



Oral History of Annette Wagner

Interviewed by:
Hansen Hsu

Recorded December 13, 2019
Mountain View, CA

CHM Reference number: X9208.2020

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Hsu: Okay. The date is December 13th, 2019. My name is Hansen Hsu, and I'm here with Annette Wagner, and could you tell us where and when you were born?

Wagner: I was born July 26th, 1957, in Watsonville, California. So I'm a local girl to Silicon Valley. Well, actually, I-- local in the sense of I was here before Silicon Valley existed. <laughs>

Hsu: And did you grow up in Watsonville?

Wagner: Yes. I was raised on a ranch, a five-acre ranch, five miles outside of town. We were quite a bit in nature. We had a pick-your-own-berry farm on one side, a turkey ranch down the hill on the other side of the creek, and an apple and plum orchard down the other side, and we lived at the end of a long gravel road. I had three siblings, and I spent most of my life-- well, spent most of my life until about seventh grade in Watsonville, and then we moved to Santa Cruz, and I went to Capitola Intermediate School for seventh and eighth grade, and then we moved again and I ended up at Aptos High School, which had just opened, and I was the first official graduating class, part of the class that had actually spent four years there. So I-- and then from there I did a little bit of time at Cabrillo College. I had some other things going on my life, and then I ended up at San Jose State. So yep. Pretty much raised in the area.

Hsu: Yeah, wow. What's your family's background?

Wagner: My father was-- is a contractor. My father's still alive. He's 96, and the Wagner family was actually a-- his father was one of the people who helped build parts of Watsonville. There's still a street, Delores Street, named after one of my aunts, and Wagner Road, and he was a contractor. He built things. My mom was a housewife when we were young and then a real estate agent when I was older, and then my parents were both real estate brokers for many years, Wagner Real Estate in Santa Cruz County. My mom was always part of every single women's club that existed, and always ended up president, and she also was the top rated real estate agent for five years in a row in Santa Cruz County. So I had just sort of a, you know, we went to the beach a lot. We, you know, camped. We were sort of a Santa Cruz family, like many others, and I had lots of relatives still in the area down there as well, from-- all the way from Oakland down to King City.

Hsu: Oh, wow.

Wagner: So I was a local California girl. We used to drive over the hill from Watsonville in the fall. We would drive over and get a big gunnysack, like this huge gunnysack of walnuts, in South San Jose, and then there were other times of the year we would drive over and get apricots. All of which is gone now. It's all been turned into houses, but back then you drove up here and there were big farms and you could come up and get, certain times of the year, and get certain things, so that was my memories of my childhood was San Jose was the place you went for walnuts and apricots, <laughs> so...

Hsu: And you said you went to college at San Jose State?

Wagner: Yes. So I took a couple years off between high school and college. I ran off and got married to my high school sweetheart and then the marriage kind of fell apart, and I always knew that I-- always knew I wanted to be an artist, that I did creative things, and so I decided to go into the graphic design program, or I wanted to be in the graphic design program, but at that point I really hadn't-- I had taken a couple classes at the Cabrillo College, but I hadn't done anything serious and I hadn't completed my GED. So what I decided to do, because that program was fairly competitive, was I went, I just decided, "I'm going to San Jose State," and I moved up there into the dorms. My parents helped me out with some of the tuition, and I proceed to do my first two years just doing my general ed, get all the basic stuff out, and then you couldn't apply to the graphic design program until your end of your sophomore year anyways. So I applied to the program and was accepted and it was a four-and-a-half-year major that I managed to get done in four years, and I, I mean, I thought I was going to graduate and go off and, you know, be a graphic designer, create logos and annual reports. In the program, however, I also ran into two different people, and I'm not going to-- Bill Fernandez, I think-- it's either Fernandez or Ferguson was one of my typography teachers, and he taught typography the old way. He taught you calligraphy, he taught you what letter forms look like. He was a very old-fashioned typography teacher. The other typography teacher I had was Paul Sinn, a part of Humpal, Leftwich & Sinn, who was one of the advertising agencies in the Valley at the time, and that, those two teachers, gave me my love of typography, which played into how I ended up moving into Silicon Valley. Now, at the same time, when you go through the graphic design program, you need to do an internship. My internship was with Murphy Advertising in Santa Clara, and I spent, like, three months there, four months there, working with them, and one of the projects that they asked me to do was to create an ad for a company called Hitachi, and it was for this thing called a computer chip. Now, you have to understand, I didn't come from the computer science background. I didn't know anything about this stuff. So I didn't know what software engineering was, I didn't know what computer chips were, I didn't know who any of these companies were, and he handed me this thing and he was explaining what it was, and I was very curious about what this thing was I was supposed to create it for. Like, what does a chip do and where do you put it in, and so I started getting interested in what this thing was about. So when I got done with the internship I came back and I started hunting around. I had heard about this thing called programming languages, and I discovered that they had a general ed class you could take that taught you how to do FORTRAN and had punch cards.

<laughter>

Wagner: Which I thought were, like, "Okay." So I took--

Hsu: What year was that? <laughs>

Wagner: That was at San Jose State, and I think it was in my junior year, but I'm not absolutely certain. But it was in-- but it wasn't in the Computer Science Department. It was part of some other department at San Jose State and they literally, you-- they taught you how to make these really simple programs and you had to do this whole punch card thing and it printed stuff out and it was amusing more than anything else, and then there was another programming class that was part of the Business Department, and I'm trying to remember if it was-- I don't know if it was BASIC or if it was something else, but it was a very,

another very simplistic early language, and at that point I got interested in the design of how the languages went together, because in graphic design, one of the things I was also interested besides typography was design language. But when I went that year, I think in my senior year, and I wanted to actually sign up for the Theory of Programming Languages, and it was actually in the Computer Science Department, and I walked-- back then there wasn't online registration. They usually had like a huge gym and you walked in and you had a certain time period and you could walk in and register for classes and I walked up to the Computer Science table and said I wanted to take this class and it was hilarious. I mean, looking back, it was complete stereotypical nerd. You know, dark pants, white button-down shirt, short sleeves, pocket protectors, crazy haircuts, black glasses. I mean, looked like they came out of the 1950s, and I walked up, said I wanted to sign up for this class and the guy looked at my card and he said, "What's your major?" and I said, "Graphic Design." He goes, "We don't do artists," and he just simply refused to allow me to sign up for the class, and I was furious. I argued with him, and he wouldn't take-- he didn't want to hear anything I had to say, so I said, "Okay, fine," and I knew I was graduating soon. Well, that same year, towards the end of the year, Paul Sinn came to me at one point and said, "Would you be interested in working for a computer company designing typefaces?" and I was like, "Sure," and he says, "Well--" because he knew I had done this internship and he knew I had some interest in computer stuff. So he says, "Well, you'd have to learn more about this computer stuff," and I was like, "Sure, fine by me." You know, "Who's the company?" and he says, "Well, it's this little dinky company called Apple," and I'm like, "Okay," and he recruited myself and he recruited another woman, Liz Hall. Elizabeth, I mean, think it's Elizabeth Hall Design, I think, at the time. Anyways, Liz had graduated the year before me and she already had a design business running, a graphic design business running, and she did logos and annual reports and things, and they hired the two of us as contractors, and we-- and I'm trying to remember. I think the building we originally got hired into was one-- was Bandle 4. It was on, you know, Bandle Drive. It was one of the old, funky, 1-story, 10-million-cubicle buildings, and the person we worked directly for was Jeff Parrish, and we basically-- they had no idea how long it would take, but what they had was they had this what I remember being an electric typewriter that had a ball in it, and I think they had another name for it. I think they called it a daisy wheel printer, and it printed out-- you could put different balls in it. It printed a serif typeface and a sans serif typeface, and they told us what they wanted us to do was to create typefaces on the screen that matched what came out on the printer, and they had-- Jeff Parrish had written and designed-- programmed this font editor for us that had like a bitmap on the left-hand side and it had other little things on the right-hand side, and you-- so you could edit what you were doing and then see what it looked like on that side and you could change what the right-hand side looked like so you could put in-- because there's particular sentences you use when you're designing typeface, like 'hamburgefons' and other weird words, so you can see line spacing and letter spacing and other things, and Liz took over the serif typefaces, and I took over the sans serif typefaces, and we had to come into Apple, into this cubicle that we shared in order to actually do the work, and that was-- that would've been in 1981, and I can't remember if it was early in the year or late in the year, <laughs> so-- and, I mean, I learned as we did this that this was the Lisa project, which didn't make a whole lot of sense to me, but I ended up being the one who was much more interested in what was going on and had a lot more questions for the engineers and I was in there on a more regular basis. I didn't have, because I had just graduated, I didn't have a whole lot of other graphic design work going on, whereas Liz had more graphic design work going on, and as time progressed and we started to create these screen fonts and we started to get a sense of how the engineers were using them inside of

this Lisa, and they told us it was called a user interface, and they would show us how they were using things inside of it, then the next request came. "Well, we want you to do display sizes. We want you to do 18 and 24 point," and we had a discussion with them about they should probably also do 14 point, and there was some back and forth about that, and somewhere around there, Liz started to bow out of things, because she was more interested in running her business, and I started to take over doing more of all the typefaces. Also somewhere in there, and I don't remember exactly what the time frame was, at some point in there when I had started to take over almost all of the typefaces and I was doing both the print versions and the screen versions, Jeff Parrish walked into my office one day and he had this printout, 8 1/2-by-11 sheet printout, and it looked like the font editor, but with a whole bunch of icons inside of it, and he handed me this thing and the icons-- well, he told me they were called icons, first of all. I thought of them as little, tiny logos, because I had never seen anything like that before. So he said they were called icons and they were going to be used in the user interface, and he wanted to know if I could do anything with them and work with them at all, and these icons were, at the time that I saw them, they were of things like pieces of paper and folders and disks, like actual floppy disks and trash cans, and they all had this three-dimensional aspect to them. But when you draw something three dimensional, you always need to create-- think of what the vanishing point is and what the perspective is. These didn't have any perspective because of-- well, I should back up slightly-- because of the pixels on the Lisa screen. The Lisa didn't have square pixels. This was before the advent of that, which was-- made life so much easier. It had rectangular pixels and they weren't even-- they didn't have a particular ratio one side to the other that made them really easy to work with, they just were what they were, and when you attempted to do anything where you were trying to go off in an angle you ended up with really strange sets of jaggies. So these little, strange icons with these three-dimensional edges, everything was completely parallel and there was no vanishing point, so optically they looked like they went out like this, and they optically, to my eye, at least, they did not look correct, and I suspect that's why Jeff handed it to me, is he thought there was something we could do better some [ph?], and I had no idea at this point who had designed them. Nobody gave me any context. I was the contractor who, you know, the contractor lady who did the typefaces. So I took the icons and I put them into the font editor, and the first thing I did was attempt to create a vanishing point, which resulted in icons that had all kinds of strange jaggy effects going off of them, which I didn't like at all, but I decided since I didn't know who had created these I didn't want to step on a whole bunch of toes, so I thought, "Well, I'll start with what's there, see if I can improve it," and then I went one step further, with some encouragement from Jeff, where I simply took all the three-dimensional pieces of it off, and then I went in and I also cleaned up some of the icons themselves and made them look a little bit more like a piece of paper. I played with variations on, you know, do you fold down the corner or not fold down the corner, or what makes something look like a file folder, and went through the various options, and the next thing that happened was there was a meeting, apparently, of some group of what I learned later were probably the graphics programmers, and Jeff insisted that I needed to go to the meeting, because at this point I was becoming more of the team. Like, I was the font lady and I was becoming the icon lady and I'm more and more of the team, and they started inviting me to come to more of the meetings, and I went into the meeting and the person who had designed the icons was there, and that was Bill Atkinson, and that was the first time I ever met Bill Atkinson, and I didn't know who any of the people were in this meeting. I didn't really understand what a graphics programmer was. I didn't understand what a software engineer was, and so there was a lot of kind of learning things by the seat of my pants and guessing, but Jeff wanted me to present what I had done. So I walked through my design

process and I made a recommendation to them, which was to get rid of the three-dimensional effect because it didn't really work with the pixels that we had on the Lisa screen and to go with something that was more flat, and that ultimately was what they ended up deciding with the icons, and my work at that point then involved creating the screen typefaces, both in serif and sans serif and the icons for every release that they put together.

Hsu: What was it like working with the people on the Lisa team? So you worked with Bill Atkinson. Who else did you work with? Did you work with Larry Tesler?

Wagner: I worked with Larry Tesler, Owens Densmore. Oh, goodness. I'm probably not going to remember. I remember all the faces; I may not remember all the names. I worked with everyone on the applications team, and for the most part, these guys were-- it was mostly guys. There were very few women. MaryAnn Hsiung was the engineer who did the BASIC programmer programming. Owen Din-- not Owens Densmore. There's another name that will come to me, but--

Hsu: A David Casseres?

Wagner: Yes. I worked with David, and-- I worked a lot with David and Owen and Jeff, because they were doing printing and graphics, and Jeff had written the font editor that I used, and also Wayne Rosing. I mean, I became an integral piece of the team because I was the only one who could do these parts, and I found actually working with the team to be quite fun. A lot of these guys, like Frank Ludolph, was someone that I worked with quite a bit, and Dan-- I want to say Dan Smith, but I'm not sure if that's his last name. They were working on what became the Filer or the-- what the equivalent of the Finder, and so there was a lot of, you know, like, "I need you to do this," or, you know, "Get me a set of these and I'm going to try that out," and I actually enjoyed working with them quite a bit. They were older than I was. They were more senior, and they were smart people, and it was fun, because they were also open to, "Well, what if I do this?" or, "What if I do that?" and they were also open to being silly. Like, there was a-- and I still don't remember what-- I have a printout of it somewhere, but there were points where, like, I made ice cream cone icons and exploding trash cans and other strange things and weird disk icons and, you know, they would put them in and make silly releases. That actually held true through a lot of my time at Apple, that there was always that willingness to, you know, be a little crazy. Like I remember one time putting flaming icons in on something, you know, to show that it was-- it was an error message that came up and the icon had flames burning behind it. <laughs> The marketing people didn't appreciate it, but... <laughs> the engineers-- I always felt closer to the engineers. But I very much enjoyed working with them. We had a lot of fun doing-- I also ended up doing a lot of the crazy T-shirt projects. So there was a point where Apple saw IBM as the bad guy and that they were the ones out to get us. So I took the IBM logo and I took a bite out of it and added a leaf to it, because that was the Apple logo at the time, and we got these IBM blue T-shirts and we printed them in black and we put the logo on it, and it only went out supposedly to the Lisa team, and of course we weren't supposed to do that, <laughs> because we weren't supposed to play with their logo. But yeah, we were having fun, and then there was the time that Wayne Rosing-- there's these jackets that are sometimes referred to as the Lisa jackets. There was a point when Wayne was running the division and he wanted to give everyone a really nice gift, and see, he wanted to do some kind of nice jacket, and Gore-Tex had just come out on the marketplace. So I had

contacts into the companies that would do things like this, and they came in and they showed us this prototype of a Gore-Tex jacket. It was burgundy with a nice lining, and Wayne said, "Okay. Well, figure out what you can print on it," and it was kind of an interesting challenge because we wanted to be able to print on it but not alter the integrity of the Gore-Tex. So I came up with this typography. I came up with several ideas, one of which was this typography idea of saying-- having a couple words and at the bottom having the Lisa logo and saying "Lisa Toolsmith," and it had come out of an offsite that we were at where we were tossing out words and phrases and doing some team building and things like that. Well, I came up with all these words, like Stargazer, Renaissance Person. I mean, I don't even remember all of them, and I made this whole list of them and then at the bottom I had this Lisa Toolsmith, and I show it to Wayne, and I say, "Well, which one of these words-- you know, let's put two or three words and put this at the bottom," and he looks at my list of words and goes, "Nope. Put them all on the jacket." <laughs> So they still are floating around. People-- I know Frank Ludolph wore his for years and years and years and probably still wears it, and I know I have one hanging in the closet and we ended up doing a whole batch for the engineers and then a whole batch for the rest of the Lisa Division. Like, we ended up doing like 200 of these things and they were like 40 or 50 bucks apiece. So we had fun doing that. We had a crazy party one time. It was-- so I was there through-- I went from employee-- contractor to employee on the Lisa project, and I was there when things started to shift and Steve--

Hsu: What year did you make that transition?

Wagner: I'll have to go back and look. I actually have a-- I think I have my original hire letter somewhere in the pile of stuff. It was-- because the Mac came out in '84, and I think at that point I was an employee, so I think it was about a year and a half in, so probably in '83 that I became an employee, and I was hired as a font engineer. I was the only one at the company that was hired as a font engineer, and somewhere in there Steve had come back and had the Macintosh team rolling along, and so there became more interesting interactions with his team.

Hsu: So he had-- had he-- he had been working with a Lisa team before and then he shifted over to--

Wagner: He-- before my time.

Hsu: Okay.

Wagner: By the time I started, he was not working with the team at all, and I think he might even-- I don't even know what he was doing at that point. He might've-- I think he left and came back or I'm not sure what he ended up doing, but he was not working with the Lisa team to my knowledge when I was there.

Hsu: I think the sources say that he moved to the Macintosh team at that point.

Wagner: Yeah.

Hsu: Yeah.

Wagner: Yeah, and it was a very closed team. It was funny, because Bryan Stearns has always been a good friend. Kate Withey was one of the other folks who worked on the Lisa team and so I knew folks on the Macintosh team through that channel, but workwise they didn't want to have anything to do with you. So let me-- so I'll tell a few anecdotes. So one small anecdote is at some point when I started working on icons and typography, I learned that there was this man named Norm Cox, and that Norm Cox was the first person in the world to design icons, and he had designed it for this thing called the Xerox Star, and I had never seen a Xerox Star. But knowing there was this other person who did this, I thought that was really cool, and a lot of the guys on the Lisa team had come from Xerox, and so Norm happened to be in town at one point and the guys, several guys came by my office and said, you know, "Would you want to meet up with him?" and I'm like, "Sure." So they gave, you know, contact information was exchanged and I ended up setting up a dinner date with him and bringing Liz along, and we ended up some restaurant in downtown Palo Alto on University Avenue and having this wonderful dinner. The three of us are all graphic designers, and exchanging what our backgrounds were and et cetera. Well, little did I know that introducing Norm to Liz resulted in a few years later Norm marrying Liz. <laughs>

Hsu: Wow.

Wagner: And taking her off to Texas, which is where he's from. <laughs> One of those serendipitous little, you know, anecdotes of things that happen, and it was like-- I think it was the first time I ever heard of the Xerox Star, though it later became an issue because of the Apple-Microsoft lawsuit. But there were a few other little things that happened in there between Lisa and Macintosh and Steve and et cetera. One of them was when-- so we had been working away on doing this daisy wheel printer, and then dot matrix printers had come around, and then there was this whole idea of a laser printer, and the concept of outline typefaces had started to come into play. So at one point they-- Apple-- the Lisa team packed me off to Boston to go talk to Bitstream, and I'd have to go back and look. I'm pretty sure I was an employee at that point, and I don't remember exactly what year it happened, but it was probably aft-- I think the LaserWriters all happened after the Mac had been announced, but I'm not entirely certain. Well, so I go back. I had never flown cross-country before. Had never been on a business trip by myself. I had to basically land, drive myself into the city of Boston. The next day drive myself out of the city of Boston all the way out to where Bitstream was. I had a complete tour of their facilities, a discussion about what outline typefaces were doing, what their typographers were doing. I basically got told that, you know, "There's this little dinky company back in California you might want to talk to called Adobe," and I had a great time. It was incredibly eye-opening. Scared the hell out of me to go off and do this by myself because I had never done this before, and one of the engineers was from Boston and he-- Larry-- not Larry Tesler. It was the other Larry [Rosenstein]. He was from Boston and he said, you know, "Whatever you do, don't make eye contact. Just if it's really trafficky," he goes, "just aim for the blank areas." <laughs> Was the best advice I could've had because I'd never driven in traffic like that. But I came home from the business trip and I told Jeff and Owen and Dave, you know, "Okay. These folks basically said I need to talk to a company called Adobe," and they all gave each other kind of an odd look and didn't explain any context to me whatsoever, and said, "Okay. We'll deal with it," and the next thing I knew is I started getting samples of these typefaces from this company called Adobe, and somewhere in there, when this first started happening, I was at work fairly late one afternoon because we also had an Apple-- we had a soccer team, and I happened to be on the soccer team, and we were in one of these

leagues and stuff and I was getting ready to go bail out the door and I was all in my soccer gear and et cetera and my phone started ringing in my office and I darted back in, grabbed the phone, picked it up, and it was Steve, who proceeded to basically rip me a new one, as they say, and rake me over the coals for talking to this company called Adobe and it was none of my business and I shouldn't be involved in this and "rah-ah-ah..." and he was-- he's always an interesting character because he would start off sounding like he was being reasonable but it was very clear very early in the conversation but he was not being reasonable and he was in fact really angry at me and, you know, very pissed off at whatever I was doing, and proceeded to have this conversation and then hung up on me, and at that point I was in total shock that this had happened, and ended up bursting into tears, and of course I had half a dozen engineers running in the office going, "What happened?" and I explained what happened, and my management just hit the ceiling. They were furious that he had done this to me, because he really had no right to have any kind of conversation with me whatsoever about any of this going on, and I don't know what happened behind the scenes, but the next thing I knew I was being-- we were going to Adobe and having a meeting with John Warnock and other folks about the typefaces, and I was explaining what I did and what kinds of things we were trying to accomplish on the screen, and I was starting to get font samples from them, and then this comes to the amusing part of the story. So I have all these printouts and I'm sitting there in my office, and I existed in this world where I didn't always know where I stood as a person or as a designer, because I was still trying to understand what software engineering was and the politics of working for a corporation were something I had never experienced before. So I tended to step carefully and be cautious about what I did, but I'm looking at these printouts and thinking to myself, "There really are some issues with what I'm seeing here, and I don't know whether or not I should say something." So I asked Jeff about it and he's like, "No, no, no. Just yeah, you need to give them really clear feedback if you see problems." So I took a red pen out and the typefaces from Adobe had several problems, and if you're a typographer they're fairly obvious. Body typeface sizes have a different set of proportions than display sizes, 14 point and above. That was one issue. Another issue was that when you optically-- and you can't look at typefaces logically as a computer would. You really have to look at them through the human eye and the viewing system that we have and look at them from an optical perspective. You've got downstrokes, you've got circular strokes, you've got diagonal strokes. These things need to optically all look like they're the same, because the way the eye processes a typeface is it's looking at black and white as it goes across. It's like you're scanning it with your eye. Well, they weren't consistent at all on these typefaces, whether they were in the small sizes or in the large sizes, and the large sizes needed to have different proportions. So I was going through marking everything up, you know, circling the diagonals and making notes and circling other things, and this all got handed back to the sales lady at Adobe that I was working with. Well, I didn't hear anything else from them other than, "We'll deal with it." Time progresses on. You know, I'm getting samples of typefaces from them. We have a LaserWriter, and I'm trying to actually now create bitmap typefaces, work on outline typefaces and trying to make sure that everything still-- because every time you introduced a new typeface, the ones that we had that were going to the dot matrix, I'd have to adjust things, and I'd have to play around on the dot matrix printer with dropping pixels out, and I'd come across this article by a man named Charles Bigelow, or Chuck Bigelow, that was in Scientific American, where he talked about typefaces and some of the things that you could do to work with them, and I grabbed that and used that as a guideline and went into my dot matrix print fonts, because you had bleed out from the-- each dot would hit the paper and it would kind of go larger. So I used some of his principles and would take pixels out of certain areas, and I

ended up being able to get crisper shapes and crisper letter forms off the printer. So I'm playing around with all this stuff and time goes by and one of the other-- I think might've been Dave Casseres, who actually knew Chuck, and he said, "You know, Chuck Bigelow's going to be in town. Why don't we ask him to come out?" Because we were also working-- they were having me work on what was called a system font, which would've been used for the menus and the menu bar across the top, and he was like, "Let's have him come out and take a look at our fonts and see what kind of feedback he has about them," and I'm like, "Okay. Good," and they set this whole thing up and they asked me to go meet him at the train station. He was coming down from San Francisco, and I think Dave and I went out to go pick him up. Anyways, we get out to the train station to go pick him up and he gets off the train and they're introducing him to me and he takes my hand with a big grin on his face and he says, "You're the one I have to thank," and I'm like, "For what?" He goes, "For the consulting job at Adobe."

<laughter>

Hsu: Oh.

Wagner: He said apparent-- he goes, "I got a call six months ago that the lady at Apple didn't like their typefaces and they needed them fixed," <laughs> and he had spent the last six months consulting with them, and I had noticed that the typefaces had gone through some major changes and they looked like tremendously better. Chuck had actually gone through and explained all these principles, and over lunch and dinner and then we worked with him for a couple days, I got the story of he actually had to educate them about they were-- all came out of, you know, Donald Knuth's-- what was it called? It was his--

Hsu: TeX.

Wagner: Hum?

Hsu: TeX?

Wagner: Yeah, the whole-- I was going to say TeX. He came out of that whole project. Well, they were all computer scientists. They weren't actually typographers, and no one had applied any of the typography rules to it. So Chuck had been spending the last six months educating them and they had been playing with how to put this into the algorithms, and Chuck had actually ended up designing a whole set of his own typefaces, the Lucida typefaces, as a way to test what was going on, because it also changed, as a typographer, it changed how you looked at designing the typeface when you knew that it was going to end up scaling and it had an algorithm behind it and it wasn't-- because originally typefaces were designed where you actually made a letter form and that's what was used. It was cut in wood or cut in metal, and that was the lineage of a typeface, and now you're talking about there is no set letter form, there's this mathematical formula and it's got a scale. So Chuck had spent all his time educating them and injecting these principles in and then they had played around with how to adjust the formulas, which I thought was completely fascinating, and then I sat Chuck down and we had a hilarious time. I showed him what I had taken out of his Scientific American article and how I had been applying it to the dot matrix fonts, which he thought was hilariously good fun. I mean, we just, we-- it was like it was cool to him to

see what I had actually used and that it was actually going out in releases and being used by people. So it was fun. That was one of, I think, one of the coolest things was to have him come back and really verify or validate the work that I had been doing. We even played with a system font, tried to fix the "W" and play with other-- I mean, he was fascinated by the fact that I had to deal with pixels that weren't square.

<laughter>

Hsu: Were you aware that-- so you obviously did not know that Apple was working with Adobe on the LaserWriter at the time that you started that.

Wagner: Oh, and I-- when I-- the what I knew was when an engineer walked into my office and said, "We're getting this new printer and it's called the LaserWriter," and when I come back from the business trip was I think just when Apple must've been starting or at least when the Lisa team had just been starting to contact the Adobe folks, and what I didn't know until later was that the Macintosh team and Steve had apparently already been working with them, and he wanted to keep it so that nobody else in the rest of Apple got to work with Adobe, only the Macintosh team, and so that was where this conflict had come from. But I didn't hit any of that until that phone call. I mean, me personally, because I was buried down in my typefaces and icons. I wasn't-- trying not to pay any attention to that kind of level of politics.

Hsu: Right, right. And Chuck Bigelow had worked with Warnock before at Xerox PARC; is that correct?

Wagner: Certainly. He worked with Donald Knuth. I think he knew-- I'm not absolutely certain, but so it was-- Bigelow & Holmes was the name of the typography company, and my understanding was that he had some knowledge of what Donald Knuth was doing, and so they all sort of knew each other through that network, and Warnock and he certainly hit it off, because John Warnock loved typography. So I think it was-- my sense was that Adobe was very early on in the process and then later years when I talked to people later about what had happened they, given the timing, they said that they weren't done with the algorithms at that point, and I think they were still trying to figure out if they could just run with what they had, and having someone come in and give them that feedback and say, "No, this isn't acceptable," it was just a matter of perfect timing and then they pulled Chuck in. I have a feeling they knew Chuck already and he was the obvious person to go to.

Hsu: Right, right, right. Yeah. Is that the reason why they had to add that sort of hinting algorithm?

Wagner: Yes.

Hsu: Okay.

Wagner: Yeah. To my understanding, that is why hinting came along, is because they had to have a way to tell the system simple things, like, "Okay. Now you're going up to display size," or in a particular typeface. Like, there were things like letter spacing that needs to change sometimes between different sizes or between different letters, and there were all kinds of little bits like that that you tune when you

create a typeface, and they didn't have any of that in there, or any way to really manage it. Yes. That's where a lot of the hinting technology came out from, is trying to-- <laughs> trying to do what the typographers wanted them to do.

<laughter>

Hsu: Earlier you mentioned that originally there was a daisy wheel printer, but that has only-- the ball only has either just two typefaces, right?

Wagner: Right.

Hsu: Just the serif and the sans serif.

Wagner: Yep.

Hsu: So... But you were designing multiple typefaces. How would that have worked with the daisy wheel printer?

Wagner: It didn't.

Hsu: Okay.

Wagner: The daisy wheel probably only hung around for about a year, and then we ended up with a dot matrix. But the Lisa-- the Lisa computer was always seen as this office computer, so it was always seen as something that was Century-- you know, Century Schoolbook and Helvetica were the typeface styles, and they didn't actually have a whole bunch of other typefaces. So that didn't come about really until the Macintosh. So in that sense the Mac was the one who had all kinds of different crazy typefaces in there, and the Lisa later started to add some of that in. But the technology on the Lisa, when you wanted to do icons, icons were on a font file, so everything was loaded as a font file. So they could've added them, and I think later on they did start to play around with adding in some of those kinds of things, but originally it was only two typeface styles.

Hsu: Okay.

Wagner: And they had an algorithm to do italic and they had an algorithm to do bold, which I believe, you know, Bill Atkinson had come up with, so-- and there was always some argument about whether or not the italic was done correctly or not, but... <laughs>

Hsu: Oh, right. Because it just slanted the letters.

Wagner: Right.

Hsu: It wasn't true italics.

Wagner: Right. It was not a true italic typeface.

Hsu: Is the work on the anti-aliasing for the fonts, was that later, or was that still in the Lisa timeframe?

Wagner: That would've been later.

Hsu: Okay.

Wagner: The way it worked. Anti-aliasing, I mean, some of what I was doing early on in tweaking the pixels on the print versions of the dot matrix fonts could be considered anti-aliasing, because I was-- it was early versions of that where you're taking pixels out or putting pixels in to get a particular effect. But I was hand tuning the fonts. Anti-aliasing was really something that they wanted to do with an algorithm. So some of that-- I'm pretty sure most of that didn't come about until we were-- had moved over onto the Mac primarily and the Lisa had gone away. Which I should-- and terms of that transition, I was there for the historic, you know, A player, B player speech. I remember sitting around the-- we had this central circular planter thing in the middle of the Bandleby building we were at and I remember sitting on that and Steve coming in to talk to the team and once again, you know, like, I'm sitting with my girlfriends and I don't really know, have any idea what to expect, and I could tell the senior engineers were not happy campers even before he got there, and then he starts this whole conversation about how there's A players and B players and C players, and we're all looking at each other like, you know, "Where is he going with this?" and, "Is he really saying what we think he's saying?" and not really understanding what the impact of it's going to be. I hadn't been through anything like a layoff or something like that, because I had this kind of unique position. But I distinctly remember how the energy shifted entirely in that building in the space of that conversation with him talking to us, and then he left, and pretty much at least a dozen engineers walked into their offices and sent their resumes out. I mean, they were just like, "I'm not putting up with this bullshit." You know, "He's an asshole, and I'm not going to work for him."

Hsu: Was this speech made to the whole company or just to the Lisa Division or...?

Wagner: Lisa Division.

Hsu: Okay.

Wagner: It was the Lisa Division. It was like he had his guns out to take us out.

Hsu: And he was already-- he was on the Mac team, so he was-- it was not--

Wagner: This is at the point where they were looking-- he had never run the Mac team and there was this point where he took-- he, like, climbed up high enough on the management chain and he was taking over both of them and the Mac had already-- the Mac had been announced. It went out there, it was a success, and now he had raised up in the management chain and the Lisa had fallen underneath him.

Hsu: Okay. So he was now coming to take the axe to Lisa?

Wagner: Yeah. He was basically going to axe it, and there was a lot of pushback because the Lisa was actually-- had a market and there was people who believed that it could've made it. But it was also a very weird time, because that began this whole cycle of we lost a whole bunch of senior engineers, which was not good for the project, and we had a release coming up and they started doing these layoffs, and it was really weird because they-- in my particular case it was very strange because they couldn't do a release without me, because I did all the icons and the typefaces. There was no one else that would step into that position who had any expertise or who could step into it, and they told me-- so my management told me, "Look. We're just going to tell you, you're very likely to be on the layoff list," and I'm like, "Well, what does that mean in terms of trying to get the release out?" and it's like, "We're trying to work it. We don't know what it's going to mean. We need you here to do the release, but we also know that we're going to end up having to lay you off, because that's the word coming down from upper management." So I lived under that, that kind of gun over my head, if you will, for a month or two and then basically went to management and said, "You know, this is insane and it's driving me crazy. Let's just see if we can't, you know, cut to the finish and I'll just go figure out something else I'm going to work on." Well, <laughs> amusingly what ended up happening was they laid me off and then within two weeks hired me back on as a contractor, which we all know now was illegal and they shouldn't have done that. But at the time, they didn't have any other choice because they needed to get this release out and the release date kept slipping and things kept happening because, of course, they were losing the people and they're trying to figure out how to make everything come together, and I ended up coming back as a contractor and working through that release, and I'm trying to remember. Think I continued to work as a contractor for a certain period of time, and then there was this whole rejiggering that started to happen and a conversation about a user interface team, or a human interface team at that point, and at some point I got hired back on as a member of the human interface team, and I don't remember exactly where the original Macintosh team was at that point, but this was a human interface team that was sort of separate of all that, and yet we were also starting to work on un-Mac-related things as well. So it was a-- but yeah, I kind of ended up transitioning out of that role, and I had been exposed on the Lisa team to watching Larry Tesler run these usability studies, working with Greg Stikeleather to understand how they were testing out applications with people to see whether or not they could use it, the whole concept of usability, and I really learned-- I just picked up what was going on around me and I learned to work with those kinds of concepts and it wasn't that foreign to what we learned as a graphic designer, and started picking up the basic underlying principles and the psychology behind what was going on. I took classes at the local junior college and I started shifting into being more of a human interface designer, and I worked on a whole variety of different projects. I worked on MacDraw. I worked on the One Button Installer. I worked on the Finder itself for many years, and in fact, that's where some of my early patents come from. So at some point it kind of shifted out of the Lisa and we ended up being part of the Mac team and part of this human interface team, and I was part of the original team that wrote the human interface guidelines.

Hsu: Oh, okay.

Wagner: Yeah. So we helped figure out things like how to do the dialogues and what the visual language should be, and at one point Anne Nichols-Thomas came in as an educational psychologist and she sat me down and taught me, like, from ground square, "This is how you do usability testing," and yeah, no. It was an amusing-- there was an amusing period there, and I'm trying to remember what year it was that

any of this happened because it was right before HyperCard came out, and I was working on the Finder and we were doing a major redesign on the Finder, and I was using early versions of the HyperCard to do little prototypes. We would have a design meeting. I would take notes. I would go back, do a little prototype on HyperCard, share it with the Finder team, and I was one of the beta users, and then at some point the HyperCard team pulled me in to do a usability study, where I was a subject. Crazy times. In fact, that was-- it was early enough on in the HyperCard project where Bill Atkinson and team were still struggling with the idea of whether or not they were going to have modes in the editing, in the user interface for edit mode versus view mode, and they sat me down in this lab and they're always-- the camera comes over your shoulder. They can hear you talking. You can see the screen, and they give you a set of tasks to work on. In fact, Anne was back there behind the camera. She was one of the people running it, so I knew the basic rigmarole, and I'm working through the task and she's like, "No," you know, "Please do this. Please do that," and I had somehow got myself into edit mode when I thought I was in view mode, and I couldn't figure out how to get back to where I was at. So I'm doing these thing-- I created all the stuff on the screen and now I wanted to go to, like, the next card, and every time I hit something on the screen I'm in erase-- literally in the erase tool and I'm erasing what I just did, and I'm like, "Wait a minute. It's not supposed to be doing this. What's it doing? It can't be doing this," and I'm like freaking out. I'm babbling and blah, <laughs> and they're all trying not to laugh back there, and like, "Oh, my God. It's doing this," so they proceeded to the user test, right? The next year at the SIGCHI Conference, Larry Tesler was invited to be one of the keynote speakers. Well, I didn't know this, but Larry and Anne pulled a snippet from that usability study <laughs> and everyone wanted to make sure I was at the keynote, and I couldn't figure out why they all wanted me to be at the keynote, and I'm sitting about two-thirds back in the audience kind of, "All right. Sitting through another keynote," right, and all of a sudden I hear my voice up on the screen, and I look up and Larry's talking about the usability study, "And here's a snippet from one of our studies, where we were dealing with trying to determine whether we put modes into this," and I'm like, "Oh, my God, that's me," and it's me.

<laughter>

Wagner: Babbling away and going, "Aaah," <laughs> and half the audience knows me because we're all in the CHI community, right, and I'm like sinking in my chair going, "Oh, no."

<laughter>

Wagner: It was hilarious, and afterwards Anne and Larry were very proud of themselves for pulling that off and I-- me not knowing anything about it, so we had some good times.

<laughter>

Wagner: So yeah. I worked on a variety of amusing projects.

Hsu: I wanted to go back and just sort of fill in some of the timeline. So you mentioned that the A, B, C player speech, that was made-- what year was that?

Wagner: It was-- has to be after '84. It might've been late '80-- it was-- the Macintosh-- my memory is that the Macintosh had come out earlier that year.

Hsu: In '84?

Wagner: Yeah, and this was later that same year.

Hsu: But you said that the Lisa had not shipped yet, but the Lisa--

Wagner: No, no. They had shipped.

Hsu: Oh.

Wagner: It had shipped, but we had a release coming up.

Hsu: Oh, an update.

Wagner: Yeah.

Hsu: Okay.

Wagner: Yeah, we had, like, another-- it was a major release coming up that they all wanted to get out and we had customers out there using this stuff.

Hsu: Oh, okay.

Wagner: So there was this big push to get out-- to get this particular release done. I think partially because they also felt like it was probably going to be the last release.

Hsu: Right.

Wagner: Which, and I think indeed it probably-- there might've been a couple small updates after that but it was the last major release.

Hsu: Okay. So this was already the Lisa 2 with the Sony floppy drive, not the original Twiggy drive?

Wagner: Right, yes, yes.

Hsu: Okay.

Wagner: Oh, yes. In fact, yes. We had gone from the literal floppies to the Twiggy drives and yes, and which meant I had to change icons and... <laughs>

Hsu: Oh, right. Yeah.

Wagner: And all kinds of other fun things like that.

Hsu: And had they already--

Wagner: And we had ProFiles [hard drives]. We had five-megabyte ProFiles that <laughs> sat on top of the Lisas.

Hsu: <laughs>

Wagner: I have a funny story to tell about those. So they were-- they had an HDA unit inside of them and they had all the electronics, and the plastic was designed so that these five-megabyte ProFiles sat directly on top the Lisas and the color and everything. Like, they just lined up perfect. So product design-wise they all-- they looked very nice. Well, I had one that ran all the font software, and one that ran the current release, and then-- and what I would do to test things is I would be in the font editor, and I would create whatever typefaces I needed to do and I would save them out onto one of the Twiggys, or onto-- and they'd be on-- the ProFile would have all the working software but I literally saved the files out onto one of these Twiggys.

Hsu: Onto the floppy.

Wagner: Then I would shut the computer down, unplug that ProFile, put the other ProFile in that had the actual system, boot it up into a particular mode, replace the set of files I needed to replace and then boot it all the way up into the Lisa office software. Well, one day, and this is back-- we're all still in Bandlely in the cubicle farm, and I had shut everything down and I was on my hands and knees literally underneath my desk pulling the plug on one profile and plugging in the other profile, and the damn thing sparked.

Hsu: Uh-oh.

Wagner: And the power in five offices went, "thunk," and Frank and Dan were on the other side of the cubicle wall and I can hear two guys going, "What the--" <laughs> and standing up because they were in the middle of doing compiles and the compiler took forever. Took like 45 minutes to compile everything back then, so I had two very angry <laughs> engineers on the other side of the wall and I'm down on the floor going, "Maybe I should just stay here a while." <laughs> Because... <laughs> I mean, it all worked out, but that was-- those kinds of things would happen all the time because the power in those old-- those buildings was not-- I mean, we were all jammed in and had lots and lots of stuff plugged in, probably way more than we needed to. But it blew out the electronics in one of my ProFiles, the one that I'd been trying to plug in. So the way you fixed this was you got a six-pack of beer and you went down to the other end of the building, which is where the Hardwareland guys live, and here was this one guy whose name I don't remember who had this kind of area-- well, he had, like, counters on all four sides and he was the guy who repaired all of the, you know, when we busted things or blew up things, or helped do prototypes and things like that, and I basically showed up with my ProFile with a six-pack of beer on top of it, said,

“Would you please pull my HDA <laughs> out of this and put it into a new box?” <laughs> And you’d get the evil eye, like, “What did you do?” and, like, “Oh, I heard about that.”

<laughter>

Wagner: And he swaps everything out and then I go back and... <laughs> But that was, you know, that was just part of everyday life that things like this would happen back then, but they were pretty funny. But yes, Twiggys-- Twiggie drives were a vast improvement upon-- the floppies didn’t-- I don’t remember them being around that long after I was there.

Hsu: Okay. I think the original floppy drives were the Twiggys and then they replaced it with the Sony-- the Sony drive.

Wagner: Yeah, they proceeded to.

Hsu: Yeah.

Wagner: Because my husband at the time was actually one of the firmware engineers, was going through testing all that stuff.

Hsu: Okay.

Wagner: Yeah, and he was building-- writing the firmware drivers for all that stuff.

Hsu: Right, and then there was, you know, the later version of Lisa, there was that Macintosh XL conversion that was done to them.

Wagner: Mm-hm. Which I didn’t have anything to do with that particular piece, but yeah, they did a whole-- you could run the Mac on it, although it was kind of weird looking because they had to do strange things, because the pixels, the screens still weren’t square. So you still had this funny thing you had to do to it to make it look halfway decent.

Hsu: Right.

Wagner: They were huge machines compared to the Macintosh. I mean, that was one thing that they-- they were like-- they took up a major, you know, like, an acre of office space in your office. They were not small computers. But I had one for a long time in my garage and then I finally got rid of it. I don’t remember what happened to it.

<laughter>

Wagner: And I also back then would collect strange computer boards from the guys down in Hardwareland, and I would do artwork out of them, like a multimedia collage, and we actually had an art

show at Apple and I had one of these pieces up on the wall and Chris Espinosa walked up to it and said, "Oh. I don't think you're supposed to have that card on there," and I'm like, "What card?" and he said, "That one. I think that was one of those phone cards that Apple got in a lot of trouble for and they were all supposed to be destroyed."

<laughter>

Wagner: Like, "I had no idea. Nobody told me what the cards do. <laughs> I just thought it looked cool." I had things wired up and printouts and all kinds of crazy things on it. I mean, it wasn't usable in any sense by the time I got done with it, but it was just an amusing, very amusing story.

<laughter>

Hsu: So you joined the-- so you were hired back into the human interface team in, what, 1985; is that correct?

Wagner: Seems to me it was about a year and a half as a consultant, a year and a half as an employee, which would put us three years in. So yeah, somewhere maybe '84, '85 I was hired in as a human interface designer, and then-- because altogether I worked at Apple for about 11 years, and once I got hired in-- think that's correct. Yeah. Once I got hired in the second time, then I was an employee and I was in the human interface group, and I did-- my designation went from font engineer to human interface engineer, <laughs> so yeah, and I didn't--

Hsu: And that--

Wagner: --go back to being a consultant after that.

Hsu: Right, okay. And that team was led by Bruce Tognazzini?

Wagner: Yep.

Hsu: Okay.

Wagner: Yep. Tog was our manager, and I-- Tog was our manager, and then I think the next manager after that would've been Bob Glass. At some point we hired in Joy Mountford.

Hsu: You mentioned that, you know, during this whole time, the human interface team didn't have, you know, like, the Macintosh team was doing their own thing.

Wagner: Yes.

Hsu: And so you didn't have contact with Susan Kare or Jerome Coonen?

Wagner: Well, so at one point, we had discovered that there were folks on the Apple II team that were doing icons.

Hsu: Oh, the Apple II team?

Wagner: Yes. Bruce Tog-- and that was when I first met Bruce Tognazzini, and we had positive conversation between the two of us and we had this idea that maybe it would make sense for us to coordinate, even though they were dealing with different hardware constraints in terms of what screen could display. But let's try and coordinate, because this is one Apple, right. We all work for the same company--

Hsu: This was when you were still working on Lisa?

Wagner: This is when I was working on Lisa. I was doing icons. I think it was when Liz was still around at that point, so it was still fairly early, and I went to Jeff and said, you know, "These--" because Jeff at that point was my manager and I said, you know, "I was contacted by this--" you know, people, Bruce Tognazzini, and, you know, "We're thinking that it would make sense to have some coordination around the icons." I said, "What do you think?" and he's like, "Yes. I think it makes a ton of sense," and I said, "Do you think I should try to contact Susan Kare and-- on the Mac team?" and I had never-- those people had never made any indication they even knew we existed. Other than Bryan Stearns. So I reached out to her and, you know, introduced myself and said, "We love to have a conversation with you just to try and coordinate icon design and such across the company so we have a consistent visual language." So Liz and I show up for the meeting and Jerome's there with Susan, and Jerome does all the talking, and Susan-- it was really pretty-- yeah, it's like we tried to explain what we were doing and, like, "We're coming out of-- we're graphic designers. We would like to share and coordinate and do a common visual language," and we're getting little to no interaction from Susan whatsoever, and not a very positive vibe from Jerome at all, and so we're like, "Okay. This feels really weird," and we just kind of-- we ended the meeting. We went back to our offices and then apparently Jerome called my manager and said that-- informed him that I was intimidating and overwhelming and that Susan really didn't want to have to deal with me and that if they had any further questions we should-- everything should go through Jerome, and that was the end of that. She never had any inclination to work with us whatsoever and never made any effort, and we just dropped it at that, and it felt very weird, but it was kind of one of those weird things with the Mac team. It's... And she was, to be quite honest, one of the most reclusive members of that team, from what we could tell, and I-- so I just left it the way it was and didn't bother. I did, however, one of the projects I was responsible for... So Bryan Stearns got hired as a teenager, and I always teased him about that. Well, when he was 19, just about to turn 20, we made him a "Twenteen" T-shirt, <laughs> and I designed it and made it for him.

<laughter>

Wagner: He was one of the nicest members of that team, I have to say, and he just thought that was the coolest thing, that he was still a teenager.

<laughter>

Hsu: What did he do on the Mac team?

Wagner: All I remember was that he was one of the software engineers and he was the youngest member of the team, and I don't remember if he was the youngest member at Apple at that point. I know Chris had that honor, Chris Espinosa had that honor for some period to time. But he was certainly the youngest member of the Mac team. I think it was his first job, if I remember correctly.

Hsu: Yeah, yeah. So going-- I guess finishing off the Lisa story, after-- so after that big A, B, C speech, there was a big-- and a bunch of people left, there was a big farewell party at Wayne Rosing's house?

Wagner: <laughs> So I don't know if this is the one you're talking about. There was, but there was also... So Didier Diaz, who was from France, and he was one of the translators who worked on doing the localizations, he and I were housemates and we had been in Palo Alto in Barron Park for little while as housemates, and then at some crazy beer fest or something we were chatting with Wayne or something and Wayne said, "Oh. Why don't you go live in this house I have down on Los Gatos? I'm not even going to charge you rent, but I need somebody to live in it." <laughs> We're like, "Okay." Well, originally it was-- it's on this piece of property that was in a nice area of Los Gatos, but it was the original farm manager's house for that plot of land when it was like a big ranch. It was funky. It was like added on in weird ways and it was just this really funky house. You went down this driveway and you came in and there was a bathroom and the bathroom didn't have anything-- the walls weren't finished. But it worked, you know, and there was a crazy attic and it was just this really-- it needed to be tore down and rebuilt. It was hilarious. So we-- so we said, "Sure," and Didier had the upstairs up in the attic, and I had, you know, the downstairs with this funky little bathroom and we had this kitchen that was in what used to be a porch, a screened-in porch, but then it got closed off, and it was a funky place. I mean, there were rats that ran through underneath the house and crazy things. Well, Didier was not yet 21, and about the time when the whole team was falling apart, Didier was going to turn 21, and I created this thing in-- this invite in Lisa, on LisaDraw, that was the-- it's the back of a man with like a hat on and then the coat is open and I forget what else I put on it, but it was the "Help Didier celebrate, turn 21, farewell, goodbye, whatever, come get crazy party," <laughs> and I had these stand-up mannequins, bra and girdle mannequins that lit up from the inside, and I put one at the top of the driveway, <laughs> and it disappeared during the party. I have no idea where it went, and we had Christmas lights and crazy stuff all over the house, and I swear to God, everyone on the fricking division who heard about the party showed up, and we had this totally over-the-top, drunk and crazy, people everywhere, singing, taking pictures, being crazy party that went on for all hours. <laughs> And fortunately, we were down the hill and there were no clear-- close neighbors so nobody called the cops on us, <laughs> but this-- what was supposed to be this birthday party turned into this crazy Lisa farewell party. So I'm not sure if that's the one you're referring to or not. <laughs> But it was totally wild and crazy. There were crazy pictures of-- they dressed up Didier. Well, first of all, of course, all the engineers decided he had to get drunk, because he was 21 now, right. So that was part of it, but they-- and they had all kinds of alcohols out and they had put, like, a crazy hat on him and I think people brought plastic leis and they put some kind of crazy robe on him and dressed him up and I-- it was insane. I mean, I have snatches of pictures of it in my head, but I just remember tons of food and chips

and salsa and beer and wine and alcohol everywhere in the place, go thinking, "Oh, my God. What have I done?" so...

<laughter>

Wagner: And everyone had an awesome time. I mean, that was the other part about it is I think we finally all let loose and just said, "To hell with it," and we even had some of the managers show up and they were like, "I'm not here as a manager. I see nothing; I know nothing."

<laughter>

Wagner: You know, it was totally off. Because it wasn't an Apple party, right. It was at a private residence and whatever happened, you know, stayed there.

<laughter>

Wagner: So yes. We did have a very crazy party.

Hsu: <laughs>

Wagner: It was very wild and crazy and I think it was just exactly what the team needed, was to blow off a whole lot of steam, because there were a lot of-- there was a lot of anger and unhappiness and resentment about what was going on, and it was the perfect antidote for all of that.

<laughter>

Wagner: Haven't thought about that party in a long time.

<laughter>

Hsu: Can you talk about the dogcow?

Wagner: Ahh. <laughs> Yeah, I will talk about dogcow. So this is when I was part of the human interface team working on the Macintosh, and typically what would happen is one of the ways in which projects would land in our lap is marketing would come over and say, "This is coming down the pipeline and we need something done," and we would try to encourage with marketing and engineering to come talk to us so we were in the loop. Because not all of them were very well trained about including human interface folks, but in this particular case, and I don't remember who the marketing person was, but they came over and said, "We have this new version of the LaserWriter coming out and it's got all these crazy features and we really want to show them off." I'm like, "Ahh. Do we really need to show the users all these crazy features?" because it really did have, like, weird things that people aren't going to even understand. So I get the word, I go off and find the engineer, and I think his name was Jay Patel, but I'm not absolutely certain, and had a conversation with the engineer and he ran me through all the features, and what they

wanted was a print dialogue where-- and all the features were-- they were all check boxes. They were not radio buttons where they were exclusive. They were all ones that could be mixed with each other. So we needed some kind of graphic that would show flipping, horizontal flipping, vertical, two percent reduction, you know, mirror effects, this effect. They were all kinds of crazy little-- they were-- think there was six or eight of them that-- of these little effects, and I had to come up with some kind of graphic that would actually show that. So I went back to my office and I came up with half a doz-- I tried, like, pointing hands and arrows, and we had this typeface of crazy symbols that had come off the Macintosh that Susan Kare had originally done that had all these little crazy critters inside of it, so--

Hsu: Oh, the Symbol font?

Wagner: Yeah, and I went through and was trying to figure out if any of them would be useful. Now, first of all, anything I used out of there I had to completely recreate because the size was wrong. So I had to make it larger and I had to play with it. So what we ultimately came up with was I think there was the hand and we came up with this dog figure, except that I had to change the dog pretty significantly so that there was a clear front, a clear back, a clear top, a clear bottom, and I had to change the spots on the dog specifically so that when the two percent reduction was in effect that you could actually tell the difference. So I altered it fairly significantly. It wasn't the original dog icon, and we showed all these things to marketing, and of course, myself and the engineer wanted the dog, <laughs> and the marketing person was saying, "Oooh, everyone's going to think this is doggie software. We don't want the dog." <laughs> But we finally convinced them that we really wanted to put the dog in there, because it really did-- it was really the most effective. I mean, you could clearly tell when you flipped it, you could tell when you did all these different things to it, and because I had changed all the spots on it, and it did look a bit more like a cow, you could actually tell all the other scaling effects that we had had to play with. So okay. He approved it. It went out in a release. I didn't hear anything about it for a couple months, and the next thing I know somebody comes sauntering into my office and drops this, you know, tech note from the tech guys where they had written this whole thing about, you know, the dogcow, <laughs> I'm rolling on the ground because, like, "Well, what sound does the dogcow make?" "It makes 'moof.'"

<laughter>

Wagner: And all of a sudden it'd become a legend, and they started coming by my office and giving me, like, little badges and getting me-- wanting to hear the story from me and telling me about how it was famous, and over the years I've had people come back. Like, apparently when the dogcow page first went up on Wikipedia, it had Susan as the creator of it, which the original icon she was the creator of, but I was the one who had done the dogcow, and so they wanted me to go in and update it and fix the page and put the history in it, and it's hilarious. It has a life of its own. <laughs> It totally does. But it was a good design solution, <laughs> so I'm happy to see that it still has a life of its own. I think I actually dug up one of the stickers that I was given years ago, not too long ago. <laughs>

Hsu: What were the changes that made it look like a cow?

Wagner: I think specifically the spots and the tail. Well, the tail was-- I tried to keep the tail relatively doglike, but I had to really enlarge the spots quite significantly, so it made it look a little bit more like a Hereford. Hereford, or however you pronounce that.

Hsu: Hereford.

Wagner: Yeah. It looked like one of those black and white cows. Maybe it's a Jersey that has the black and white spots. But that was part of what kicked it off, because there was one spot that's across the chest of the dog and then the one that comes down the back, and that actually looks-- is a lot more like how cows have spots than dogs have spots. <laughs> So I think that's what kicked them off.

Hsu: <laughs>

Wagner: What can I say? <laughs>

Hsu: Let's see. So maybe we could go back and talk about the anti-aliasing.

Wagner: Okay. What are you...?

Hsu: Oh. So that was-- so the anti-aliasing for the screen fonts. So did you work on that while you were on the human interface team?

Wagner: So when I was on the human interface team, trying to think if it-- oh, you're talking about the slides that I gave you.

Hsu: Yeah.

Wagner: Ahh, yes. So one of the things that they-- yes. I worked on that when I was on the human interface team, and I worked for system software, and primarily for the Finder team. So when some of these technologies came out, they would have me go play with it to see-- and I had this typography background. So some of the anti-aliasing things was working with the engineers in Hardwareland, like Donald North, who was the person who created the first Macintosh color computer at Apple, and deliberately designed it so that you could not put plastic around the plugs in the back so that marketing wouldn't ship it.

<laughter>

Wagner: And he designed it with all kinds of crazy modes, and so--

Hsu: So this was not the Mac II. This was an earlier color Mac that was--

Wagner: This was what the Mac II was based on.

Hsu: Oh, okay.

Wagner: And he-- he was an advanced development engineer, and he very much wanted-- they wanted to play around with 4-bit, 8-bit, 32-bit. I mean, they wanted to play around with what you could-- he deliberately wanted to play around with the hardware and figure out what the right solutions were and he was really, really worried that marketing was going to try and ship what he came up with, and he had thrown all kinds of stuff onto this particular-- it's called Yet Another Color Computer, a YACC computer, and for years I still had one in my garage and I finally got rid of it. But it let us play with a whole bunch of things, and one of the things that he let us play with is you could put different algorithms on it, and the-- and I'm trying remember if it was that computer or one of the other ones where we were playing with the anti-aliasing, because there were a number of different algorithms, and what we would do is you'd boot up the software and then look at the typefaces and try to determine what was going on with them in the early days on what worked, and there was a question of what readability and legibility. How well can somebody read a line of text and then how legible are the edges of the letter forms? And both of those things impact how-- well, legibility impacts how readable the typeface is, and so different aliasing formulas made things softer, but-- and other ones made them more crisp but didn't have as much, you know, but you could still see jaggies, so there was this whole question about what-- how many pixels per inch did you need on the screen, how well did the algorithm work with it, and I was simply trying to explore and try to figure out what made the most amount of sense.

Hsu: But you did work on designs for the color, for that color Macintosh?

Wagner: So what we worked on on that other set of slides about the color. So there was a large amount of controversy about now that we had this color Macintosh coming up-- and this was for the actual Mac II, the one that would actually be the one that shipped. Now that we had this thing coming along, how were we going to add color to the user interface? And there was one camp that said the only thing that had color in it for the user interface was the Apple logo, and there was another camp that said, "No, hell, no. We've got color. Let's use it all over the place," and at the time we had a-- this was in a group that was run by Joy Mountford and we had this woman named Kristina Hooper who had been hired in as like a researcher, and so there was this push to do this very methodically, and-- which was very much against how the Finder team operated. John Meyer was one of the Finder engineers at the time that I worked with a lot, and Erich Ringwald. People like that were really designers as much as they were software engineers, and they-- they would rather play with something. "Let's try it out. Let's put it in. Let's do this. Let's make each menu item at the top a different color. Let's make the menu bar a different color. Let's change the typefaces. Let's play with this." Well, the folks in-- this is before the human interface group divided out and there became more of a system software group and an advanced development group, and the push at that time was to be very methodical and very research-oriented, and so instead, what we ended up doing was we literally brainstormed all the different ways we thought we could add color to the user interface and came up with a version of the system software that supported each one of them, ran usability testing, and then wrote this, you know, did-- I had to do a whole literature review of color in the user interface and then I had to write a whole report about it and then it was presented out to everyone, and that wasn't actually my background. I was not somebody who had-- I had a college degree, but you presented a portfolio in your graphic design, you know, your senior project was your portfolio. It wasn't

writing a literature review and doing a paper. But that was where these folk came from and that was the language that they spoke, so that was what I ended up creating. So that set of slides was what we used to capture the results of what we had done and to present it to the various teams for a decision to be made, and ultimately, I think they ended up going out with something that was very, very conservative, and I seem to recall that that was the time period in which Steve was off at a different company.

Hsu: At NeXT, yeah.

Wagner: At NeXT, because when he came back, I felt like they finally kicked the doors off and did something interesting with color. Because I just felt like what they came up with at the time was overly conservative and not very interesting. But it was what it was.

Hsu: Yeah. So you've mentioned SIGCHI and, you know, doing literature reviews. So, you know, was your entry into sort of this human interface community, that began when you joined the human interface team?

Wagner: No.

Hsu: Or--

Wagner: Actually, it really started on the Lisa team.

Hsu: Oh, okay.

Wagner: There were things on the Lisa team where I started getting-- because I-- of sort of figuring out what Greg Stikeleather and Larry Tesler were doing and being exposed to that, there became more-- and also doing the icon work, because icons aren't logos, and one of the things I rapidly learned when you play with icons is the user has to be able to figure out what this thing is fairly rapidly, and it's not-- I call it the one-to-five rule. They can stumble around on an icon a couple times, but if they don't get it by the third or fourth time... You know, if they're still struggling with it by the fifth time they use it, the icon's not working. You want that midrange, by the third time they play with it it's like, "Okay, this is the thing I go for," and I got pulled into it originally from that angle, of that understanding the usability of the icons, and then getting pulled into it when I would work with the engineers on LisaDraw and LisaWrite and I was actually using the applications and I-- and they would ask me questions. Because I wasn't somebody who came from a software engineering background. They say, "What do you think this means?" Well, I'd say, "I have no bloody clue what this means." Or I'd walk into their office and say, "You just added this thing to the menu. What's it do, and why isn't it--" you know, "Why don't you bury it one?" Is it really something that's common? And so we would get in these discussions of what the flow was through the menus and the things that they offered out to the users, and that started to pull me in to the user interface area, and I always had a strong affinity to working on the Finder, what-- the Filer on the Lisa, but working on the Finder and working with the engineers, because it was sort of the skeleton of the system and making sure that that basic skeleton all worked in a way that was for the most part unobtrusive. It didn't interfere with what the user was trying to get done, and I'm trying to think. At the-- I mean, I worked on

helping to convert MacDraw over to the Macintosh from the Lisa. The One Button Installer was probably one of the early projects that I worked on that had a huge impact.

Hsu: That was for the Mac?

Wagner: And it was hilarious. So here they had this wonderful little Macintosh that really easy to use. Nobody could install the software on their own, <laughs> and the reason you couldn't install the software on your own is because the things that would come up would-- the dialogue that would come up was completely confusing. The language was confusing. What button they were supposed to press was confusing. I mean, the whole process was confusing. So Anne Nichol-- and this was the project that Anne Nichol kind of made me cut my teeth on usability testing, is I went in and worked with the engineer and we came up with this idea of we just want one button. I mean, because we had to give them options for ways to cancel the process or to back out of the process, another thing, but really what you wanted to have happen is when you stuck that disk into the Macintosh to install the system software, and it came up, you wanted one screen that said, "Are you ready to install your software?" or something, and a button that said, "Install," and you wanted people to just, you know, like, everything else was extraneous. You wanted that to be like in the front of what they needed to do. But what I had to learn from the user testing, in the first round of user testing, was they would put in the disk and then they would click the button and then there was a set of steps that they might have to go through, as I had to wait until the user basically <claps> hit a wall, and that's one of the hardest parts when you're doing usability testing is to know whether-- when to step in and when to let-- when is the user hit <claps> the wall and they're just-- they're completely frustrated and you need to say, "Okay, click this," or, "Do this," or, "We're going to stop here," or you're going to, you know, move it on to whatever stage comes next. But that was a highly successful project because we went from having massive numbers of phone calls to tech support to basically having very few at all, and I think the next major thing that happened to Apple after that was when Tom Gomoll and crew did the packaging study, which I wasn't involved in but it was hilariously good fun to watch all the outtakes from.

<laughter>

Wagner: I don't know if you heard about that one, but some point you have to get someone like Tom Gomoll and Kate Gomoll in here to talk about it. They literally took the boxes that came from the factory, put them all in a lab, and then videotaped users trying to open all the boxes and put their computer together. People cut their fingers on things. People couldn't get the plastic off of cables. I mean, it was horrid, and it resulted in a massive reset on the factory end in the packaging side to completely simplify things and really kicked Apple off in the direction of the, you know, much simpler design, and it was a brilliant project, and it was desperately needed, <laughs> so...

Hsu: So what was-- when was the first year that you went to CHI?

Wagner: I went to CHI when it was held in San Francisco, which was one of the very first years they had ever had that conference, and I think that was '84, and I didn't present at it. I'm trying to remember when the first time was I presented at it, and it somewhat correlated with-- so one of the things I did at Apple

was I taught a user interface design class as part of the Apple Education Department, and I won awards for that class. I worked-- and I don't remember the gal's name, but I worked with one of the gals there to develop it and I-- my management had asked me to do it because they wanted other people inside of Apple to understand about designing user interface, and I used HyperCard to teach the class, and I had exercises in it, having people doing simple things that they did. I turned that into a tutorial at CHI, both from the perspective of doing very simple user interface design and also from the perspective of showing people how we used HyperCard to teach something like this, and I taught that class in various forms with Bruce Tognazzini, with-- oh, few other people as well over the years, and so I started doing things where I was presenting tutorials at CHI and I don't think I really got as much into presenting papers until I went to Sun, but I would do different tutorials and I would, yeah, attend CHI and you'd meet your, you know, compatriots, and there were actually people out there who, you know, over the years was like suddenly there started to be programs where you could get a degree in human interface design, which, you know, didn't exist at all the first 10 or 15 years of my working in Silicon Valley. So that was pretty hilarious. But yes, CHI was probably more of an impact in what I did when I went to Sun.

Hsu: Is there anything else you want to talk about about the class that you designed?

Wagner: The class was a lot of fun. I think I still have some of the original-- I'll have to look and see if I still have any of the original. I have one of the later versions of the class, but I don't know if I still have the original one. It was very simple and it-- so we had written the human interface guidelines at that point, and we had some basic principles as part of the human interface guidelines, and so part of the class talked about the principles, and it explained the concept of what human interface design was, talked about the user, talked about some of the principles, and then I had some very simple exercises like going through and figuring out how to work on a dialogue, like giving them a really awful dialogue and saying, "How would you fix this?" or talking about the-- what I told you about icons, about how if you design an icon somebody needs-- it's not about figuring it out the very first time. It's, you know, because you have to-- with an icon you have to use it to figure out what the icon means, and I would get people in that class that were software engineers whose manager decided they needed to take the class.

<laughter>

Wagner: To marketing people, to, you know, documentation writers. People who were curious, people whose managers thought they needed it, and I got very good feedback. I taught it for-- I think I taught it for at least two years and got lots of wonderful feedback from everyone across the company about it, that it was really needed, because at that point human interface design was a concept people really didn't know anything about, and it was-- we were many times treated as second-class citizens, and-- because we weren't clearly documentation, we weren't clearly marketing, we weren't clearly software engineers. We were our own field, but we were a fairly new field. So people had to figure out where to put us in the process, and that this was a way of educating the broader community. So I had a lot of fun teaching it. I got Best Teacher of the Year, Most Creative Teacher of the Year awards out of it, and I don't know if Apple ever continued to teach that or not after I stopped. We might want to talk about the Apple/Microsoft lawsuit.

Hsu: Yes, that's actually a good idea. I was going to ask you about that. Why don't we do that now?

Wagner: So, I'm trying to remember what year all this happened. I know I was in the human interface group, and I don't remember what exactly I was doing at that point in time, but I'm pretty--Tognazzini--Tog was still our manager, and somebody was muttering about that HP had come out with a computer and it had icons, and they were worried that the icons-- somebody wandered by my office and said, "You ought to go take a look at this thing because they really look like things that you've done before." And I'm like, "Really?" So I took the initiative and tracked down somebody in marketing. It might have been Curtis Sasaki, but I don't remember, but I tracked down somebody in marketing and said, "I need to look at this thing," and they had one of them set up in a lab, and I went in and booted it up and wandered through the whole user interface and was appalled because it looked like someone had basically used my icons directly, and it wasn't just like Lisa icons. It was Macintosh icons. It looked like they had simply lifted them and put them on this other computer, like down to the point where it almost looked like the pixels were exactly the same for the trashcan, which is kind of a unique trashcan back then on the computer, so I'm like, "This is not right." So I went to management and told them what I found, and they said, "Okay, you need to write it up," and I said, "Okay." And at some point they sat me down with this Microsoft machine and had me look at it and do the same thing, like "Okay." Write it all up and didn't think much more about it, and then suddenly there's this announcement that Apple is suing Microsoft. I'm like, "Oh, great," and I'm proceeding to go along with whatever my usual work is, and one day an attorney calls me up and says he wants to go through all my files, and I was admittedly a bit of a packrat when it came to all my various files, and I had journals that I kept that I wrote down what I did every day so I could go back and keep track of what I needed to get done and what I had coming up, and they went through and put these tags, literal paper tags, "attorney-client privilege" or something in literally half of my file folders and wanted to have copies of everything, and my manager's like, "You want copies, you make copies." So periodically I would have this interaction with the attorney side of things, but it finally got to this point where they started deposing people, and I got introduced to this wonderful woman who was part of the legal team, and she was Steve Capps' wife. They ended up getting married. I can't remember her first name. It's escaping me.

Hsu: They were already married or they married later?

Wagner: If they weren't married, they were seriously dating at that point, and she was a crackup because she was stylish from head to toe, and Steve was the canonical white shirt, shorts. It was Steve, right? Another one who joined the Mac team who I really liked. He always just had a wonderful outlook on life. I think her first name was Lisa, but I'm not-- no, it wasn't Lisa. Anyway, she was my attorney. They hauled me into their office one day, and I spent a whole day being trained in how to be deposed, and then the next day I dressed all in black, I put my black cowboy boots on, and I went into the attorney's office, and the HP attorney and the Microsoft attorney deposed me, and the heart of what they wanted to ask me was had I ever seen a Xerox Star computer before. Now at this point I had seen one because somebody had arranged a demo, and I had actually gone to see one, but it was like a year and a half after I had ever done any icons. It was way after as far as I was concerned, but they wanted to go back through these journals I had and the paperwork I have and ask me questions about things that had happened like three years before or four years before, and I didn't always remember the context, so they taught me in the

deposition training that every time the HP attorney asked me something, I was supposed to pause, wait to see if my attorney would protest, then attempt to answer the question, and never to guess, if I didn't remember, just to say, "I don't remember," or "I don't know." But they kept trying to make out that I was influenced by other things, and I always thought it was kind of ironic because I didn't know what all these other things were that I would have been influenced by. I was a graphic designer who thought I was going to end up designing annual reports and logos, so to assume that I would be influenced by other computer technology assumed that I actually had some knowledge that other computer technology existed, and I didn't, so in some ways I was probably the perfect person to design icons because I didn't know what else was out there in the world at that point in time, so I just went from what I thought a piece of paper looked like. But I had this I think it was like a half-day deposition, and things progressed, and it was about the time when Tog had decided we needed to do this Starfire video. Apple had come out with some kind of crazy-- Was I at--? No I was at Apple. Apple had come out with some kind of crazy video. No, no, that was the Starfire. Scratch that. We were doing something though, and I have the picture in my head, and I can't remember exactly what it was, but I got told that they were getting close to picking a jury for the lawsuit, and the jury consultant had decided that I shouldn't have pink in my hair for the trial, and I remember looking cross-eyed at my attorney saying, "You want me to take the pink out of my hair to be a witness?" and I'd been informed that I was one of the key witnesses in the trial. I forget who else was a key witness. There were three or four of us that were considered key witnesses, and I always thought that was so funny. At that point I actually did still have, as I do today, I had pink in my hair, and they were insistent that I was going to have to remove the pink, and I was like, "I'm not sure I'm willing to do this." Fortunately, not too long after that we heard that they actually had somehow settled the lawsuit, and I never ended up having to do anything further with it except that when I left Apple I still had all these files that still had these attorney things in them, and they had me box them all up and drop them off at the Mariani building, and I have no idea whatever happened to them, but I suspect they all got shredded, which is a very sad thing. All that history gone unfortunately, so, yep, that was the lawsuit.

Hsu: You mentioned this video. Was that the Knowledge Navigator video?

Wagner: Yes, actually I got things slightly confused there in terms of timing. Starfire was something that Tognazzini did when we were at Sun, and it was in response to the Knowledge Navigator, so my brain got the timing switched up. The problem was that there was a collection of us that left Apple and went to Sun, and so sometimes it's hard for me to keep track.

Hsu: Okay. That's something that we can go back to. Did you do any work on the Apple IIGS?

Wagner: That was the Cortland computer, wasn't it? I mean, codename. That was the codename. There was one of them that I know I was asked to do something on, but I don't remember exactly if it was icons or what, but there was something I got asked to help with on one of those, and I don't remember a whole lot about it at this point.

Hsu: Okay. Because, yeah, I think the IIGS did have mouse control and icons and menus.

Wagner: Yeah, and I think Tognazzini did ask me to go take a look at it and work on it with the engineers, but I'm trying to remember what the specifics were because I can remember sitting there and working with them and talking to them about it, and I don't know if I created icons for them, but, yeah, they actually had an iconic user interface on it, so, yes, I think I probably did contribute some small amount to it.

Hsu: Did you ever have any run-ins or contact with Jean-Louis Gassée?

Wagner: Oh, yes. Jean-Louis Gassée. I had to do icons of him. I did cross paths with him as part of being in system software and doing the work that we did. I don't remember anything-- I remember going to all-hands [meetings] and asking him questions, and I remember having conversations with him about simple things. I think that was the same period of time that Eric Ringwald was-- we were working on the Switcher.

Hsu: Which became the MultiFinder?

Wagner: Yes, so we were trying to figure out this jump between having a single-processing Mac and having a multiprocessing system, which of course was what the Lisa was, but never would they resurrect that, but in between those two points was, "Is there something we can do in between?" and so Eric had come out with this idea of having four memory spaces and basically having four versions of the OS running that he called the Switcher, and you could move between them. Well, that was where the flaming icon came from, so one night very late at night I'm working with him, and we were talking about the user interface and what's happening with it, and he's showing me what he's got done. And like, "What happens if one of the instances of the Macintosh crashes? We need some way to tell the user what's going on." And he's explaining this all to me, and he's like, "I really wish we had some animation of the thing going up in flames," so I went back to my office, created four or five flames that you could put together in an animated gif so you'd have a Macintosh icon, and then behind it you had these flames. It went like this. Marketing shot that down so fast. They did not like it. And it was gorgeous. It looked beautiful, and it was what had happened. This Macintosh instance just died. They wouldn't let us ship it. But Jean-Louis Gassée, I think he did actually see that, and he thought it was funny. That was the year we had the Christmas party up at the Academy of Sciences in the city, and they took over the entire place, and they turned the shark tank into a sushi bar, which was hilarious, and they had all these talking head video monitors all over, and they wanted icons of Jean-Louis Gassée to use in various things all over the place, and so I got asked to do some crazy graphics for some of that kind of stuff, but that's kind of what I remember. I remember him as having a good time when he was there and that he had lots of crazy ideas, which may or may not have been good for the corporation as a whole, but I enjoyed working with him so...

Hsu: Did you get to work on System 7 at any point?

Wagner: Oh, yes. System 7, I was the main human interface designer for the Finder for System 7, and System 7 was the one where Larry Kenyon-- Larry Kenyon ran these big design meetings, and I was the lone human interface person in the room, and I took visual notes. I was a graphic note taker, always have been a graphic note taker, so I would take all these graphic notes during the meeting, and we came

up with several interesting ideas in the meeting that later went into patents. One of them was the pop-up help. System 7 is the one where then I would go back to my office, and I would use HyperCard, and I would come up with a very simple prototype to capture what they were talking about, and it wasn't to try and finalize the user interface as much as it was like, "Is this what we're all talking about?", more of a validation of the design concept, and I put them all into one HyperCard stack, and then over time I refined them, and I created a human interface specification to go along with it, and out of those meetings we now had this HyperCard stack, and the HyperCard stack made its rounds through system software and marketing and etc., so people could see what we were talking about doing, and all the major user interface changes that we were going to do were all in that stack, and the main one I remember is the pop-up help because I was the one who said, "We need to be filing patents on some of these things," and that was one of the ones that-- drag and drop of text although that came out later. Sorry. That was part of Taligent, the Pink team, when we were doing that, but there were various things in the System 7 where it's like, "No, these things could be patented. Let's pull them out and do them," so, yes, I did work on that. I think John Meyer was one of the main-- John and Larry were the two main engineers that worked on it, and they were the two main engineers that I worked with on it as well, and I don't remember if Eric was still there at that point or if he had moved on.

Hsu: Besides balloon help, what were the other patents?

Wagner: I have to go think. Let me look them up on my computer, and I'll remind myself of what all-- because I know there's one for drag and drop of text. There's the balloon help one. I'm trying to remember what other Apple ones I have because I have a bunch at Sun, but, yeah, I'd have to look them up to jog my memory, so... which isn't that difficult, but we can take a break at some point. Maybe I'll jog my memory.

Hsu: You mentioned that you had an exhibit at the Guggenheim that--

Wagner: Oh, yes. So part of the advanced development-- or, I'm trying to think if this was part of the advanced-- this wasn't part of the advanced development group. There was an arm of Apple that worked with outside groups that were doing interesting things with Macintosh systems. I don't remember what the name of that organization outside of Apple was, but they gave out grants for various interesting things, and so they had this group that had come to them. The Guggenheim Museum wanted to do a retrospective on Josef Albers, who was a major color theorist, and what they wanted to have was an interactive exhibit that somebody could sit at, and they could do some of the color exercises, and Josef Albers had this interesting exercise where he would put a color onto neutral gray, and you could put it on different-colored backgrounds, and it would change what the color looked like optically or visually, and so they wanted to play with some of these different exercises that he-- it was the way he taught color theory in his classes, and Jodi Slater, I think, was the name of the outside engineer, who was based in New York, who wrote the actual program, and I became the main contact outside of engineering for them. So at some point I actually flew out to New York and actually worked with her on and off for several days where she actually had a user interface put together, and I coached her on how to tune up the user interface. I got to see where they were going to set it up inside of the Guggenheim, and we went back and forth several times tuning this thing, and then I was invited to the opening at the Guggenheim, and

the day before I had been at an off-site down at Pajaro Dunes. It was a very hilarious off-site. Software Engineering was there, Human Interface Design was there, and I forget who else was there, and Don Norman had come in. Don Norman had come in, and anyways they were one of these off-sites where they're supposed to be teaching you all kinds of crazy things and changing your perspective, and that night--

Hsu: Was Don Norman working with Apple or for Apple at that point or...?

Wagner: I think it was Don Norman. Actually, it may not have been Don Norman. Let me think about that one for a minute. But it was a consultant like Don Norman who came in. I'll have to think on that one because I know he worked with Sun, and I can't remember if he came in to work on that because there was someone who came in on that one that was from outside. Anyways, at the end of the day we had dinner, and we all trooped out on the beach to go have a bonfire, and John Meyer was in front of me, and he's six foot something or other, like six foot four or three, and he stepped over the pile of wood, and I didn't realize it was there and jammed my left big toe into this pile of wood and broke my toe, and Tog had to drive me to the emergency room to figure out what had happened, and I ended up in a cast. I had to fly to New York City the next day for the opening at the Guggenheim, so there I am at the Guggenheim on crutches in a black velvet cocktail dress, and the Guggenheim is this big, long spiral that goes up, and it was packed. It was jam packed, so it was one of the more hilarious experiences of my life was trying to deal with all of that, and I probably should have just stayed home, but I would have missed being there, but the Albers exhibit was very well received, and the interactive exhibit that Jodi came up with was very well received, and it was one station. It was about halfway up the loops that you went, and people seemed to really like it. It was one of the first things I was involved in that was an interactive museum exhibit like that, and I thought it was very cool.

Hsu: And you did it with HyperCard and CD-ROMs?

Wagner: I don't know if she did that one with HyperCard and CD-ROM. She may have. I think she may have just programmed it herself. She was not a HyperCard programmer. She was a software engineer, and I think she set it up that way, but there was some way in which she set it up so that the computer could be rebooted when she wasn't there, like if something happened they could restart it, and it would go back to a neutral point, and they could restart the program. Yeah, I don't remember it being HyperCard, but I could be wrong.

Hsu: So you talked about joining the Pink project at some point.

Wagner: Yes, so I had been working on System 7 and working with people like Eric. There had been all this discussion about doing multitasking, trying to move to a multitasking system, and there became this movement towards having what they called the Blue team and the Pink team, and I opted to go join the Pink team along with Frank Ludolph and a couple other folks to see where they were going to go with that, and it was an interesting project because they had grand schemes of what they were going to come up with, and they wanted to come up with a whole different user interface, and they hired in an interesting collection of people from various places, whose names I probably don't all remember, yet at the same

time there wasn't really a feel that the engineers had a lot of respect for the human interface designers, so we would come up with ideas and play with things, but there wasn't a real-- I don't know how to describe it. It was just like the flow of energy back and forth just didn't feel like it went as smoothly or as creatively as it did in other places I worked at Apple, but initially it was definitely a fun project, but it got to a place where they were starting to bring in IBM and starting to have questions about whether or not this project was going where they wanted it to go, and they kept having me shift gears. They at one point decided they didn't want me to do any more design work. They only wanted me to do usability work, so I started creating interesting ways of doing usability work. What I wanted to have was conversations with potential users about how they would use a computer to see if that could come up with alternate ways. I had been watching other people in CHI, and what I wanted to have was conversations as opposed to usability tasks, so I came up with this idea of getting a big like map board, having little Post-it notes that had little pictures on them and words on them, spreading them all out all over it, giving them another board that was clean, and then giving them a task like, "Okay. Assume this is your computer screen and you need to ship a whole bunch of presents for Christmas and you don't have a whole lot of time. How would you want to do it on your computer? We're going to have you do it on the computer. How do you want to do that? What kinds of tools do you need to have on-hand to do that?" and anything that they felt that was missing, I would draw on a pad of paper and give them a little sheet of paper. And while they were doing these interesting tasks that I came up with, I would have this kind of conversation where I'd say to them, "Tell me more about that," or "Can you give me some insight into what you're doing here?" but I tried to really be very conscious of the flow of what the person was doing so I didn't interrupt their train of thought, but if they paused or if there seemed like there was a moment I could step in... Because what I was trying to do was in some ways have a usability conversation that was really advanced development, if you will. I wanted to see what they would come up with if I put them in an environment where they had to create something on their own. Out of some of that came this idea of people, places, and things that later morphed into other things that Taligent was doing, but I did a whole series of usability studies where I gave them crazy tasks like this and turned them loose and just tried to see what people would come up with, and then I would write up a report from it and share it with the rest of the engineers, and it was my way of kind of creatively having a hand in the design, but I wasn't actually designing. The people who were coming in as our test subjects were actually doing the design work, and this is also probably past the time when people like Gitta Salomon were doing things like the work she did for Piles, the user interface idea of you could just pile a bunch of stuff on your desktop. It came out of that same kind of thinking, though, because the idea was to try to get a better insight into how people worked as opposed to coming up with something from the computer end, so it was a lot of fun, and I actually took that methodology and used it at other places, at Sun and other things when we were trying to explore and give the users more freedom on something, but what ended up happening was the work environment deteriorated in my opinion, and I wasn't happy working there. Bob Glass at around the time, I think about two or three weeks before-- Let me back up. So we knew that the Pink team was headed towards becoming this thing called Taligent.

Hsu: And getting spun out.

Wagner: And it was going to be this Apple/IBM thing, and they had told us that they were likely going to do something where they were going to have to lay us off from Apple in one office, and then you walk to

the next office and they give you the hiring thing for Taligent. And I don't remember if it was two or four weeks before all this was coming down, but Bob Glass had left Apple and had gone to Sun, and when he went to Sun they basically have him open six reqs [requisitions] and said, "We want you to form a human interface team," and that was happening at the same time at which all this Taligent stuff was happening. Well, I was not a happy camper with any of what was going on, and so I contacted Bob, and we had several conversations, and I said, "Make me an offer. I'm going to walk in. I'll go see what the Taligent offer is," and so about the time I got the Taligent offer, and they expected me to sit in the office and sign on the dotted line, and I said, "Thank you. I'm going to take it with me and think about it, and I'll let you know," and I walked out of the office, and Bob gave me a much better offer from Sun. I really didn't know what I was getting into, but Bob Glass really believed in me as a human interface designer and thought I did really great work, so I decided I wasn't going to accept the offer from Taligent, and I accepted the offer from Sun, and went off to the joys of Unix, which was a completely different world. And walked right into interesting politics at the same time. They already had had a user interface team, but it was a team of folks who all had PhDs, didn't believe anyone could do the work unless they had a PhD for the most part, and they all immediately took a Unix class as soon as they started at the company. Well this was completely 180 from how Bob wanted to run things. The reason they hired Bob in was they wanted to basically take the Sun Microsystems office environment and make it something that people in an office could use. To date this had really been something that only engineers had been using. They wanted to make it something that ultimately somebody in an office could actually operate. We talked about the user interface giving us job tenure because it was really quite awful, so instead of trundling us off to a Unix class, Bob's response to this was set up a video camera over your shoulder and try to use the system. You have a week to use it, five days, and then I want a written report about what you liked and didn't like and what worked and what didn't work, basically do what we would have called a heuristic evaluation of it from a human interface perspective, and I did so many things wrong. I didn't realize that every time you clicked an icon it started a process, and because the system was so slow and there was no response feedback that you actually had started a process, I would end up with 16 processes of the paint application running, and then I would overload the system, and the engineers would have to come in, and I'd say, "Well, why don't you just reboot it?" "We never reboot Unix systems." It was a hilarious two weeks trying to learn out how to use-- but I had no training. It was literally he sat me in an office and said, "Try to use it," and it was horrifying, but I learned an enormous amount about what somebody's perspective was going to be walking in and trying to use this thing for the first time, so from there I dove into the windows system at that point.

Hsu: I want to go back slightly. So you mentioned you weren't happy with the Pink, the Taligent project. What were the reasons why you weren't happy?

Wagner: A lot of it was interpersonal interactions with other people on the team. There was a certain amount of frustration. I didn't really actually feel the spark of innovation. Looking back it was like it didn't feel like we really were sparking and being as creative as we could have been, and I also felt like there were some of the engineers that we were trying to deal with that tended to make me feel like they wanted to shut you down as opposed to brainstorm and be creative with. I always work better on teams where you can bounce ideas back and forth, and I really didn't feel like that was welcome in many ways there,

and then in the latter part of the project I started to develop health issues. So Apple had moved us into a building that was off campus and I later discovered was--

Hsu: At Moffett Field?

Wagner: Yes, next door to a soy sauce factory. We would come in every morning and literally wipe black off the screens of our computers. You could literally wipe a tissue, and there would be black on your computer screen. I started coming into work feeling fine, and within an hour I would have a pounding headache, and the headache would go away when I went home. Well, it turns out that I have severe mold allergies, and soy sauce is created with a mold called aspergillus, so I had this whole period of time where my health was going really wacko, and my doctor said it's very clearly an allergic reaction, and he sent me home, and I had to track down through three or four allergists until I found one who actually was an expert on dealing with mold, and he said, "No, you need to stay out of the building and work from home if possible." Well, this didn't go over well with the management I had. Mark Vickers was my manager at the time, and he actually wrote me a review that claimed that I was psychotic. It can be really difficult for people to understand odd health issues like this, but for whatever reason he was very unsupportive about the health issues. They ended up moving us back out of that building and into a different set of buildings, and I continued to have health issues but continued to also come into work and do my work, and the health issues got better, but it threw my system off enough that I continued to have some health issues, and it was like that added to the not-creative environment, and then not feeling-- we finally moved into our own building, and I wasn't having issues with the building, but it just felt like the whole environment was not supportive and not open-minded enough. It was almost like we were being demanded to create some kind of new, wild, totally-never-seen-before user interface but not feeling like the environment was creative enough to allow that to happen, at least not for me. It may have been perfectly fine for other people, but I just didn't feel like the mix was working for me. Those two things were the reasons I think I basically said, "No, I'm out of here. I need to move on." When I start to feel like my creativity is shutting down, that's usually a clear sign that I need to go somewhere else.

Hsu: So going back to Sun then, you mentioned the politics. Did we already cover that or is there more?

Wagner: Well, the politics of the two user interface groups, it made for some challenges initially in getting started. I didn't worry so much about the larger corporate politics, but the initial politics of dealing with these folks who had come from the original team, and they were really stunned by-- we were all interviewed before we came in, and then Bob made the final decision about, Dr. Bob as we used to call him, made the final decision about who got hired, and I think they were stunned by the fact that he hired me because I didn't have a degree in user interface design, but I had years and years and years of on-the-job training, and I had helped create Lisa and Macintosh things like System 7, so I had a track record that was very solid. They had no one on their team who actually had track records when they were hired, had no track records of shipping products. They had shipped products once they got to Sun obviously, so it was a real shift for all of them, and several of them had a really hard time dealing with it and ultimately ended up in other parts of the company or just left and went somewhere else. So when I mentioned before about being at Apple when I did the color work where they were very formal and they wanted

literature reviews and etc., there was a part of that team that was very formal like that. It was almost more like doing human factors than it was about doing design work.

Hsu: At Sun?

Wagner: Yeah, there was a part of that team that was like that, and really what Sun was looking for was designers, people who had worked with the engineers, and the engineers at Sun-- it was kind of odd. The engineers at Apple, you designed with them, and it could be difficult. They might leave you out of the loop, or they might pull an all-nighter, and you come in the next morning. The user interface is completely different than what you expected, but you tended to design with them, and while you might be treated as a second-class citizen, it was more because they were both doing software design and software engineering. At Sun they had no concept about how to integrate human interface design. They had to learn what it was, and then they had to learn how to integrate us into the process. In some areas there was, but in a lot of areas there was not the same sense of having software design and software engineering in the same skill set, so it was a very different environment, and ultimately I worked in the windowing department, and then I worked on some object-oriented projects that were going on, and then I ultimately ended up working on Java with James Gosling and Herb Jellinek and focusing mostly on the consumer Java version.

Hsu: Could you talk more first about the windowing system work?

Wagner: So windowing system work, one of the things I helped them add in was a proper drag and drop user interface, and they had to build the subsystem, and then they had to actually figure out how to do the correct rules for doing it, and that was one of the papers that I actually presented at CHI. I worked on it with another human interface designer, Maria Capuciatti and then the engineer was Robert O'Brien and the paper was called something like, "Drag Me, Drop Me..." It was "Drag Me, Drop Me, Something," but it had this very catchy title to it, and we presented at CHI, and it was interesting because CHI had another whole arm that was very formal, and then they had this whole crew of us that came in, and we would present papers on actual products that we were shipping and the kinds of things that we did, so I did that. I helped redesign color pickers. We helped clean up icons. There were so many different things that we ended up getting involved in. I'd have to actually go back and look at it, but a lot of it was, once again, sort of system software related things that I worked on. I did do some applications here and there, but a lot of it was the actual, "Let's get this basic system working in a better way," and getting them to have a set of rules for how they wrote dialogue messages and having icons in the dialogue and having like, "There's three classifications of icons. This is when you use them," and bringing in documentation so the documentation was wired into that, so when they're looking through a system if they don't see something that aligns with that that they're coming back to both engineering and us and saying, "Okay, we have a problem here," and changing the language. They would literally say, "Unix error blah" right? And it's like, "No, you need to tell me what 'Unix error blah,' means, and it's like getting them to actually write error messages and then to write them in English, right? So it felt like pulling them up from the swamp in some ways, right? There was a lot of just basic training in terms of, "Let's make this useable," and one of the things was also educating them about who their user was because up to that date their user was other Unix users, right? So they had been writing for themselves in many ways, and so we had to create

storyboards and what we would call personas and different user profiles and things like this that we could use to say, "No, okay, the person who's doing this is somebody who sits at a desk from eight to five, and they're doing this kind of project, and they're this many years old, and this is their background. They don't know what Unix is." But you had to give them a new picture in their head so that they could start to turn some of this stuff around, and I was also learning how to deal with a set of engineers who really had absolutely no context of who their user was and in many cases didn't want to shift. There were a lot of old-style engineers there at Sun and still are or are probably buried in Oracle somewhere.

Hsu: What was the windows system called?

Wagner: Alright, I have to think about this for a minute because it wasn't the Common Desktop Environment because that came later. I worked on that project. I don't know if it had a name.

Hsu: So this was not the NeWS system that Gosling worked on. Was that different?

Wagner: Well, this was way before Java, and it's before the Common Desktop Environment, and it's before what we call DOE the Desktop Object-oriented Environment. It was what was running on Unix in 1992.

Hsu: Okay. '92 was the year that you joined Sun?

Wagner: That's the year I joined was 1992, and it was the basic windowing system that was running on it at that point in time, and it went through several iterations of other things. The Common Desktop Environment was this thing that they did with HP and IBM. I don't remember exactly who, but it was a collaboration between several companies. Sun was very into doing standards in various forms, and so they would come up with these crazy ideas of doing things where, "We're going to do this in collaboration with so-and-so. We'll come up with these standards," and I always felt like they were designed by collaboration and they never looked or ran the way they were supposed to.

Hsu: So you mentioned then you worked on an object-oriented system prior to Java. So that was the D-O-E DOE that you mentioned?

Wagner: I worked mostly on helping them do demos. It was--

Hsu: What was that project, could you describe it?

Wagner: It was an attempt to use an early version of object-oriented programming to replace some of the windowing system and other related things in the Sun. It was supposed to be a new operating user environment. Amy Pearl was the manager that I worked with on that one, and it's funny. I remember working on a NEC system, that they had brought in a NEC system, and I also had a Sun system, and I remember I had like two computers in my office, and I was using both of them to create the demo that we were going to try and run.

Hsu: So was it using ideas from the NEC system?

Wagner: Sorry, say that again.

Hsu: Was the DOE system using ideas from the NEC system?

Wagner: I don't know if it was using ideas as much as it might have been using the underlying operating system to run the object-oriented programming.

Hsu: Oh, really.

Wagner: But I don't remember. Amy Pearl and crew would remember more of the details of--

Hsu: So it was one of the Sun/NEC collaborations?

Wagner: Could have been. I only got called in to do the demo, and the project was still looking for funding. It was very early stages. Rich Green was running it if I remember correctly, and I think they were going to do a demo, and then they were going to decide whether or not they were going to go forward with it, and my recollection is that somewhere in there is when the Java stuff started to hit, and Java basically overtook things, and I got hired onto the Java team. Amy wanted to hire me onto the Java team as part of the HotJava Browser, so that was the team that I originally got hired into.

Hsu: What year was that?

Wagner: I can't remember. It was after James had presented at the TED conference.

Hsu: So '95? Does that--

Wagner: That sounds about right. That sounds about right. Somewhere right in there, and the offices were still in Downtown Palo Alto. It was very funny. They were only in there for, like, another two months before we moved down to the other building in Mariani, but I had to move up to Palo Alto so I could be part of the move to the Mariani building because they were turning them into JavaSoft, so they were going to be their own company, so there was this funny thing where I had to move up there, but we were only in the building for, like, another month and a half or two months or something, and then we moved down to the Mariani building, and I was originally working primarily with Herb Jelinek, and there was one other engineer on the team, who was supposed to be the lead engineer, and his social skills left a lot to be desired, and he was not mature enough to be a manager, to really lead a team, and Amy was having her hands full trying to train him, but we filed some patents from that one. I remember Herb and I filing-- we realized that there was this way that we could actually determine what was going on in a Java app inside of the browser, and we could actually build dialogue messages on the fly, and there was this whole mechanism behind it because I started asking all these questions of like, "Well, is there a way we can do this?" Or, like, when you're browsing the internet there were all these things that could go wrong. "Well, is there some way we can determine what's going on and then automatically create the right thing on the

fly,” and Herb’s like, “Oh, yeah. I could do this,” and off we’d go, and there’d be another patent. That was a fun project to work on. We did a lot of little crazy things with the HotJava Browser, and then eventually somewhere in there they decided they were going to create a consumer Java, and they pulled me off of the browser and Herb off of it, and James and Herb and I, and I was kind of more just to bring in the human interface element to it, but we started brainstorming-- and Curtis Sasaki was also part of that-- and started brainstorming about, “Well, what could we do?” and we all ended up-- I’m sorry. No, James flew to Japan I remember at one point to have conversations with people, but we would have brainstorming sessions about-- James, I remember, was in the corner office, and there was Steve, who was still working on the HotJava Browser and then Herb and then me, and Curtis would come down. We’d have these brainstorming conversations about, “Well, what about this?” or “What about that?” or “We talked to this company, and they have these crazy things,” and I was trying to do storyboards and just capture ideas and try to design things, and they were trying to think about, “Well, what would be the initial spec?” and it was like this evolving conversation that just kept shifting and moving and shifting and moving until we had something we felt was solid enough we could present it as the consumer Java, so very early on. I think Herb ended up writing most of that initial API spec.

Hsu: So you mentioned that the JavaSoft building was on Mariani Avenue.

Wagner: It was one of the old Apple buildings.

Hsu: Which is one of the old Apple buildings. Had it been actually a Taligent building at one point?

Wagner: Yes, and in fact--

Hsu: Pretty ironic.

Wagner: It was very ironic. We came in and saged the building. We actually took sage and went in and cleared the energy in the building, and they were renovating the building at one point, and there were these weird little hallways and things, and so Tim Lindholm, I remember this, and James, and I think Herb was-- I forget who all was there, but there was a curved hallway, and then on the other side of the curved hallway was like a straight wall, so there was this one little funny triangular piece that went up in the wall that was blank, so we stuffed things in there as part of like a time thing. Although I don’t know exactly when I did it but it was after we were all in the building, but at the end of one of the hallways I grabbed a couple people and an overhead projector, and I-- by this point James had introduced me to all the Duke artwork and said he wanted me to be like one of the people who held all the Duke artwork, and there was this flat file, this big, heavy, wooden, white flat file that Tim Lindholm and him had collected all the original artwork of all the Duke stuff in from-- I’ll remember in a second what the guy’s name was. Palrang, I think, was his last name, the man who originally came up with the Duke concept. Well, I took some of the Dukes out of it. I think it was the one with the surfboard. Down the end of one of the hallways in Mariani we projected Duke up onto the wall, and I went and bought a bunch of latex paint, and we painted Duke on the wall and didn’t ask permission, didn’t tell anyone we were doing it. I just gathered up a few people, and we went and painted Duke on the wall, and I think we painted Duke in a couple places, but that

particular one, I was just told a few weeks ago was still there, and they were finally going to renovate the building and paint over it.

Hsu: Really?

Wagner: Yes, I thought that was just--

Hsu: It's like an Apple building now again <inaudible 02:21:45>.

Wagner: I know.

Hsu: They just kept it.

Wagner: And it was still on the wall, which I thought was wild, but, yeah, somebody posted on Facebook that it had apparently still been there. I would have thought it would have been painted over many times by now, but we painted three of them in the building, and apparently that one actually lasted for the longest time. The crazy things that you end up doing like that.

Hsu: Earlier you mentioned the Starfire project. Could you talk about that?

Wagner: Yes, so that was fairly early on in my Apple or, sorry, my Sun days. Tognazzini got hired in as a distinguished engineer, and he felt that Sun really needed to have a response to something like Knowledge Navigator and needed to really look out into the future, and Bob Glass also supported this whole idea that we needed some kind of video that was forward thinking that put us way out there. And so Tog was the main lead on this, and they wrote up a script. We did a lot of brainstorming sessions to come up with some ideas around it, and then there was one evening where we apparently rented part of the San Jose Airport. I think it was the San Jose Airport, one little terminal area, and they had all the video equipment. It was one small segment of the Starfire video, and they did us all up in makeup and clothes and etc., and we all had different parts to play, and some chunk of the videoing was done. I think part of it made it into the Starfire video. Somewhere I think I have that video, somewhere or other. I know it got digitized at one point, but he was the main person who pushed on that, and I don't know how successful a video it was. It did get shown in a number of places. There was the monthly user interface meetings up at PARC that happened, and I know it got shown there. It got shown at CHI. It got shown all the way around Sun. Periodically it resurfaces, and it was really-- if I remember correctly, there were things in it like, I'm trying to think of the movie that that was in, but things in it where there were walls and desks that shifted, desks that shifted up into walls and clear surfaces. There were monitors as well as things you could write on and some of those kinds of concepts, and some of these are all things we've seen in movies now.

Hsu: Like "Minority Report" type stuff or...?

Wagner: None of it was actual prototype. This was all very conceptual.

Hsu: Oh, I mean like the movie “Minority Report.”

Wagner: Yeah, that kind of thing. That’s the one I was thinking of, and I think some of the things that Microsoft had out of their research lab with some of the crazy tables they were doing are inklings of the kind of things.

Hsu: Oh, so the touch stuff. The touch, okay.

Wagner: Yeah, it was the touch stuff, and I also just remember they were moving things around and talking to things like Siri and things like that, all integrated. I feel like I should go back and watch it for homework.

Hsu: So what else was in that video?

Wagner: I don’t remember at this point. When I move on to the next thing I tend to just set the old stuff with like it’s done, and I’m off to the new things. I’m a visual rememberer, so if I look at the name of a patent or I look at a storyboard or I look at something, then I’ll go, “Oh,” and then it all flips back into context, so I’d have to jog my memory that way. It’s in there. I just don’t always keep the timeline straight in my head.

Hsu: So could you talk more about your work on the Duke cartoon character?

Wagner: On Duke? Oh, on Duke?

Hsu: Yeah.

Wagner: So when I came into the Java project and was introduced to this whole flat file and I went through it, there was all kinds of crazy stuff in there. Oh, and that’s one of the things I want to bring to you, too. Joe Palrang, that was the name of the man who originally did it. There were off-the-cuff drawings. There were animations that each one was on its own frame. This was all from the TV environment that they were originally going to do. The language was originally called Oak, and they were originally going to put it all in this crazy environment that they were doing. A lot of it was hand-drawn, and it was all in those drawers, and there were all kinds of things in the drawers, and in the meantime James would periodically go off and create another version of a 3D Duke, and people would come in and ask me to do things with the Duke, so there were a lot of Dukes that I ended up digitizing so that the team could use them in various formats. There was a set of coasters that they did at JavaOne one year where I gave them a set of Dukes, and they turned them into these really nice little plastic coasters. There were T-shirts that we did. For different JavaOnes, depending on what was going, I might have an outside artist do the work, and I would give them several versions of Duke as inspiration. Then I would say, “Create something that looks like this,” and I would usually have Herb or James or Curtis look at the final artwork because they knew the original artist, and they always had a good eye for, “That doesn’t feel Duke-ish enough.” There was also the Duke comic book. So I think it was JavaOne-- No, wait a minute. JavaOne '99 was when we did the PageWriter thingy on. I think it might have been one of the JavaOnes before

that. We came up with this crazy idea of doing a comic book and worked with marketing and James and Herb and various people, Tim Lindholm, and came up with this script, and I think it was the same year that there was a very well-known-- so there was a big hacker, but there's this one particular well-known engineer out in the world who tracks down hackers, and it's like-- I forget what his name was, but the storyline in it was that somebody was out hacking something on the internet, and they were using Duke's persona and turning him into a bad guy, and so they hauled in this other third-party person, and there's this whole wild adventure that they go on, and Duke is a surfer as well, so it has Duke surfing in there, and it has all this crazy stuff, and it has this whole adventure of Duke tracking down his evil alter ego, and we ended up hiring a comic book designer in New York City. I gave him a ton of original scans and things of stuff. I made him copies of all kinds of stuff to use as source material, and then he drew the comic book out for us, and the script was something that went around and went around and went around between the set of us who were doing it, and I kind of helped drive it so that we had a final script, we had all this source material, and then the marketing person I was working with made sure it all got sent off to the comic book artist and then off to the printer, and they handed this out at whatever year JavaOne that was, and I have one, so I'll have to make sure you get a copy of it, and it's just hilarious. It was great fun. Our plan was to do a comic book every year, but it only got done once, but it would have been fun to come back and do it, and we also made noises about Duke having a girlfriend as well. That was a very fun project to do. But I really enjoyed-- I dressed up as Duke, well as a Dukette one year for JavaOne. I had, like, a red nose and a black hat, crazy things. Halloween costumes were always a good part of working for any of these companies, but Duke was definitely one of the cra-- I'm quite certain I have a CD-ROM that has a copy of everything that I did on Duke. James was kind of adamant that we all at least make something like that and keep it with us because he was never quite sure what was going to happen to all the original artwork because Tim went off to Google, and then James ended up leaving, and I don't know whatever happened to all the original artwork, so it would have been awesome if it was donated here.

Hsu: Yeah, definitely. What else was involved in splitting Java between consumer and enterprise?

Wagner: So, it's kind of like what ended up happening was they had the desktop version, which was the original Java, and marketing and other folks were like, "Okay, what can we do with this?" and there was a whole contingent that said, "Let's go see what we can do in the enterprise world." They had ideas. And then there was this contingent with Curtis and James who's like, "No, let's go see what we can do about putting it on consumer projects," and at the same time later on we discovered that there were people out there. Like, there was the KVM. There were people out there in the world that were playing with putting Java onto little dinky devices and playing with the technology, and so we didn't really know where it was going to go. Actually, JavaOne '99, I think, is the same one where we actually talked a lot about consumer Java, and I worked for, was it Tony Hillman?-- I think was his name, was our manager, and we had this small team of folks, and they came up with a bunch of different user interfaces that we thought we could power with Java as a consumer device. We had what we called the touchable user interface, which was more like a pad, sort of like an iPad-sized thing, and we had like a kid version of it in all kinds of crazy colors. We had a cell phone prototype that we created based on the cell phones of that period, which were kind of hilarious, and we had an integrated mailbox and a bunch of things we did in it that we filed patents on that are later now part of most cell phones, and what did we do? We did cell phone. We

did the touchable. There was a TV-based prototype, and we had all these crazy prototypes, and we had the PageWriter, and we did a version of Java that ran on the Palm, so we had all these ideas of different kinds of devices that you could put the Java technology on and how it could be touch-based, it could be cell phone-based where we were assuming it was not touch-based because basically smartphones weren't out at that point in time. But we had the Palm, which had a stylus, so it was fun. The Palm one actually worked quite well. The PageWriter was more of putting a user interface over the Java version that they had running on it. In fact, some of the other ones were just simply prototypes.

Hsu: Okay. So the PageWriter was the Motorola PageWriter?

Wagner: Yes, the Motorola PageWriter, yeah.

Hsu: So that was one where Sun collaborated with Motorola or...?

Wagner: Yes, yes. We'd collaborated directly with them with the team in Austin, I believe they were in. It was a team in Austin, and I actually flew down there at one point, and I had a contractor, Kate [Withey], who did the actual graphics for me because I was also trying to get all these other prototypes done that I was responsible for, so I gave her, once again, source material, and what we did was we put a user interface onto what they had on the PageWriter, and they were running I think it was a version of the KVM and Java on top of it, and then what we did is we had a home screen, a settings screen, and something else where you had like a main screen, and then we changed out a bunch of the other icons. We didn't actually change the mechanism of how they did the user interface so much as we-- because they had something in place-- as we put a different graphics on top of it because we didn't have enough time to really do it from the ground up, but it was running Java, and we'd hoped to hand that out to everyone at the conference.

Hsu: Java--

Wagner: Then have everyone to have a PageWriter, but Motorola management said that was not going to happen.

Hsu: At JavaOne?

Wagner: It was, yes, at JavaOne.

Hsu: What year?

Wagner: That would have been Java One '99.

Hsu: '99. Okay. So this would have replaced the existing Motorola PageWriter user interface with--?

Wagner: No, this was really about putting Java on a PageWriter as an option for where they might go in terms of programming with it. The user interface we came up with was strictly for the conference, and in

fact it had an exhibit list. It had a whole little application where you could look up exhibitors and figure out where they were at and what the schedule was, and I think we did something similar on the Palm where you could actually-- I'm trying to remember if they handed out the Palm units, but the idea was to have, like, all the conference information on the device that we handed out. I may have ended up handing out the Palms. Curtis Sasaki really wanted to hand out a device with the consumer Java stuff on it.

Hsu: Right. Okay, but then this would lead to in the future there would be more sort of Java applications running on the PageWriter or the Palm or other things?

Wagner: Yes.

Hsu: And so they would get installed on the device, and so you would only load Java if you were running these apps?

Wagner: Well, this was always an interesting question, and there was always a certain amount of pushback in both directions. You could have taken Java and had it be everything, not just the applications, but you could have done the whole user interface, but Sun management tended to back off every time we went there because that would have meant we needed to invest in a device, and so there was this constant funny dynamic that happened all the time around working with people because they didn't want to invest in doing a device. We were just--

Hsu: Oh, so Sun do its own device?

Wagner: Right. Yeah, because Sun's money was in the big hardware. It was in the big hardware. They didn't want to invest in doing a whole 'nother little device. We were always in this funny position of having this technology but not having a device, and so there was also a lot of work that went into doing the standards and working with Nokia and all kinds of other companies about trying to put together a consumer standard. And smartphones, when we started working with Nokia, they were effectively doing an early smartphone, and we also did quite a bit of work with Docomo to put Java onto the Docomo phones, so it ended up being almost more of a let's help other people put this on their devices as opposed to having something that was our own user interface, which was more of a challenge for those of us who were user interface designers because we had to think about what they were doing on the various devices, what the sort of user scenarios were for what kind of apps were going to run on those devices and then come back and think about, "What does that mean in terms of what an API would support?" so you had to have a certain amount of engineering expertise, which at that point I had pretty much collected, and work with the engineers to kind of say, "Okay, can I do this? Can I do that?" and storyboard out-- I did a lot of looking out three to five years and doing brainstorming and storyboards and user scenarios and various things where we'd say, "This is the kind of thing we think somebody's going to do." We had scenarios that said, "I just flew into X town. I open up my phone. I'm going to look for all the restaurants next to me, and I know what the weather is here." It's like all the things you do on your smartphone now when you land somewhere. We had scenarios that talked about doing all of those kinds of things, and then we would say, "Can the API support this?" because there were questions about permissions and privacy and security and all kinds of crazy things that kept cropping up because no one

had ever done these sorts of things before, and it was hard, and I think that's why Java as a consumer thing really ultimately failed because it wasn't on a device, and as soon as Apple came out with the iPhone and Google came out with what they were doing, I think it wasn't going to work on consumer devices at that point because you really needed the whole device to make a play.

Hsu: Right. But you did mention that there were smartphone projects going on at Sun that you were working on.

Wagner: Towards the end before I left Sun, most of what we were focused on was putting our user interface-- we actually went out and worked with an outside design firm and came up with a whole crazy, beautiful user interface, and it was all cell phone targeted, all looking at smartphones.

Hsu: Right. So was this like iPhone style touchscreen-based smartphone?

Wagner: Mm-hmm. Yes, and in fact the main human interface designer on a lot of that was YooJin [Hong], and she's now a VP at Samsung. She came from Korea originally and worked with us for a few years and ended up going back, so, yeah, it was hard because we were trying to design things and we never had an actual device so we would come up with a profile, and then we would work to that, but I think we all had cell phones. We would buy cell phones from Europe and get cell phones that had technology-- this was before the iPhone. You would buy phones from Europe that would have technology that wouldn't show up in the U.S. for another 18 months in some cases, and in fact an amusing anecdote for you. So I had a very young child at this point when I was working on-- and we always had random cell phones coming to the group, and we would buy cell phones, and then we would use them. We would take them home, make them our phone, and use them for six months, so we always had to have phones you could swap the SIM cards in and out of, so I had one of the earliest cell phones with a camera that you could have possibly had in the United States. My daughter's two and a half, three years old. She's only ever known smartphones, right? This is before an iPhone's come out, and I remember walking down the street with her one day and she sees something. She says, "Mommy, Mommy, take a picture," and I'm like, "Well, I don't have a camera," and she gives me one of those looks that only a three-year-old can give you, and she's like, "You have your phone!" I'm like, "Oh, what have I done?" and in fact the first phone she ever had personally was a flip phone. She didn't know how to use it. She would send me a text message, and then she would put it to sleep. She was turning it off every time she sent a text message. I finally gave up and just started giving her my old iPhones. It's funny how people just-- she was raised with that technology. In fact, one of the other things I did in my copious spare time was Pamela Hinds at Stanford University used to run a cross-functional design class where she would bring in people from engineering and marketing and various design and create teams, and she would invite people out in the industry to come up with project proposals for the teams to work on, and then she would invite also people from industry to come in as mentors, and we would hand in project proposals for them to work on, and they'd be fairly self-contained, but I did a lot of work as a mentor. So one of the things, for example, very, very early on that they got asked to do was when cell phones had just come out with cameras, there was a project for these folks to go out and figure out how college students were using the cameras, and I came in as the mentor to walk them through the process of how to do it, collect the data, what kinds of questions to ask, what to expect, and they could ask me any question they wanted, and I

mentored them through the process of doing the project, and I did that for two or three years where I helped her with that, and that was really great fun because you could actually see the technology as it hit the college audience who had no fear of the technology, so it was a fun way to play with that end of it.

Hsu: Is there anything else that you did at Sun that you'd like to talk about?

Wagner: I'm trying to think if-- There may be things that come back to me when I go through the paperwork at home. At the moment I can't think of anything.

Hsu: Okay. So you mentioned you left Sun in 2008?

Wagner: I did.

Hsu: What led to that decision?

Wagner: That had a lot more to do with personal direction than it had to do with Sun. I was actually at the top of my career. For the last two years before I left I had been told repeatedly by VPs that I should be a distinguished engineer, but Sun had a very strong old-boy's network at that point, and being a woman, a human interface engineer, did not lend me to be somebody that they felt would make-- the way the distinguished engineer process worked at Sun is the other distinguished engineers had to vote you in, and they were almost all primarily software engineers, so it wasn't an audience that really knew my work one way or the other, so I felt like I kind of hit the end of what I was going to do there, but I also just felt like I had gotten to a point where my creativity was dying and my life needed to take a radically different direction, and I was a key employee. They paid me big bonuses, and everyone thought I was a lunatic, but I basically turned my back and walked away from high tech, and I went back to school and got a degree in women's spirituality, which was about as 90 degrees as I could possibly go. I've always wanted to work as an artist, so I returned back to that direction, and I actually teach creativity classes and work as an artist, and the amusing part is I have actually been hired back as a creativity consultant in a couple places to work with putting human interface teams together.

Hsu: Really?

Wagner: Yes, I don't do it very often. My friends have to twist my arms to make me do it, but I have actually been hired back in to do things like that.

Hsu: As a contractor or as a...?

Wagner: They have to usually hire me as a consultant or a contractor. I don't come back as an employee. I'm not doing that anymore.

Hsu: Wait. So you've gone back to Apple or Sun to do these things?

Wagner: No, this was actually a friend of mine who had been working at-- it's a very big corporation, AB-- ABB Corporation. It's a big corporation that does work with power plants and the government and things like that, and they had a very disparate user interface group that they needed to pull together, and they literally were disparate. They were all over Europe and the United States, and they needed to be able to interact with each other to create a standard user interface guideline for this new area that they were going into, and they didn't know how to work with each other. They didn't know each other, so what they really needed was a design off-site where they not only got some of the work done, but they also had some fun designing with each other, so one of the funnest things-- well, it's always a fun thing to do. It's a great project to do with anyone is they all went off to lunch, and while they were off at lunch I walked around the room and made sure there was a certain set of things in the room like rubber bands and paper clips and little jelly candies, and when they came back I told them, "Okay, you have 45 minutes to design some way to get the piece of jelly candy from that end of the table to the other end of the conference room table." And I broke them up into teams deliberately so they weren't sitting with their friends, and they had a blast. And then we switched it up and did another round of it. They could use anything in the room that they wanted to use. They could use trashcans. They could use chairs. Whatever was in the room at that point in time they could use, and they had a blast doing it, so I had fun with it.

Hsu: Is that the Lemon Drop Project or is that something else?

Wagner: Oh, the Lemon Drop Project was something that I worked on at Sun towards the last few years I was there where we were looking out into the future of what we thought we could do with cell phones and Java technology, and I was working, and I can't remember his last name. His first name was Danny and I probably have some of that paperwork buried in a box, and we were doing a lot of storyboarding and scenarios, thinking of usage scenarios, looking out into the future, and we were also doing a demo, so we actually did a demo based on that, and, once again, it was something where we would have marketing input, and it would probably get shown back up the chain. I don't know if Lemon Drop was the one. I'd have to go back and look. One of the projects we worked on like that that was advanced development I know we ended up showing to Jonathan Schwartz and taking it all the way up the chain, so, yes, I did work on that, but I'm going to have to go jog my memory. It's been almost 10 years since I looked at any of this stuff.

Hsu: What other things have you worked on since you left the industry?

Wagner: High tech related?

Hsu: Well, anything.

Wagner: So I worked with Shiloh Sophia McCloud, or Shiloh Sophia as she's known, who is the founder of the Intentional Creativity Movement, and I had met her through the master's program that I was in, and I graduated in 2010, and I didn't know what I was doing with myself at that point, and I also was going through a divorce, so I ended up working as an admissions counselor at the Institute for Transpersonal Psychology just as a sort of fill-the-gap type of thing because I wasn't sure where I was going, and I was painting. I had some solo shows of my artwork, and then Shiloh had been a teacher in the program, and

she decided that she wanted to take the process that she used to teach us and turn it into a certification program, and so I signed up along with 17 other women to be in the very first cohort that went through the Intentional Creativity training that she was going to teach, and she has this particular method that she uses. Creating with intention is something that humans have done for thousands of years, and what she does in her process is make it conscious so that you're very consciously working with intention, and the process that she uses is a very simple 13-step process that anyone, and people who have never picked up a paintbrush in their life-- I have done this with hundreds of people-- where we walk you through this 13-step process of painting on a very big canvas, and generally there's usually a theme to what we're doing, and there's an intention, and we start with a red thread circle. We get you to voice your intention. We get you to pull the old stories out that have been running you with regards to whatever inquiry we're asking, and paint it onto the canvas, and then we walk you through this process that literally transforms from old story to new story using this 13-step process, and it works. I became certified in the program. I am now faculty in the Color of Woman School, which is the school that we teach through, and it's global. We teach all around the world, and I'm what's called an art doctor, and I use the training of being a mentor. For many years at Apple and at Sun both I mentored people, and I was always part of the mentoring program, so I use that background as well as the training that I received in my master's program to be sort of like a spiritual guide for people as well as the technical side of, "Okay. How do I paint this?" or "I'm stuck. I don't know what to do next." So I creativity coach on the other end of it, and so that's one of the things that I do is I work as faculty, and I'm going to go back to teaching more of those workshops on my own now that I've moved to a space where I actually have room to teach again, so I've got that thread. The Intentional Creativity thread has been running through the last 10 years pretty strongly, and at the same time I'm continuing to develop my own paintings and styles, and I've actually pulled in doing more of an Asian style of watercolor into the style that I teach. I do acrylics on canvas, and I do watercolors on rice paper, and I also have this little sketchbook that I paint in, doing a very simple version of sumi-e, which is ink drawing where you connect with what you want to draw with intention, and then you write the words that come to you, and you sign it, and I actually have online classes I've developed where I teach people how to do this, and, once again, I can take people who have absolutely no experience whatsoever and give them a way to-- it can be a meditation, or it could be travel sketching, or it could just be something that you do to kind of ground yourself, but it's a creative, spiritual practice that people can use and take with them anywhere. So I'm planning on doing more of that, and I'm actually planning on doing more in-person teaching, which has been a little difficult in Silicon Valley because I just didn't have the space for it, so it is what it is, but, yeah. I've been indulging my creative side is what I've been doing for the last 10 years and having a very good time of it.

Hsu: How would you summarize your career in the computer industry?

Wagner: There's an interesting aspect to what I did of landing in a career that I never expected to be in and learning to sink or swim, really enjoying the creative aspects of it, and I'm very happy I had the career I had. It always felt like part of me didn't quite fit into it, so I will be honest about that, but on the other hand there were parts of it that I was just as much as a geek as anyone else who was in it doing it because I can remember late nights before conferences. We're all in a conference room, and we all have a device, and we're all trying to get them to boot up at the right thing and make sure the demos are working out so we have the right number of units the next day for the booth, and there was a lot of

craziness and fun that went into that that I miss, so I'm very glad I did it. I don't know. I had a lot of fun with it, so I guess I just think of it as being one of those creative, crazy parts of my life, and I'm glad I did it, but I think for the most part I'm also done with it and happy with where I'm heading now.

Hsu: What's your take on how the computer industry has developed since you left it?

Wagner: So I've had some interesting conversations with friends who've been in the high tech world as long as I have. So I was born and raised in what became Silicon Valley around me, and I've seen it go from being very idealistic to being very money driven, and I'm not impressed with a lot of what I see coming out of high tech these days, partially because it seems like a lot of me too. Instead of coming up with something unique and... well, something unique, I guess, is probably really the word I'm looking for, it seems more like things are one-offs of something else that's already been done, but the part that for me kind of loses it is I was part of Apple the days where we had that silly bumper sticker that said "Changing the World One Computer at a Time," and I still have a copy of that bumper sticker, and there was an idealistic piece to what we did, and you can laugh at that and say that that's not part of a capitalistic society, and it's not, but it kept the doors open to being a little more creative and a little more unique and to being a little more grounded into the rest of humanity, and I don't see that as often in Silicon Valley, and I think that's a loss because there's something about having that idealistic thread in there that I think keeps things more innovative, and I think some of the innovation has dropped. I also am less than enamored with the fact that Silicon Valley still suffers from issues of not treating minorities and women at the same level as they could be. There's a lot of brain power they miss out on by doing that, but it's always been there, and it's unspoken, which is unfortunate, and, yes, I'm a feminist, but I'm not a feminist from the 1970s. I'm a feminist from 2019, and there's a big difference, and it's still there, and I think that there's been a lot of movement, but it's been interesting watching it change, and I don't know if I would be happy in it at this point in time. I'm also not a big fan of huge companies. I probably would be happier at something that was a lot smaller. So who knows? I might get dragged back in something up where I'm going to be living in Montana, but I don't know. At the moment I'm happy with what I'm doing, and I'm happy to let Silicon Valley continue on in its wayward path.

Hsu: I guess my last question to follow up on what you just said, discrimination, is that something you experienced in your career?

Wagner: Yes.

Hsu: Significantly? Because you mentioned feeling like an outsider.

Wagner: Well, there was always this issue of being an outsider because I did human interface design and I came from a graphic design background, but there was also an issue of being a woman. I've talked to other women in the industry. There was an episode at Apple where our manager pinched my ass at a beer bust and shocked the shit out of me, to be quite honest, to the point that I didn't say anything to him because I couldn't believe that the idiot had just done it, and then comparing notes with other women over the next few days to discover that the idiot had done it to more than one of us, and it was just completely unprofessional, so there was stuff like that that happened. There were incidences where you got passed

over for promotion, but you couldn't quite put your finger on why you got passed over for promotion, but I was very bluntly told by a departing VP that one of the reasons I was passed over for promotion at least for the DE stuff was partly because I was a woman and that it was just that more difficult to become a distinguished engineer because I was female.

Hsu: Right. That was at Sun?

Wagner: Yes, and coupled with being a human interface designer. The two things were like two black marks against me, and he was absolutely convinced, and it was a man who told me that. It wasn't a woman. It was a man. It was like, no, he was completely convinced, but I had managers over the years say "Yes." They had seen it. It was always subtle, and it was something that was difficult to change the behaviors because it was so ingrained that people just didn't think to assume-- like, most women were in the documentation department or in the human interface group. They weren't in software engineering, and they just didn't think to change that. You had to take a manager who was willing to say, "No, I'm going to interview women for this position. I'm going to deliberately make an attempt to find a woman and interview her for this position to make some kind of changes," and there were managers who did that. I know managers out there who did that kind of thing, but it had to take someone who believed that there was something going on and to realize how subtle it was to actually make a shift, and I do think things have shifted dramatically. If you look back at 1970 and you look at now, we know it's shifted, but the threads of culture shift slowly, and you have to really be conscious about them to see what's going on, and I think that's just part of the whole dynamic.

Hsu: Right. So do you think that things have improved in the computer industry for women?

Wagner: I think they have and they haven't. I haven't actually given it serious consideration, but I have a friend who still keeps a very close eye on it, and she thinks that, "Yes, things have improved," and "No, they haven't improved." They've shifted, but it's never quite as much as you wish it was, and there isn't a question to be asked there, which is, "Will it ever?" because there's always these shifting dynamics within a culture about not just male and female roles, but there's this question of what somebody's background is and their racial background and whether that has an impact, and there's these threads, and you're just never quite certain what happens with these shifts, and they're going to keep moving. They're not going to settle in one place, so, yes, it's improved, and I hope it continues to improve.

Hsu: Do you have any final thoughts?

Wagner: No, I suspect I'll have more things I'm going to find and give you hopefully, and who knows? I may as I jog my memory on some of this stuff come back and have more things to share, but thank you.

Hsu: Thank you very much.

Wagner: Alright.

END OF THE INTERVIEW