Checkpointing, it wasn't maybe the first environment that had checkpoints, but it...

Hsu: This is like the snapshot facility?

Tesler: Yeah, it would snapshot the whole memory, basically, and so you could recover to the way things were just before a crash, and that's very popular now in Microsoft Office Suite, the whole Mac OS crash recovery system. But the main thing, probably, is the user interface, the popup menus and the use of dragging for different things. That's what I can think of right now.

Hsu: Thank you very much.

Brock: Yeah, great. Thank you.

Tesler: Okay. Thank you.

END OF THE INTERVIEW