Oral History of Liz Bond Crews

Interviewed by:
Paul McJones

Recorded May 24, 2017
Mountain View, CA

CHM Reference number: X8213.2017

Table of Contents

Liz Bond Crews

Conducted by Software Industry Special Interest Group

Abstract: Liz Bond Crews grew up in McAllen, TX. She attended Bradford College in Haverhill, MA, and the University of Texas at Austin, where she obtained a bachelor's degree with a double major in mathematics and computer science. Her first job was as a systems analyst in Los Angeles for RCA's computer business, with customers including Signal Oil & Gas, and Glendale Hospital. After RCA shut down its computer business, she joined the Xerox Electro-Optical Division in Pasadena, CA, where she led a group building special systems for customers including National Geographic magazine, Ginn & Company, and University Microfilm. She also set up a user group for the Alto personal computer from Xerox's Palo Alto Research Center. Her next assignment was the Xerox Corporate Font Center, in the Printing System Division, where among other things she negotiated a licensing deal with Mergenthaler Linotype for high-quality typefaces for use with Xerox's 9700 electronic printer. John Warnock recruited her to Adobe Systems, where she became employee number 15 and once again licensed high-quality typeface designs from Merganthaler Linotype and others, this time to be rendered as Adobe Type 1 fonts usable on every PostScript printer. While at Adobe, she ran corporate marketing, hired graphics designers, created the *Colophon* newsletter, and more. After Adobe, she helped found Electronics for Imaging, did some consulting, and then retired. In retirement she has done technology work for the Museum of New Mexico Foundation.

Growing Up

Paul McJones: This is an Oral History interview of Liz Bond Crews at the Computer History Museum on May 24, 2017. My name is Paul McJones. Good morning!

Liz Crews: Good morning, Paul.

McJones: I would like to start at the beginning. Could you tell me a little bit about where you grew up and went to school?

Crews: Yes, I can. I grew up in South Texas, McAllen, on the border with Reynosa, Mexico. It was a bi-cultural experience. I was very encouraged by my family to excel in whatever I did. And it was a very loving environment. I enjoyed school immensely, and I ended up doing a lot of things in the school, activity-wise. For example, I ran for President of the senior class in the student body government. And, in those activities, I think I really exceled in doing creative

things. I'll never forget the campaign I ran for student body president, and came up with slogans like, "Liz knows her biz! Vote for Liz!" Sadly, I will report to you that I lost the election by six votes to the captain of the basketball team. So, I think that says something about those days of women having something of a little bit of a difficulty moving on. It was an encouraging environment, but it was also a sheltered environment. I was very fortunate to have a family who loved me, cared for me and absolutely insisted that you excel.

McJones: So ,they encouraged you to go to college. Had they gone to college?

Crews: Daddy had, yes. He was an orthodontist. In fact, he and Mother met when World War II was on and he was in dental school. He completed his dental schoolwork and then they moved on to Corpus Christi at the end of the war. And Mother, sadly, her parents weren't able to send her on to college, read incessantly. After the war was over, they moved to Altus, Oklahoma where my father practiced dentistry. And that's where I was born, in Oklahoma. But then the Korean war broke out, and they recalled all doctors, and he was sent to Korea for two years. Then when he returned, we moved to Memphis, Tennessee and he worked on his advanced degree in orthodontics and maxillofacial surgery. After that, because they enjoyed Corpus Christi, we moved to McAllen, Texas. And that's why I feel that I really grew up in McAllen, Texas.

McJones: I see, so you really did move around for a while there.

Crews: A little bit in the beginning.

McJones: Were there other mentors in, say, high school or college that encouraged you to go in the direction that you did?

Crews: Oh, well, that's an interesting question. I can't think of a predominant one. When I graduated from high school, I wanted to do something different. I wanted to get out of that environment, so I went to Bradford College, north of Boston, Massachusetts. It was a small school, and in fact, there were only two girls from Texas in the school. So, it was an interesting cultural switch for me, from growing up in a small town in Texas to going all the way back East to Boston. I enjoyed that environment very much. I loved the art history, I loved the cultural aspects, the opportunity I had back there. But the classes I enjoyed the most actually were math. When I graduated there [after two years: Bradford College was a junior college], I was editor of the annual and quite involved in activities at Bradford.

And then because I grew up in Texas, I was told you couldn't stay back East in school; you had to come home to Texas to finish. So, I did, I went to the University of Texas and finished. My degree was in Math and Computer Science. In those days, the undergraduates were not

allowed in the computer room. We did everything by punch cards and submitted our programs to the Computer Center. And if you dropped your box, you were really in trouble.

McJones: I remember those days, too. Yes. So, there weren't too many women, I suspect, in that program with you.

Crews: No, there were not many women in the Math program at the University. And ironically, I really wanted a Computer Science degree. In order to get that, I had to have a double major. Math was obviously the right double major to have.

McJones: Yes, it's a very good combination.

Crews: But I liked the application side of the math. I wasn't really that interested in the theory side. I really did enjoy the application side. It was like the problem-solving to me. And the programming was fun.

McJones: Do you remember any of the computer science courses and/or the math courses?

Crews: Oh, that's interesting. I hadn't thought about that in a long time. We wrote a compiler. I'm not too sure what were the other programs. Mostly it was just solving problems, you know? It wasn't application driven, as it would have been today, if I was back in school. I know it was all Fortran. In those days, the biggest problem was the input and output. You know, the computational stuff was easy, but it was figuring out how to do something in Fortran and the input and output.

McJones: Create a FORMAT statement that was going to be attractive and clear and so on. So then you graduated in 1968, is that correct?

Crews: Yes, 1968. The question was what would I do with the degree? And it was interesting in those days, interviewers came to your campus and you interviewed with everybody. I had an opportunity to go to several different organizations. Cape Canaveral. NCR had a program. I interviewed quite a few places around the country. I had about decided that I wasn't really that interested in the programming aspects entirely. And so, I sort of leaned towards organizations that were offering me the opportunity to be more like an analyst. Because I enjoyed solving the problem and the debugging and I felt I would rather do that than just be on a programming team. And so that's why I ended up with RCA.

RCA

McJones: I'm guessing-- I never was a systems analyst-- that that also involved a fair amount of interaction with clients and customers.

Crews: Yes, and I liked doing that. I found, and I still feel that way, I enjoy talking to people and sort of searching out what the real issue is, and how do we solve that problem. And so, when I was with RCA, as a system's analyst-- this is obviously the very beginning stages—I was assigned to a corporate account and was just full time on that account. Software developers would come in and say, "I'm having problems, I can't solve this," and I'd go through their dumps with them. And we'd figure out what the error was and what to do about that.

McJones: Could you tell us about some of your customers at that point?

Crews: Yes, I can share that with you. Signal Oil & Gas was a very interesting one. That's the one client that I enjoyed working with because they had a large department and I literally went through a lot of dumps with them -- core dumps. And after that, one of the other interesting clients was Glendale Hospital in the Los Angeles area. That was my first time to really get involved with COBOL, because the developers who were using the RCA Spectra 70 computers had written a business application, an accounting system, in COBOL and they were having difficulty in expanding it. So, I went in to help them document the system, figure out how we could expand the system, and then wrote code for that. That was an interesting project because I discovered very quickly how important it was to really succinctly document your code, leave the right opportunities for modifications to be made. It was an enlightening experience because what I inherited to fix was really not very good.

McJones: Did the hospital have a documentation standard or was that something you brought from RCA?

Crews: I think I brought it from RCA.

McJones: You began with Fortran in college, but at this point you were programming in assembly language and COBOL, so you had a broad range of technologies.

Crews: Yes, when I joined RCA, one of the things that appealed to me is they sent everybody back to Cherry Hill, New Jersey for a three-month program. I was surprised at the number of people that were in this program of Systems Analyst who hadn't had any math or computer background. For me it was very easy, because I had had that background. But it was a really good training program.

McJones: And this was all in the L.A. area.

Crews: Yes, it was in Los Angeles area. You'll love this: I'd wanted to go to San Francisco. You know, if you had to pick your ideal place where you wanted to work as your first opportunity, I thought it'd be San Francisco. But in those days, there was nothing going on in San Francisco in the computer industry, so Los Angeles was it!

McJones: How long were you in that job?

Crews: Well, RCA, unfortunately, I think it was in the early 1970s, disbanded and went out of the computer business and sold off to Sperry Rand. At that time, I thought, "Now, what am I going to do next?" I went about interviewing with different organization and I even contemplated becoming a stockbroker. I'll never forget that interview! The gentleman who interviewed me said, "If you're doing so well, and have done so much in the computer industry, why do you want to be a stockbroker?" And I said, "You know, you asked a really good question." So, then I interviewed with Xerox Electro-Optical Systems in Pasadena. I was fascinated with that organization because it was a group of scientists and they were looking for a systems person. And I thought, "My gosh, this is where I should be," so I joined EOS.

Xerox Electro-Optical Systems

McJones: And you had a somewhat similar title where you were a systems analyst, so there was a continuity.

Crews: But there was a new set of problems. And this time it was interesting, because under the organization when you're working for a vendor, you go to their clients or their customer base; and here we were not really a vendor, we were a supporter of trying to find customers in a different way. In the beginning at EOS, they did a lot of government contract work, and it was appropriating their technologies that they've used in different places. One of the tasks I did in the beginning came as a result of one of the salespeople in the Washington D.C. area who had been exploring the opportunity to use some of Xerox's technology in *National Geographic Magazine.* They asked me to go back and look at the magazine and see what we could possibly offer in automation, for helping them produce the magazine. So, I spent probably six months at the Society, just interviewing people and talking to them and figuring out what their workflow was. We discovered that the main issue there really was the proofing. How do you proof the pages and the mock-ups, etcetera? At that time, Dale Green was doing some wonderfully interesting work with a color printer and it was being electronically driven. So, we proposed a page makeup system, and its proof device would be the Xerox color printer. We priced that out as a one supply solution, but the actual price tag was ridiculous, because Dale Green only had this one machine; he really wouldn't want to put it in a user environment. So that was an interesting assignment.

McJones: That printer had been developed there at EOS in Pasadena?

Crews: Yes.

McJones: Dale was one of your colleagues there?

Crews: Yes. He was a part of Xerox and was on the research side. But he wasn't at Palo Alto Research Center, he was at EOS. So, EOS was like a research supply house for Xerox, too.

McJones: I see. So, you say you had proposed an actual page layout system as part of that package.

Crews: Yes.

McJones: So that would've involved?

Crews: Software development.

McJones: Had you thought about how that would work, what components you would use, or what?

Crews: Yes, we had. We were using Alto computers at that time, and so we would have developed it. Since the magazine was a very fixed format layout, we didn't have to make a variable page format issue. It was a very fixed layout solution. But to be honest with you, I'm not too sure, if the project had come through, how long it would have taken to develop. At the end, I was sort of glad we didn't get the contract. But that led onto other work with Xerox Education Group. They didn't have a direct research arm at that time. So, I was assigned from corporate headquarters to help the Xerox Education Group companies understand what was being done internally in Xerox in the research area, and how some of the Xerox tools could be applied to their businesses.

I moved on to work in solving that problem. One of the companies we worked with in the beginning was Ginn & Company. Ginn had developed a math program, an individualized tracking math program. This was when accountability was extremely important in the schools. This was a self-paced program. The way it worked was they had a cart and all the materials were on the cart. At the beginning of the day, the child would take a pretest. Depending on the pretest results, they would get assignments from the cart of what they should be working on. After they completed that, they would take a post-test. Of course, the teacher then was supposed to be able to hand out all the different materials based on the individual child's

progress through the program. You can imagine how difficult that was for a teacher to manage, so it seemed like an appropriate one for us to try to help them automate. I had, by this time, a group of software developers, and we automated that system. And EOS brought the technology to the picture. They took a 660 copier and made it into an optical scanner. This was an example of one of your first optical mark sense scanners. So, the pre-test and the post-test were scored with marks, and then we scanned them, and the data was transferred back to a central processor, a G.E. Then we scored the test and we gave a prescriptive report back to the teacher so that she could determine what child would use what. We developed that system and installed it in Title I [Title I of the Elementary and Secondary Education Act of 1965] schools in South Carolina, Iowa, even Kirkland, Washington where Microsoft subsequently ended up.

One of the fun issues came up when I was going out to the schools to check how the programs were working. There were several human problems that you just don't count on. At that time, transmission of the data was being done at 300 baud — very, very slow. And in Kirkland, Washington, they still had a switchboard. The woman operator at the switchboard saw the light flashing, blinking, and she unplugged the connection and so, of course, our data was lost. The other complication with that program was the teachers often didn't put the materials back on the cart. So, we'd write prescriptive reports and the cart would have gone to the next classroom; where's the material to give to the child? So that's an example of, I think, centralized processing trying to solve individualized programs. When the system is not that close to the actual results, it's sometimes difficult.

McJones: Were you able to do a little extra training and smooth out some of those rough things?

Crews: Yes, we did. We did smooth out some of the issues, and when we discovered it, we were able to solve some of the problems. I think we ran the program for probably two years, and I think Ginn moved on to something else. It was probably an example of a program that had been automated, but maybe if the people who had developed the program had originally appreciated what some of the technology could do, they might have changed the development of the program a little.

McJones: I see; that makes sense. So organizationally, were you still part of EOS in this Education Group?

Crews: Yes. I was still an employee of EOS, but what EOS had done is they had gotten funding from the Xerox Education Group, and I was in essence assigned to the Xerox Education Group but under the umbrella of being paid by EOS. It's a really interesting sort of dichotomy there. And at this time, because we used Alto computers, I was in and out of Xerox PARC all the time. And with the Education Group, through their different companies, R. R. Bowker, Ginn

& Company, University Microfilms, I got a wonderful opportunity to see a lot of Xerox, and appreciate what was going on, and where the divisions were progressing.

McJones: You were probably one of these “hub” people who helped set up other connections.

Crews: Yes, sort of reconnect people. Did I describe what I was doing at University Microfilms?

McJones: Not yet.

Crews: Okay, University Microfilms had an interesting issue. They were recording all dissertations and recording them on film. The corporation said, "Wait a minute, maybe we should be thinking about digitally capturing this information." Rather than doing what we would do automatically today, scan it, and store it in a digital file, we chose to actually re-keystroke the dissertations. In other word, the abstracts would come in and then somebody would rekey them into a digital format. And then we would just create a page layout. Of course, dissertation abstracts, have a very consistent layout form; it was easy to design a descriptive page format that you could print. We used, again, Alto computers.

My group developed the software to do this page layout system for University Microfilms. The biggest problem we had was how to connect different dissertations together so that you could actually print them in a format. We used Ed Taft's FTP work that was done at PARC. And also, Ralph Kimball at that time had done some very interesting typesetting of formulas, so that you could actually typeset mathematical formulas. So, we had the opportunity to use Ralph's work. We used Ed Taft's work. We developed a page layout system, with the hope that we would be able to actually digitize all the abstracts that came in-house, and that they wouldn't have to go to cut and paste. That system ran for about a year, but there were anomalies, and so we ended up having to admit that we probably had to cut and paste some. There was actually a woman that ran that division at that time. I found her extremely helpful in working with, because we were stretching what we could do at that point, really stretching it. And she didn't commit that we were going to become the new way she could produce the dissertation abstracts, but she was willing to test it, and to take it as far as it could be tested. And at some point in time, we said, "Okay, this is not going to work as a production system because it's not production hardware, and we can't solve all the issues," and she said, "But it's been a good test, I understand it," and that was fine.

McJones: How big of a team did you have working on something like this?

Crews: Let's see. I had three software engineers and myself.

McJones: Yes, pretty ambitious.

Crews: <laughs> But it was an exciting time, and it was fun to do. And I remember Jonathan Seybold came over one time and visited us to see what we were up to, and we had interest from PARC. Because we were using Altos and we were taking them out, and putting them in different places throughout the company, I suddenly realized, "There's an awful lot going on with Alto computers throughout Xerox. I didn't know everything that was going on. I talked to several of my friends back in Rochester and Palo Alto, and I said, "I think we ought to start an Alto Users Group. And so, I proposed that, and we did. And came up with a title, WAW, Whole Alto World <laughs>, WAW. We met several times. And that was helpful, because there was an exchange of information about who was doing what, and I chaired that group for about a year-and-a-half, and then Jim Iverson, Dr. Iverson from Rochester, took over. He was doing work there, and he became the chair of that. And I'm not too sure how long that continued on after.

McJones: Do you remember what years you were directly involved when you set it up?

Crews: Oh, my gosh! That would have been probably early 1970s.

McJones: I was curious, did the PARC people react positively to your setting this up? For example, did any of the PARC people want to stay in the loop on the user group?

Crews: Oh, yes, that was an interesting question. The PARC group was participative. I was really pleased about that. Not everybody from PARC came. I think the first meeting probably was in El Segundo, and I think probably maybe the next meeting we did have up in PARC [in Palo Alto]. And we had one on the East Coast in Rochester. I think PARC people were interested in what was happening. They particularly were interested in what people were doing with their technology. It was difficult, though, to get things out of PARC, not difficult-- I mean, they'd let you have their tools, but they were very hesitant sometimes for us to try to put them into a package that would then, quote, be used as a-- not a product, because we weren't producing products, but actually used to make products. That was worrisome for them, because it was exploratory and it was research-oriented software. And that's like my example with Dale Green and his color copier. He didn't really want to see that outside his lab.

McJones: You mentioned Ed Taft, and a couple of other people. Are there other people that you were interacting with a lot from PARC?

Crews: From PARC time? Yes, Ed Taft. I did a little bit of just following Alan Kay's work, and Adele Goldberg's work. Of course, I knew John Warnock and Chuck Geschke, Bob Taylor, and Butler Lampson. I didn't work directly with Butler Lampson, but with Larry Tesler and Tim Mott, particularly. So, I was interacting with these people a lot. That was what was thrilling about

working at Xerox at that time! Particularly at EOS. It gave me the flexibility to really go around the corporation and work with different people.

McJones: Did you use the Gypsy System from Tim and Larry?

Crews: No, we did not use the Gypsy System from Tim and Larry. And it's interesting after yesterday's desktop publishing meeting. I was thinking back; I wonder why we didn't. <laughs>. But I guess we were lone developers in one set of different geography, and so we just didn't use it.

McJones: Right, the timing may not have been right.

Crews: The timing probably wasn't there.

McJones: It would have probably been an interesting thing to consider for the thesis abstracts.

Crews: Yes, it would have been. And I suspect that work was probably being done after what we did. I should have spent some time with Larry Tesler yesterday to find out that schedule, but I suspect his work was after ours.

McJones: Then there was one more big part, a whole new section of your work at Xerox that started around this time, I think? You went into the Printing Systems Division.

Xerox Corporate Font Center

Crews: Yes, after exploring these different opportunities through working with the Xerox Education Group, I was given the opportunity to come down and take over managing Xerox Corporate Font Center for the Printing Systems Division. And by this time, I thought that was a good idea. I'd been doing these other separate projects, and the development team was a small little group of people. But this sounded like a really interesting problem to address! So, I got down to Xerox and this was in El Segundo, California, still in Southern California. I discovered some interesting things that were going on through the Corporate Font Center. The majority of those electronic printers were the 9700, and they were high-speed printers. The first industry to adopt the high-speed technology was the insurance companies. And it was a perfect application for those high-speed printers, because the majority of it is boilerplate, and all you have to do is insert the name of the insured person, the policy number, the dates and things like that. A lot of static information, and then digital information is inserted.

The way the system worked is the customer base would design a new form, a new app, a new thing they were producing, such as a policy. And they would come back to Xerox and say, "I want my fonts delivered to me in 10.2 characters per inch." You remember the fixed-pitch typewriter days. And the next thing we would get is they'd want a font done in 10.4 characters per inch. Of course, we were making bitmaps, literally a bitmap of every character. And we primarily made Universe or a bastardized version of Universe, similar to Helvetica, a sans serif font, and I was flabbergasted in the number of versions we had made. We were just inundated with this burden of creating all these fixed-pitch fonts! One of the things that the company wanted very desperately was to use Roman PS [proportionally spaced] and Courier – these were particularly desired in England, at Rank Xerox. We didn't have the access to that. So, I did go over and negotiate the contracts for the licensing of Roman PS and Courier from Eric Bower in Neuchâtel, Switzerland. He was not at all happy with the contract, because he developed type wheels, and he was Swiss, he wanted to make it! <laughs> He didn't object to it, but he thought the idea of me paying him a royalty just so I could use the design was not really what he wanted to do! He wanted to sell print wheels. So that was an interesting negotiation.

McJones: Perhaps you could describe briefly the font development process, the tools that were used to go from artwork to the apps.

Crews: The tools were written on Alto. I didn't develop those tools. They were literally a raster generation. The user would bring up on the screen each character and modify the characters until the shape was created, and literally design it so that they would match the character's requirements of fixed pitch type faces.

McJones: Did you use the Fred editor, which was spine or outline based?

Crews: Yes, we did use that.

McJones: Because that was the first step.

Crews: That was the first step. And then I realized that the corporation was going to reach a point of not being able to deliver these printers, because we didn't have enough type faces. And so, our internal department couldn't generate it. We were killing ourselves just generating the other fonts for the existing customer base. And so, I went off to meet some type designers and type developers and was introduced to Mike Parker at Mergenthaler Linotype, and Rick Freeman and we negotiated a contract for Mergenthaler Linotype to produce typeface families for Xerox Corporation. They would actually do the bitmap development and deliver the bitmaps to us. And of course, then the question is, "What do we do? How many sizes do we make?" Because we're now talking about proportionally-spaced typefaces. So, I worked with Mike, particularly, for a long time on what we needed and what would work. How small of a typeface size could we actually legibly produce on a 300 dot per inch printer? We defined ten

typeface sizes. And knowing that primarily we're going to be printing on 8.5 x 11-inch pieces of paper, and so they were going to be text-oriented faces, not display faces, not faces that would be used for advertising work and all. We finally got the contract signed and they set off to develop some typefaces for us. And so that was a challenge to get that contract, I'll tell you that! <laughs>

McJones: Was it a question of them being uncomfortable translating their designs into your format?

Crews: Yes, there was a question about which typefaces would lend themselves best for 300 DPI [dots per inch] printing. I also worked with International Typeface Corporation at this time. Everybody I approached in the type industry was quite interested about digital electronic printing! I mean, they were fascinated about it! It gave them an opportunity to say, "Can we do this? Can we make 300 DPI fonts?" I'll never forget, I went to visit International Typeface Corporation, and Ed Rondthaler was there at that time, and Aaron Burns, and Ed Benguiat. At the second meeting I had back in New York, Ed brought out a piece of paper, and he had literally made alphabets and it was like looking at a piece of needlepoint, you know, in large size, to show that he thought he could get the different sizes of typefaces. Of course, rather than doing ten-point or twelve-point, what they presented to me was an eleven-point, which is a lovely typeface size for text work. You know, the first electronic users either used ten-point or twelve-point or fourteen-point. <laughs> It was just an example of the publishing industry appreciating what good typeface sizes were for readability versus what subsequently later on, users just defaulted to.

McJones: Right. So, you were learning about the fine topography materials.

Crews: Oh, absolutely!

McJones: Were you able to feed that back into the Xerox products people, and customers?

Crews: Yes, or at least I tried to. <laughs> I set out because I realized that we needed to learn a lot about typography, if we were going to be the electronic printing company, we had to know about typography issues. And that included then, of course, all of our character sets we were doing just with the keyboard character set! Nobody had considered whether or not we should do fractions, em-dashes, ligatures, quotes, leader dots, nobody had thought about that! Ron Peller was working for me, at that time, and he was a very, very, very intelligent scientist. I asked him if he would go onto the standards committees for us. He worked diligently in getting the character set expanded, so that we had consistency. If we put that ligature at that ASCII character position, no matter what typeface you had, you would always get that character. And that was important work, I think, at that time. Then, through Allan Haley and some of the other

ITC people in the International Association of Typographers International, (ATypI), I spent a lot of time learning about fine typography.

McJones: It sounds like the standards work was both within Xerox and across these other companies.

Crews: Yes, the standards work was even external to Xerox. So that was important, too, I think to have Xerox contributing to those standards. And so, I encouraged Ron to go to all those meetings and to make sure we had that standard.

McJones: Were Xerox PARC people involved in things like that? Or just not so much?

Crews: I think that's an interesting question. Probably they were. I'm not sure how much. But I think they were very aware of what we were doing. I often went up to PARC to show what we were doing. I'd present the problems, the issues we had, because I was looking for solutions. And that's probably when I spent more time with John Warnock and Chuck Geschke, because when I was managing the Font Center, I think they were very in tune to what my issues were. Yes, they were very attuned. And I was attuned to what they were doing up there.

McJones: So that would have been very late 1970s, or in the early 1980s.

Crews: Yes, early 1980s. Late 1970s and early 1980s was when all this work was going on. At that point in time, I'm not too sure the leadership of Xerox Printing Systems Division was that interested in typography or printing. I'll never forget going to a Xerox Users Group meeting, and I'd written a speech for the President of the Division to announce the Mergenthaler agreement and what typefaces we'd have. He made some comment during the speech, well, he didn't understand why this was important! So, there was a lack of appreciation where, from my perspective, of where the Printing Systems Division knew electronic printing technology could go.

McJones: What printers were involved? You've mentioned the 9700, which was very high speed.

Crews: Very high-speed printer.

McJones: Were there others?

Crews: They were breaking out other printers. I thought it was a 5700 printer. That was the next one that coming out.

McJones: Okay.

Crews: There was discussion at that time of whether or not we needed to incorporate a copier and a printer. You know, if the next version should be a copier and a printer. There was a lot of discussion, which I wasn't involved in, but I was aware of, of, "Should we just be producing highspeed copiers?" Because most of the salespeople were used to selling copiers, and discussing the page per minute, and cost per page. And rather than appreciating what document production could do. For example, in the color copier area, I remember a lot of people were not convinced that it was going to be going anywhere, because what would you copy? What needs color copies? <laughs> So it was a slow progression to, I think, to where we are today. And it goes up and down.

McJones: One question I had was about your staff while you were doing this font development work. What sort of team, what skills and what people?

Crews: Oh, the actual people doing the production of the typefaces, working on the Alto computers and all were probably not very skilled at all. Not programmers, they were just people we trained to use the tool. I don't think they had a strong appreciation of type, and I'm not too sure they saw value in what they were doing. It was like a manufacturing area.

McJones: But you also had some technical people you mentioned.

Crews: When I got there, all the software had been developed and they were using it. And I did not put in place a team to "reengineer" it. I left the software and the actual production just going as it was. But I realized that just adding more terminals wasn't going to solve our problem. We had to figure out a way to do it differently. And to also get the typefaces available for the corporation where we had no expertise. So, it seemed appropriate for me to look outside to bring that expertise in, and I think if I'd stayed at Xerox Corporate Font Center after Mergenthaler would have delivered, we would probably have moved on to a new technology of developing fonts. But at 300 bits per inch, and we have to make a bitmap for every size you're producing, that's a lot of bitmaps.

McJones: I see. But essentially by going to those outside type companies, you were able to outsource even the production of a lot of the work.

Crews: Yes, by going to Mergenthaler, I outsourced the production. And it seemed the only thing appropriate to do at that time, because we had to get some typefaces available for the electronic printing market, and we didn't have them, and we didn't own the rights to them, and so by licensing them and having Mergenthaler produce them, we also got the rights to the typeface to use them. And we weren't copying anybody else's. We were using the original designs. That was important to me.

McJones: Yes, you had this credibility of being part of Xerox.

Crews: As I approached all the type designers in the industry, I said, "We're Xerox Corporation." And because of that name, I was able to open doors that probably no one else could do at that time. And they were interested! They saw all the opportunity of what was going to happen, and they wanted their typefaces licensed by Xerox.

McJones: So, you personally were really moving into the world of typography in terms of joining organizations and so on.

Crews: Yes, I felt that it was important because of this, when I began working with these people, I said, "You know, we have to set the standards of what excellence in typography looks like, because the publishing industry sees Xerox Corporation as this organization bringing typography to the world! And therefore, we have to present the excellence in what we're doing." So, by going to different trade industry meetings and shows, I met an awful lot of people and was asked to join the National Composition Association Board of Directors. This was a group of typesetters. At the time, I was curious why they wanted me, and I realized what they were interested in, it was having a more insiders' input. You know, "What's Xerox doing? What's the next thing coming?" They wanted just to have a dialogue with somebody! And these are a group of typesetters. Ultimately, they realized, I think, they were going to have to expand their business and move on to another, or they were going to go out of business. And so, what I suggested at the meetings was just to share with them what we were doing, how things were moving, so that quite a few of them did, I think, then say, "Okay, I need a new business strategy or I'm going to go out of business." And I enjoyed that group. I was asked a couple times to be on a review board for a contest. That was enjoyable, because I got an appreciation for how do you judge fine typography? And what are the criteria that people are looking for? And so yes, I enjoyed that interrelationship, working with these different people.

McJones: And you were actually meeting the designers as well as the overall management.

Crews: Yes, yes, particularly, I think one of the vehicles I was enabled to do that was through International Typeface Corporation. They sort of took me under their wing, and recommended I join – ATypI [Association Typographique Internationale] -- International Typographic Association. And I went to their international conferences. There, of course, I met all the type designers. And showed them what we were doing. Brought specimens, and we talked about things, and I think they were sort of generating up in their mind, you know, "What designs might work in this new xerography?"

McJones: You just mentioned specimen sheets. Would you print various kinds of things using the Xerox hardware, but their type?

Crews: Yes, I would print things. By this time, Altos were everywhere. At Xerox Printing Systems Division we were using Altos, we were using Bravo, which was Charles Simonyi's development for word processing capability, and we had one or two typefaces, and so I produced examples of specimen type things that I could produce at that time. Of course, I couldn't do much. I could only print one-point size. <laughs> But I showed them exactly what was happening. I showed them what happened when xerography puts down the toner and it smushes it. <laughs> And so certain strokes get heavier, and I showed them how we were doing things to make up for that. For example, if a stroke was too heavy, we took out every other bit so that we could, in essence, when the impression was made on the sheet, then you had the appropriate stroke, and that sort of fascinated the type designers. They hadn't even thought about something like that.

McJones: And they needed to learn this from you in order to give you good advice.

Crews: They had to come to it from a different approach. They knew what they wanted to accomplish in readability and design, et cetera, but now they were thrown a new piece of technology. They thought, "Yes. This is exciting." This gives them a new opportunity for type, and so I think through National Composition Association, ATypI, and outside industry contacts, we were able to get some feedback from the typeface community back into the corporation.

McJones: So, you were there through about 1983.Then something was changing.

Adobe Systems

Crews: Something happened then that was probably the most exciting thing for me in my whole career. John Warnock came down to visit me. He and Chuck had left PARC by this time and they came down to visit me in I guess it was late 1982, early 1983, and John showed me exactly what PostScript could do in type and I was blown away. It would've solved everything. In other words, he proposed that I take PostScript software and we use it as a font development piece of software, and so I went up to the organization saying, "This is it. We need to move to this technology and we'll be able to make the typefaces we need and we'll be able to move forward and we'll be able to supply the corporation with the type," and I couldn't sell it internally.

McJones: But you were literally trying to convince Xerox to adopt Adobe technology.

Crews: I wanted Xerox to commit to buying PostScript and using it internally for our font generation, and I couldn't sell it internally, and I have all my reasons why I think it wouldn't sell, and so I told John that and he said, "I think you ought to come up and talk to us," so I said, "Okay." <laughs> So I went up to talk to John and Chuck in Palo Alto and they showed me more of what they were thinking about – device independence – and they had a strong desire and a passion for fine typography. They didn't have direct contacts with type designers or the type

foundries. They knew about them but they didn't have an "in" to these people and they said, "Why don't you come join us and let's do this?" So, I decided to quit Xerox after 11 1/2 years, <laughs> and I realized that I had just reached a glass ceiling, I wasn't going to go anywhere, and it was time to move on and it was exciting.

So, I joined Adobe and I was employee number 15 and in those days, I don't remember what your title was really, whatever. You were just an engineer. You went out and did what you needed to get done and so the first thing that John and Chuck needed, that Adobe needed, was licensing the typefaces, so we could generate the type. The first person I contacted, that I called right away, was Mike Parker at Mergenthaler and I told him and Jonathan Seybold I was leaving Xerox before it was announced publicly. I mean, I'd told Xerox, but the industry hadn't been told, and I'll never forget Mike Parker coming and sitting on my back patio in Southern California and we just were daydreaming together what this could mean. You know, what would it mean if you had device independence and printers got, you know, just pervasive everywhere and he said, "Well, as you know," he said, "typefaces cost $35 a typeface," and I said, "Mike, it ain't going to go." <laughs> "We can't do that." I mean, just think of the volume and numbers now that a copier you have in your office becomes your printer, and they're going to be everywhere, and so I think he started generating, cogitating and realizing that the whole pricing scheme for fonts had to change, and so that was a good meeting.

McJones: Yes. That's a fascinating story. So, let's jump ahead, but a font price of $35 would've been for one size?

Crews: No.

McJones: For one typeface.

Crews: It would've been for one typeface, and, remember, CRT typesetters could generate any size.

McJones: I see.

Crews: So, what I heard was encouraging, and because we wanted the design, we wanted the licensing rights to use the design. We did not want to have them produce it for us. All I was suggesting is he needed to rethink his strategy. He wasn't selling fonts. He was selling designs and he was selling the Mergenthaler quality and therefore deserved a licensing royalty versus a sale, and that was a new way of thinking for him in that industry that he now had a revenue stream that would be royalty-based on his designs.

McJones: But they would deliver camera-ready artwork?

Crews: They'd deliver artwork that we would then use. So, we had the excellence of their artwork and then we would actually produce the typefaces ourselves.

McJones: Were you running the type production at Adobe?

Crews: No. No. I didn't do that. Mainly because it took a lot more energy and effort to do these contracts, to get things set up, and the actual production was being done by a group of engineers. I think my expertise was bringing to Adobe the ability to get these licenses, and because of our relationship with Mergenthaler and getting the licensing and the typefaces, that then enabled our salesperson to negotiate the contract that they would use PostScript in a lot of typesetters. We wanted the high-end typesetters because we knew that we had the ability of device independence. It had to be both at the high end and at the, "low end," 300 DPI. So, Mergenthaler Linotype was really key in the beginning and I enjoyed giving them the opportunity to get an inroad there.

McJones: And you'd already known these people, so it's trying to help them move to a new technology.

Crews: Yes, yes. I'd known the people for quite a while And so it was a good relationship-building opportunity there.

McJones: And was it the Linotronic that was the specific machine that you designed for?

Crews: Yes. The Linotronic was the machine that we drove, or we "bundled" our software with, or put PostScript into.

McJones: Could you describe that machine just briefly? Modern audiences are aware of things like laser printers and ink jet printers but may not be familiar with typesetters.

Crews: Oh. This is a film recorder. So, a lot of typesetters are film recorders, and this was a digital machine, so we were able to put PostScript in, and then instead of generating output at 300 DPI on a xerographic-based engine, it was producing 1270 dots per inch on film. The film, after it was produced, would then be taken to a printer and the printer would make plates and then you would replicate as many copies or print as many as you needed. So, where we think of the printer in our office now today as being our printer, we don't in essence create a plate. We create an image in memory that is produced on the actual output, and when you go to the Linotype machine, you in essence are going through a production process, which then goes to a printer who makes plates.

McJones: So that was on your table when you first started at Adobe, to start negotiating that deal.

Crews: Yes, that and the ITC typefaces. We were also working with Apple at that time and Steve Jobs realized the importance of having typography in the first laser printers. So the first printer came out I believe it had only two typefaces, the Helvetica and Times Roman [also Courier and Symbol; all but Symbol included roman, italic, bold, and bold italic versions, making 13 faces total], and I helped Steve's team pick the typefaces that would be in the LaserWriter Plus [adding, to the original 13, 4 faces each, of ITC Avant Garde Gothic, ITC Bookman, Helvetica Narrow, New Century Schoolbook, and Palatino, as well as Zapf Chancery Medium Italic and Zapf Dingbats], and in doing that, I don't consider myself a type designer. I think I have some good graphic design sense, since I've been working with this, but I looked to the industry experts to help me figure out which typefaces we should recommend to Apple, and so that came from a group of people, and that is how we ended up with the 35 typefaces that were in the first LaserWriter.

McJones: Or perhaps that was the LaserWriter Plus?

Crews: It was the LaserWriter Plus. Not the first one.

McJones: Yes, there was 17 [actually 13] and then 35.

Crews: So then, you know, those sort of things had gotten going and we were working on trying to get OEM contracts and we had this thing called PostScript and a lot of people had problems understanding what PostScript is because you didn't see it, you didn't buy it. It was in something else [it was embedded in a printer] and so I spent some energy and time going off to industry conferences and giving talks about what is PostScript, why is it important, why are you going to need it? I did an awful lot of talking, which I enjoyed. I found it challenging to try to get that information out. In order to take materials to these conferences and to show slides, et cetera, I had to write PostScript programs because there were no tools. So that was interesting to literally produce your own slides by writing a software program.

McJones: Going back to your old skills from a long time before.

Crews: Absolutely. Programming skills came out, and it didn't matter if it was a long PostScript program or not. Who could care as long as I could get that thing printed?

McJones: There were some books written about PostScript. There was the Red Book, which was the PostScript language book and relatively early on there were some other books that would show how to program in PostScript. Were those helpful to you?

Crews: Well, you know, it's so funny. I don't remember those books. Instead I remember, oh, one of the engineers gave a class, <laughs> and that was how one got PostScript.

McJones: Very good.

Crews: So, after doing this I ended up being the marketing communications person for the company because we didn't have any, and, of course, I used every opportunity I could for us to speak at a conference. I asked John [Warnock] if he'd do it. Quite often he was willing to speak, or Chuck [Geschke] was, and then the question is how do you show off what PostScript's going to do? That's when I realized that we needed some graphic arts quality people in-house, and since we were short-staffed at that time and I'm not sure that everybody appreciated that we needed that capability. I went off to RISD, Rhode Island School of Design, and I talked to some of the people there and there were several graphic arts people that were talented and they needed summer work, so I said, "Why don't you come out to California and work for me? And you can use some of these new tools," and Hugh Dubberly came out and at the same time I found Russell Brown and Luanne [Seymour] Cohen and some very talented graphic artists who were willing to leap into this new technology. So, I hired them for a limited time and I think John and Chuck realized really quickly that it was an asset for our company and we were able to convert some of them to full-time work.

McJones: I think Russell Brown is still there.

Crews: Russell Brown is still there. I used to kid Russell because after I went away to give a talk or something and would come back, he would've changed something on my system. <laughs> But he was wonderful. He's creative and he's just amazing. I think he calls himself Dr. Brown now. He goes out and gives talks and he has become, I think, one of the best speakers for the corporation, about what it's doing,

McJones: I had a question, backing up just a tiny bit. It involves the relationship between proof printing and high-resolution printing. I'm wondering if in some sense you were introducing two different groups to each other and you would maybe have to change your story. For example, the LaserWriter could be thought of as just a printer, a simple tool for the high-end people, but for the office people it was the main thing and then the high-resolution printer was this sort of remote thing. Were there these two cultures? How did they fit together?

Crews: That's interesting. There are two cultures. At that time there were two cultures. Now, really, remember this is talking mostly about black and white printing. We hadn't introduced color at all into it, and so to the high-end person, the one that's looking for producing editions of something, the LaserWriter looked like a simulation of what you were going to get off the printing press – to them it was a proofer, a proof printer. I think that's what the people from

the typography world and the industry felt, when they saw the first low resolution printers coming into market. They sold them as proof devices. Now, of course, the other people, the people who were interested in having that capability in their house or in their graphic design studio say, "My gosh, I've got the final piece. I don't have to go to a printer." So, in essence they were creating in-house, camera-ready art, and it's interesting to see how the two industries interrelated. Because the printers were stable, black and white, you didn't have any stability issues, unless your toner wore out, it was a nice solution.

But in the beginning, all we had was text and so at Adobe we said, "Wait. There is power in PostScript – a device-independent page description language – that's in these printers that's not even been touched." For example, one of the pieces we would always show in the very beginning was type on a spiral, you know, that went around and around and around, because that was very difficult to do, and people were just flabbergasted. That's what led, I think, to John Warnock deciding that we should put some energy into making a drawing package that would literally take advantage of this fine technology and allow people to move and to do illustrative work. So, we developed Adobe Illustrator for that, and the packaging and all was fun because we were doing everything internally, and Luanne Cohen was the one that came up with a design for using Botticelli's "Venus" as being an example for the outside of the packaging. Of course, we had to get the Beckman Library to agree to license that image, and then Russell did a real cute thing. He made a design looking like a Roy Lichtenstein piece, and it was a wonderful marketing piece we used, and then when we went to introduce the products in Europe, one of the things one of our French people did, is they took the image of an ape and literally had it migrate into a human being and it was done with Illustrator, and when I got over there I thought, "Oh, this is clever." In the U.S., we hadn't thought about that, but our French group had thought about that.

McJones: You also created a newsletter …

Crews: When you're a startup company, how do you get your message out? You can go to conferences, you can talk to people, you can talk to industry leaders, you can talk to your potential customers, but how do you get your message out to a broad group of people? It occurred to me that maybe we should do a newsletter, and this is before newsletters were really ever done, and we should talk about what PostScript could do, and so we developed a newsletter and we called it *Colophon*. *Colophon* because that's the thing that you find at the back of every book that lists how you did something, the typefaces and the typography and the sense of that and it seemed like an appropriate name. So, we produced it, and we had to do this all in PostScript, because there were no other tools. We did a large form size and we had a printed and we sent it out to every possible person that would have any possible interest. We didn't buy a mailing list. It was for people we had made contacts with, and of course, to produce this was not cheap. Because we had to print it and send it and I'm not too sure how many issues. We probably did it over two years. But it was a way for us to then communicate,

between meetings and between conferences, to be able to at least contact our potential users of this technology and say, “This is an example of what you will be getting and doing,”

McJones: Adobe also had to start producing catalogs of typefaces.

Crews: Yes. Obviously, we were producing type and we had to produce catalogs for the typefaces, and that was a challenge. But we did that and we packaged typefaces and so it was an interesting time, particularly. By this time, we had developed a type group and I had known Sumner Stone from previous work, ATypI and all, and introduced Sumner to Chuck, and Chuck and Sumner hit it off beautifully and Sumner came in to run our type development group, and he brought in some very talented young people. They actually produced some of our own designs. They’re Warnock design, and we used Chuck Bigelow’s Lucida typeface. It was a wonderful group of very talented people that came in.

McJones: I remember the names Robert Slimbach and Carol Twombly?

Crews: Yes. Carol was a wonderful type designer.

McJones: Perhaps those two had been Charles Bigelow’s students? [I now believe this is incorrect: Sumner Stone had met Slimbach at Autologic, while Bigelow had hired Twombly to work in his studio and recommended her to Stone.]

Crews: Charles Bigelow was an asset because Sumner was very connected with him and so his students came out of I believe it was RISD, Rhode Island School of Design, and other places where Charles Bigelow had worked. He had been at Stanford, so we had some people from Stanford. Cleo Huggins came in and I think she was through our Stanford connection. It was a very talented group of people and Sumner did a wonderful job in really positioning the company as being not only the first people that were producing and would have typefaces, but they had a type program, and they were interested in developing type, and of course then there were other people at this time that started off also starting their own type foundries that wanted to develop PostScript fonts.

McJones: So, did your licensing work taper off?

Crews: We had licensed the libraries, so our licensing agreements for new typefaces had probably tapered off because we had our own in-house staff and Sumner was encouraging that new typeface development be done. Then Chuck Bigelow and Matthew Carter set up Bitstream [editor’s note: Carter’s cofounder was Mike Parker rather than Chuck Bigelow, while Bigelow and Chris Holmes formed Bigelow & Holmes] and went off and did their own typeface development there. So, the type people said, “This is an opportunity. We’re going to see more

and more typefaces, and Adobe's not going to be the only one that's going to make typefaces, but we will be a quality group that will develop lovely faces through the industry."

McJones: And the Adobe Type I format became prevalent?

Crews: Yes. Adobe Type I format was absolutely critical and then it became available.

McJones: So even the other developers would develop in your format?

Crews: Yes, when we decided to open that up, that meant then the other typeface developers could develop in our format and we would have more on the market. More faces, more reasons to print, more reasons to develop good typography, more reasons to just use our printing engines. So, the type and the applications were just another reason for PostScript to become more pervasive and provide an amazing solution for the industry. If you could reflect back on the number of times in the beginning stages where you had a document and you tried to print it and you wanted to print it on somebody else's printer, it didn't print. You couldn't even send it. So, this is what I think was sort of the building block for desktop publishing. If we hadn't had PostScript, the page description language, that allowed us to have a route for fine printing, as well as just proof printing or production printing, we wouldn't be where we are today. Of course, in addition to that, you need the applications and you need the typefaces and building blocks to actually do publishing.

McJones: Right. And the workshop the last couple of days helped show a lot of those pieces too.

Crews: Yes. The workshop was beautiful because it showed, I think, how the pieces had to work together and I think we were all fortunate to be there at the right time and at the right place and we got things going. It was exciting.

McJones: So, type was a catalyst. It wasn't necessarily a huge profit center, but it established that everybody should have PostScript in their printer.

Crews: Yes, yes, it did. I think type was, oh, I call it the glue that made it all happen, because if we hadn't had that, we just wouldn't be where we are today and it caused the whole revolution to happen, and I can't stress the importance of the fact that we brought quality to the market. It was absolutely imperative and I agreed a hundred percent with John and Chuck, that if we didn't do it right, if we didn't do it with the quality it deserved, we weren't going to change the world at all. So that was one of the reasons why I joined Adobe, because they believed in fine typography and the point that that's intellectual property. Those typeface designs are

intellectually beautiful pieces of art and they should be respected and honored and they shouldn't be just ripped off like other organizations were doing, and so I concurred with that.

McJones: Yes. So, you brought that to Adobe.

Crews: It was just imperative for me, personally, that that happen, too, and it was important to the founders at Adobe.

McJones: We mentioned type, and you said there was no color initially, just black and white.

Crews: Yes.

EFI (Electronics for Imaging)

McJones: Could you say a little bit more about, during your time, the onset of more graphics and color?

Crews: Yes. All during my time at Adobe, it was all black and white. The question is, color brings in another set of technological problems: more memory, how do you manipulate it, how do you handle halftones? How do you produce color separations? If you're going to print on a press, you're going to have to produce color separations, the four-color separations. When will we have a color printer? So, I was fascinated by that, the next step being into color, and who was going to solve that issue? I was approached by Efi [Efraim R.] Arazi, who was at Scitex Corporation. He developed Scitex and he wanted to start a company in Silicon Valley and he had hired Don McKinney as his director or vice president of sales and marketing. I had known EFI from industry conferences and he approached me and asked me if I'd come over and help him start EFI, Electronics For Imaging, and be his vice president of corporate communications.

By this time Adobe had grown and we had launched Europe and we had divisionalized the marketing communication activities into help supporting each of the divisions and so John Warnock had said, "Liz, why don't you now just be the spokesperson for the company?" So rather than running the marketing communications activities, I did that for quite a while. I found that exhilarating and I think it was helpful but I was missing figuring out with Russell, "Now, hey, we're going to show off that Agfa machine that produces film. What can we do to get people intrigued by it?" Then I would say, "Let's see if we can't make slides and we'll print the actual image and then we'll go to trade shows and we'll hand out these slides, and we'll hand out the printed pieces." Russell would say, "Yes, I think that's a great idea." <laughs> So that was the type of thing I enjoyed doing. How do you communicate something that's really hard to

understand unless you can get it into a solution that somebody can grasp? I missed that and so when Efi asked me to join EFI, I decided to go ahead and make that leap.

Looking back, I realize that I probably left the best job I ever had at Adobe, but it was time I think to move on and it was another problem to solve. How do you communicate what we're going to do next? Our big problem at EFI is we had developed, or were developing, mapping tables that would allow people to be able to integrate into their software the ability to say, "Okay. I must have this mapping table if I want to go to a color printer of this type or the display has to be this type of mapping. Am I going to go RGB or CYMK?" and those type of color mapping issues. Efi had that technology with Scitex from Israel and so I went over to help him start that company and we worked on getting that message out. One of the first things I'll never forget doing was going to one of the Seybold conferences, I think it was, or maybe it was MacWorld, but we wanted to show that the color copiers were unstable and that you had to have mapping tables. So, we sent an engineer around to make color copies from different copy centers throughout the Bay area. He came back with examples and you could see very blatantly how the colors had migrated, and so that was one of the ways we put together a demonstration and we could show these people that, "This is a problem. We're going to have to work on this."

McJones: Let me just clarify. Did EFI make complete printers that included the mapping part?

Crews: No. They just made the controllers. It was called an EFI controller, and that went on to your color printer and that gave your mapping.

McJones: But it could drive, say, a film printer?

Crews: It could drive a film recorder or whatever.

McJones: Film.

Crews: I enjoyed that experience. I found the environment not really healthy for me. Efi had an interesting personality, and so I decided by that time it was about time to retire.

McJones: I see.

Crews: So, I did some consulting after that.

McJones: You were at EFI for a few years?

Crews: Just a couple years, yes. Mainly because at the beginning we started the company and the question was how were we going to get funded, and there was a general patent that Efi had from MIT days and he used that as a way to acquire funding by suing people that used that patent.

McJones: Oh, interesting.

Crews: It was an interesting funding idea.

McJones: It might be also useful to just say briefly about his background, what Scitex did.

Crews: Oh, what did Scitex do? Efi came out of the printing and publishing industry and one of the things that the printing and publishing industry needed was a page makeup system that allowed them to place halftones, color, text, graphics. In essence, a picture page layout system like we have today and Blurb, one of the book composition programs where you place pictures and you place text and all, that was done on a very high-end Scitex machine and that was done probably in the 1980s. So here we are, this would've been an example, if you had to emulate something on the desktop, you would've said, "I want that Scitex capability," and that's what we now have today.

McJones: With InDesign and Photoshop and things like that.

Crews: And design and layout and kerning the characters and placing the pictures. I mean, if I looked back and I said, historically, what would I have wanted on my desktop today, I would've said I want a Scitex capability, and you have it. That's what's amazing.

You know, you stop and think about this. I've enjoyed making books. For the Museum of New Mexico Foundation, we went on several trips with a group and I wanted to record for the foundation what the joy of this trip was, et cetera. I had taken some photographs along the way and we met these different artisans and I came home and I decided, "I'm going to publish a book, a limited-edition book," and so I downloaded onto my computer Blurb software, BookSmart, and I literally created and laid out the text. I decided on double column. I was able to do drop capitals. I was able to typographically set it and fine tune it; column balance my columns and bring in pictures and I produced a 55, oh, I don't know, 60, 70-page book. If I'd have tried to do that earlier, I would've paid $175 for every color separation. There is no way I would've been able to produce 40 copies of that book, because I couldn't even afford to produce the first one. It would've cost too much.

McJones: And the standard was high.

Crews: Yes. So, you say it came out in the desktop publishing meetings. Sometimes we say, “Oh, we give all these tools to these people and they don’t appreciate them,” or they don’t have that knowledge base of producing quality things, but I think we are seeing more and more capabilities in that area. Originally it was thought that the only solution would be templates and that you had to give everybody a template or they wouldn’t be able to do anything, but nowadays it’s just amazing, totally amazing.

McJones: Some people can move beyond the templates?

Crews: People can move beyond the templates. They can take a template; they can modify it. In fine publishing you want things to sometimes flow through the gutter and on to the next page. You’re not bounded by a page any longer, and the pages can be any size. Thanks to PostScript.

McJones: Right. I wanted to just ask a couple more questions about Adobe since that was a crucial time. Just curious. Did you work with many of the engineers at different times? You’ve mentioned Ed Taft at Xerox.

Crews: Yes, I did. In the beginning days, you know, we all competed for access to the printer. And also, when I had to go give talks and I wanted 35 mm slides. I went over to the engineering group and said, “Guys, how am I going to do this now?” So, there was a lot of interaction and Adobe was a wonderful place to work. If I had a question and if I needed an answer, I could walk down to Bill Paxton’s office and ask him, “What do I need and what do I do here?” and there was a good rapport back and forth. Because it was a mostly engineering group, all engineers, practically, when I started bringing in the graphic arts people, I told them, I said, “You know what I think we need to do? We need to show value here too.” So, I encouraged them to enter any of the contests, communication arts, and said, “Let’s see if we can’t just win some awards for Adobe.” And we did, and I had them framed and put on the wall, along the engineering wall, so that I think we both had this sense, you know, “This is what they’re producing and this is the quality of things that can be produced,” and they elicit acknowledgement by the industry. So, I think it was a good balance of appreciation for each other. We were all involved in figuring out how to solve problems and it was a very interesting, a wonderful environment to work in.

McJones: And your background allowed you to bridge between the very technical side, the computer side, and the artistic side.

Crews: Yes. You know, I really never got my hands into doing a lot of programming after leaving college, until I went to Adobe and had to program my slides and presentation material. But because I think I have a skill in problem solving and a good skill in interpreting things, I was able to interact well with people that needed to understand what we needed, what we were

doing, and I could interpret that for them, and I enjoyed doing it. So, I could sit down and I think help Adobe in that way, and so that's what I said I'll do.

Consulting

McJones: Great. So, after EFI you did a little bit more consulting work.

Crews: I did a little consulting work after EFI. I thought about possibly going back to Adobe, and then I realized, "You know, the organization has changed and I enjoy startups and I enjoy the initial challenges of trying to get something new on the market." So, I thought about joining some other startup companies, and instead I was approached by Allen Rosman. He had a company he invested in called Ray Dream, and so I went over and helped in figuring out what he wanted to do and did some consulting for him and also introduced their rating technology to the press and things of that sort.

And then Microsoft called; Robert Norton was a type designer from England who was at Microsoft consulting with them, and he wanted me to come up and look at their program and recommend what they could do, and so I did. I spent some time up at Microsoft. I recommended a type program for them and what faces I would recommend that they do to balance what Adobe was doing and I did a little bit of work on that. At Adobe I had taken on all the responsibility for the public relations work in the beginning, as well as the advertising and so when Microsoft was getting ready to do something, I'll never forget, I went back to a Seybold conference in Boston, and I wanted some of those Microsoft people to meet certain people in the industry and I had a breakfast meeting and a couple of them didn't show because they were working up in their suite. I talked to my husband that evening. He said, "Are you having fun?" and I said, "Not really." He said, "Why are you there?" I said, "That's a good question."

So, I decided maybe this consulting for companies is not the path I really want to go down, and that's what triggered me saying, "It's time maybe to go take your expertise and skills and move them to some other area, like nonprofit work." That precipitated our move to New Mexico. I continued doing some technology work for the Museum of New Mexico Foundation because they had no online presence, and I worked on figuring out some ideas for them for how they could get an online presence in the beginning and development.

McJones: The web was there, wasn't it?

Crews: The web was there.

McJones: So, you helped them create a website?

Crews: Yes. And I recommended some things they should get involved with. For example, they should, like all the museums, have a presence on Facebook. In other words, these were the tools in the beginning that no one understood why do we need them, why are people doing that? Of course, now you would expect a museum to have a presence on Facebook, but in those days, back, you know, 10, 15 years ago, they didn't, so it was sort of one thing leads to another.

McJones: So, you continued to do those kinds of things?

Crews: I continued to do those type of things, and you look back at some of your skills, I suspect you would say, you know, what strengths were there, and it probably goes back to the problem-solving thing that I picked up way back in math and computer science days. It's a problem and how do you solve it and how do you place yourself in that other person's position and say, "Okay. I understand-- I know what I've got and I understand what I can give you. I know the features, et cetera," but what does that person need? What do they want? And so, like at Adobe, that would be the question: "I can tell you all about PostScript, but why do you need it? What are the features that really talk to you?" and that's what I enjoy doing,

McJones: Have you had a chance to explore the museum here?

Crews: You know, I explored the museum several years ago and I haven't had an opportunity to spend that much time in it because you all kept us too busy the last two days at that desktop publishing meeting. But I'm looking forward to that. I was sorry to hear the Babbage machine [Difference Engine] is gone.

McJones: That's right.

Crews: That was a fascinating thing I saw when I was here before. I'm so thrilled I was here to get to see that. It was amazing.

McJones: It's a physical thing. It's beautiful.

Crews: The physical beauty of it and then you look at how it worked and you just sort of said, "Oh, my gosh. How could somebody have thought that through?" And then to have it actually produced.

McJones: Right, yes. Well, the museum is actually hoping they can get another one commissioned.

Crews: The one that was here went to England, I think? Or did it go to a private collection?

McJones: It's owned by a private collection.

Crews: That's what I thought. It went to a private collection and it was on loan here for a while and I believe the collector was going to make two of them I think, or maybe we can encourage that collector to make another one for the museum.

McJones: Yes.

Crews: But I think what's fun about walking through the museum is to see the history that's there. Not only in the hardware but the implications of how things have moved. It's a wonderful museum.

McJones: Yes. I hope you can go back through it again and also see the new software exhibit.

Crews: I would like to do that. I only got to briefly walk through it the other evening and I plan to do that,

McJones: Well, just in summing up, do you have any things I should've asked you?

Crews: Any things you should ask me? I don't know. Really. I enjoyed the last two-day conference. I thought that was fascinating, and I was very honored to participate in it and I want to thank you for asking me and for this interview too. You know, there are more women in the industry now, a lot more women in the industry, and I'm delighted to see that. That's exciting and encouraging. I just think you just have to maintain your sense of ethics and your sense of balance and never give up a sense of the best possible quality that you can produce and you'll go a long way.

