



## **Oral History of Charles Bigelow**

Interviewed by:  
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## Table of Contents

|  |    |
|--|----|
| Reflection on Desktop Publishing Pioneer Meeting .....           | 3  |
| Childhood and Adolescence.....                                   | 5  |
| Reed College Years.....  | 8  |
| Early Printing Career in San Francisco and Portland, Oregon..... | 11 |
| Gerald Murch .....   | 14 |
| RISD, First Work with Digital Type, MacArthur Award .....        | 15 |
| Bigelow and Holmes Studio .....                                  | 18 |
| Lucida .....   | 21 |
| "Scientific American" Article (1983) .....                       | 25 |
| Imagen.....  | 27 |
| Kris Holmes and Lucida .....                                     | 28 |
| After Lucida.....  | 33 |
| Teaching at RIT .....  | 35 |

## Charles Bigelow

### Conducted by Software Industry Special Interest Group

**Abstract:** The interview with Chuck Bigelow opens with a reflection on the Desktop Publishing meeting which had just concluded. The first half of the interview focuses largely on his biography, with particular emphasis on Bigelow's upbringing and early education in Detroit and then at Reed College (studying calligraphy under Lloyd Reynolds), as well as his early career in San Francisco and Portland, Oregon which included ongoing intellectual and vocational development. His long-term collaboration with designer Kris Holmes is treated extensively, as is the development of the Lucida family of fonts. The interview then moves into later phases of Bigelow's career and a range of other topics, including his perspectives on the early personal computer revolution, the "Font Wars," and the rise of independent type design. Teaching at RISD, Stanford, and RIT is covered, as are industry collaborations and consultations, notably Imagen, Adobe, and Apple. The interview concludes with thoughts on the place of desktop publishing and digital type design in the long history of human communication. Those seeking more technical discussion of Bigelow's type design are referred to his interview with Yue Wang published in *TUGboat* 34 (2013): <https://tug.org/TUGboat/tb34-2/tb107bigelow-wang.pdf>.

### Reflection on Desktop Publishing Pioneer Meeting

**Matthew Kirschenbaum:** This interview with Charles A. ("Chuck") Bigelow, Melbert B. Cary, Jr. Professor of Graphic Arts at the Rochester Institute of Technology, was conducted May 24, 2017 by Matthew Kirschenbaum (Professor of English and Digital Studies, University of Maryland) at the Computer History Museum. The interview followed a two-day Pioneer' Meeting on desktop publishing which brought together many leading figures from the industry and historians. This interview is part of the Software Industry SIG's ongoing oral history project. Good afternoon, Chuck, and thank you for being here.

**Chuck Bigelow:** You're welcome, Matt.

**Kirschenbaum:** I thought we could start by talking about the last two days. Tell me your overall impression of the Desktop Publishing Pioneer meetings (May 22-23, 2017), and whether there was anything that surprised you or were there any missed opportunities or missed moments in the conversation.

**Bigelow:** Of course, these things happened 30 to 35 years ago, so it was interesting to hear from some of the principals, many of whom I knew in that era and some I didn't or whom I met only in passing. It was interesting to come back and hear their views of what they did and what went on compared to my perspective on it.

There were two things that emerged that I knew at the time and I've always known, but I never thought to put them into some kind of encapsulation. One was that nearly every person from Adobe or Aldus or anybody else, Warnock and Geschke, Paul Brainerd or Richard Ying, that when they saw an opportunity, an emerging possibility for a new venture involving computing and word processing or newspaper text entry or page description languages or fonts, that they also saw a closing window of opportunity, and you may have noticed that where they'd say, "Well, when we tried to peddle this idea to somebody they'd say 'We have a five-year cycle time' but we knew that we didn't have more than two years before somebody else would do this and so we had to take that chance"—whether to leave Xerox PARC and start their own company or to just close a deal that was taking time. And so with each kind of emerging opportunity there was only a limited time to exploit it, to capitalize on it, and the fact that these were mostly successful firms suggested that they were successful in doing that. They didn't dawdle, they really went for it, and they-- all these stories of staying up all night and living in decrepit circumstances in order to focus night and day on it-- in developing these products. And some bragged about it and some were modest about it, but all had that same timing issue and the same sense of "Let's not lose this opportunity" and I thought that was fascinating.

The other thing that was in my field—typography—a lot of ideas for technical solutions that you can trace back; these were ideas that already existed, whether by French mathematicians in the '50s, a Russian mathematician, Sergei Bernstein in the early part of the century, a French mathematician from the nineteenth century, Charles Hermite and so on; these were often abstract mathematical constructions that had no particular value technically until they were absorbed into computing. And algorithms were developed by Donald Knuth or Pierre Bezier in France or Paul de Casteljaou -- he developed some of these famous algorithms for Bezier curves, but he worked for Citroen that didn't allow him to publish. And so we call them Bezier curves, not Casteljaou curves because Casteljaou didn't publish until later, though his algorithm for decomposing Bezier curves to rasterize them they call it the de Casteljaou's algorithm. I just thought well, okay, it's a way to think that this sort of ivory tower academicism that people say we should do practical research is okay, but it might take fifty or a hundred years, but suddenly these things are tremendously valuable and essentially founded the way of doing things. So I thought that was interesting.

**Kirschenbaum:** So those mathematicians really furnished the mathematical basis for digital typography.

**Bigelow:** Yes, they did. Well, you could say primitive man furnished the fundamental ideas because in caves like in Chauvet in France they now say that you can see

little images of animals that were done by daubing like pixels and others were outlined or made with strokes, and those are the three major ways of making fonts in the analog world that were adapted into the digital world. So it's ancient ideas, fairly old mathematics, but modern implementations in computers.

**Kirschenbaum:** That pinpoints what really stuck with me from the last two days, which is that you have this kind of collision between those frenetic technical cycles that you were talking about a moment ago, the fast pace of the digital world, but then ideas and techniques that go back centuries if not millennia. And I wonder if desktop publishing is unique in that regard as an area of computer applications for having that kind of juxtaposition.

**Bigelow:** I don't know. Unfortunately, I'm sort of specialized in this one area so you could say, "Well, pointillism in France, Seurat and others who developed that daubing technique, it's a precursor to a pixel -- Paul Signac and others -- it's a precursor to this." The ideas obviously existed in the twentieth century, what the Germans would call a raster, but an orderly array of picture elements. "Pixel" is a word that came from Bell Labs meaning "picture element" and IBM called them pels, which is another abbreviation of picture element. So the ideas were there but the implementation was not in computers.

### **Childhood and Adolescence**

**Kirschenbaum:** Let's talk a little bit about your biography, starting with childhood. Tell me something about where you grew up, your family, your life through high school.

**Bigelow:** Okay. I think about this more than ever these days because it was a long time ago, but I was born in Detroit. My parents were a middle-class couple. They'd gone to Michigan State University and met there. I was born in 1945. My first years were spent on my grandfather's farm; this was for a few years and then my parents moved to a suburb. My grandfather was an interesting character. He had been a mercenary soldier in the Mexican Civil War (the Mexican Revolution) and he could ride and shoot and do all kinds of glamorous things that a kid was interested in; but I grew up without any of that. I mean I rode a little bit but didn't follow in that path. But something happened that interested me looking back on it, and it actually influenced my whole intellectual life, but I didn't know it then. I contracted a disease that maybe was rheumatic fever when I was just starting the second grade and so I was taken out of school and I had to be bedridden or stay at home for a year. I missed the second grade, but my parents were concerned and helpful. And they would go to the school and get the lesson plans from the teachers and bring them home and they would get the teacher's handbook or teacher's notes about what answers there were, and they would give them to me and then they would sometimes be too busy to actually homeschool me in a sense. I was given the stuff and kind of told the problems and then I would be left alone to try to figure it out so I invented ways to answer all of these problems and questions and quite often I got them right but not always; often I was totally wrong.

**Kirschenbaum:** What were your favorite subjects?

**Bigelow:** Oh, I liked all of them. There was stuff about animals I liked and there was stuff about reading stories, ape stories were my favorite thing, mathematics but it was of course just arithmetic. So I'd invent these little algorithms or methods to do things and then later my parents would come home and look at the teacher's manual for the right answers and they would tell me, "This was right; that's right; this is right; oh, no, this is quite wrong." So then I would have to go back and study where my invention or my assumptions were wrong and sometimes I was pretty sure I wasn't wrong, -- just that the orthodox method of teaching instituted the right answer, but there were alternate answers that I thought were as good and other times I was wrong.

And so when I got to the third grade I discovered where I was really wrong and that was in long division and complicated multiplication. I had invented some cockamamie method of adding things and fixing things and when I saw that my answers were not the same as in the teacher's workbook back when I was sick, I'd invent kind of epicycles to correct this. And so I never quite reinvented the standard school algorithms, but when I got to the third grade the teacher was too busy with 30 kids running around and it was usually the girls -- the kind of smart girls who were usually ahead of the boys in class -- and they would show me, "Chuckie, you don't have that right. Here's how we do it," and so I learned really how to do those things from my classmates. So it left me a little puzzled about math things sometimes, but it left me with the sense that if you don't have complete information and things are kind of murky and you're not sure what's going on don't worry about it. Figure out the best you can and then if you see something's wrong you fix that in your mind and go forge ahead; so it always left me with that kind of attitude, which is you can figure things out and don't always accept the received notion and wisdom and there might be other ways.

**Kirschenbaum:** Good traits to absorb early on.

**Bigelow:** Apparently. I can't say that they really were important, I just felt I was catching up to a year that I had missed, but they turned out to be helpful in this particular field.

**Kirschenbaum:** Do you have any memories of learning to write cursive?

**Bigelow:** Oh, yeah, but first they would explain by showing you hand shapes, I never figured that out, but first we wrote the ball and stick letters and then I wrote cursive, and again I noticed that the girls wrote beautiful cursive and I had a little more trouble with it, but I had a lot of manual dexterity because my dad was a painter on the side, an amateur portraitist and painter, and so I'd watch him and he would paint things and I would imitate that. My mother later became an English teacher and she then would try to teach me good grammar and stuff like that.

**Kirschenbaum:** And by the time you got to high school, what was school like?

**Bigelow:** Well, here I can say some negative things, but not far from our house, a few miles away, there was a science museum and an art museum and they were just wonderful; I loved to go to the science museum. My parents would drive me and I would wander around more than they wanted to be there, so they signed me up as a junior member of this museum as a kid; and they had a library that was in the museum and only the members could use it. So, I would sit there and read books, but again the problem was this library was for researchers and staff and so the books were for adults, and I was ten years old or nine years old so I would kind of read these books and the vocabulary was often way beyond me and some of the thinking was beyond me, but I would persist from my early experience, "Well, I can figure these words out as I go. I can figure this stuff out as I go." And again, I didn't always get it right but there was a fantastic book, "The Vertebrate Eye and its Adaptive Radiation" by [Gordon Lynn] Walls so it's inexplicable. I was reading these little "Golden Field Guides" and stuff and here's this book with diagrams of the retinas and all of this stuff, and toward the end it starts explaining things about the eyes of animals and birds and stuff, that I found so fascinating even though I couldn't understand it. I liked that aspect of the museum.

And the art museum was beautiful; I'd go there with my dad and he would show me sculptures and he'd point out let's say an impressionist painting. You stand a certain distance away it's a scene and when you get up close it's just little daubs. Or my dad would point out that a ballerina's hand is making a delicate move say in a painting by Degas. But in the distance, you see this young girl's hand doing something, but up close they're just little flecks of brush strokes so I remember always that things look different close up and far away and you can make impressions.

Then I went to high school and there was a high school associated with these; it was a private school and I could go, and I thought this will be my dream. I'll spend all day in the museum library studying science and then I'll go for fun to the art museum and see the beautiful sculptures, Henry Moore, they had a wooden sculpture of Henry Moore and I couldn't imagine anything better. I got there and it was nothing like that at all. You weren't allowed to go to these museums, you had to be in classrooms and study halls, and it emphasized social control and rigidity and how to sit still rather than how to learn things. Oh, we had to learn the lessons, so I was a good student and I did it but after a few years I was frustrated and bored and so I began to, in my way, rebel. My friends who didn't rebel did very well in life and I often envied them that they could stand this regimentation, but I stole some glassware from the chem lab and distilled a gallon of apple brandy and some of my friends got drunk. And I made pyrotechnics and one night I blew up a little sector of the school; it didn't do any damage but it scared people and it was a beautiful sight to see this exploding aluminum dust make a brilliant flash like a lightning bolt. So I got in trouble and I was put on probation and I could no longer do these wicked things without being expelled, but the school kept me on. A friend of mine who was a partner in crime was expelled but they kept me.

**Kirschenbaum:** What was the name of the school?

**Bigelow:** Cranbrook School in Bloomfield Hills. Mitt Romney was not in my class, but he was a few years behind me and I knew his older brother. So, they kept me on and there I had to behave myself. I became interested in literature and mythology and I wrote papers, and later I won the grand prize in the state writing contest sponsored by the district. They gave me a typewriter—first, they gave me dictionaries and I liked that and then my last year I won a typewriter. I won the National Council of Teachers of English Award so everybody thought I'd become a writer, but I went to college and I was so glad to get out of high school. I chose a college that was sociologically the opposite. My high school was boys only so I went to a coeducational school and my high school was highly regimented and basically a kind of a Republican capitalist Detroit orientation, so I went to Reed College in Oregon, which-- the motto was "Communism, Atheism and Free Love."

### Reed College Years

**Kirschenbaum:** How did you find your way there? How did you hear about Reed?

**Bigelow:** I was reading some poetry by Gary Snyder, a beat poet, a friend of Jack Kerouac's and Allen Ginsberg's, and he had gone to Reed College and I thought that sounded really cool, and then I saw there was an article in some magazine that showed Reed College kids and they were wearing serapes and blue jeans and had beards and I thought that's cool, I want to go there, and so I did.

**Kirschenbaum:** And this would have been in the mid-1960s?

**Bigelow:** In 1963 I went to college. My high school told me that I was such a screw-up. But actually, there were some very nice faculty who were supportive; I really admire them for this -- especially for putting up with me. My chem teacher, I sort of had an affinity for chemistry what with distillation and pyrotechnics, said, "Well, look. You've messed up here but we're going to keep you. But let's say that you apply for a good government job like the Central Intelligence Agency. The FBI will come to ask about you and we're going to have to tell them of your misdeeds." But by the time I went to college, that was not my goal. And he said, "We'll tell some of the colleges and we're not going to really recommend you to the top-of-the-line Ivy League schools," but I applied to Reed and apparently my school didn't bother to tell them anything or they didn't care.

So, I'm sitting there and it's these hard benches in what had once been the college chapel and then a guy came out to lecture. We were reading "The Odyssey" in translation, but he came out and he read the first parts in Greek, <speaks Greek> "Tell me, O Muse, of the many-turned man, Polytropos," and I thought this is really cool, all these words; they still exist in English,



“android” in science-fiction novels, so I thought I’ve come to the right place and this is going to be cool.

**Kirschenbaum:** I have a lot of admiration for my own students, but I’m not sure how many of them would hear the opening lines of “The Odyssey” and their response would be, “Man, that’s really cool.”

**Bigelow:** <laughs> Well, Reed was supposed to be a really good school for smart kids and I thought well, I’d better-- unlike what I felt in high school where I rebelled -- but here I thought it’s my job to get all of this. So Mousa, Muse, andros, man, polytropon, multiply turn, polyethylene is a compound -- I can’t recite most of it but anyway, it seemed exciting.

**Kirschenbaum:** And did you just thrive once you were there?

**Bigelow:** Oh, yeah, I just loved it and I studied linguistics as a sophomore. In fact, in order to do so I was supposed to take humanities one year as a freshman and modern European humanities the second year for history and literature. In high school I loved biology but I couldn’t take ancient and medieval history because it met at the same time as something else. I got to college and here was a whole course in ancient and medieval history so I loved it. But I couldn’t take the linguistics and structural anthropology that I wanted because they met at the same time as the humanities lectures in the second year, so I adopted my old method. I said, “Well, I’m going to take these other courses” and they didn’t cross-check you so I could take these other courses and just never went to my humanities lectures. It wasn’t until the end of the second semester that my teacher discovered I never went to the lectures. But I would read the books and then in class you’d debate and I could listen to what other kids said about the lectures and I thought okay, I can muddle my way through this.

**Kirschenbaum:** So it was very different from high school.

**Bigelow:** It was the opposite. Well, really in some ways it wasn’t. You had to sit still and you had to listen and you had to do homework and you had to write things so in all of those senses, the traditional senses, it was the same, but the orientation and attitude were entirely opposite.

**Kirschenbaum:** And of course you studied with Lloyd Reynolds.

**Bigelow:** I did. As a senior, I felt that I didn’t want to leave without that. Lloyd was an extremely charismatic guy. Actually, he had his Ph.D. in literature, but he had become interested in writing and calligraphy and he saw that writing was the fundamental aspect of civilization. You don’t have what we call modern civilization without writing and so he taught it that way. Some people thought you just learned to write pretty stuff but Lloyd drilled it into you

that we were talking about Mesopotamia and the Greeks and the Romans and the medieval era, and he would point out that Charlemagne was almost illiterate; he could sort of read, he couldn't write much, he could sign with an X, but he imported the best scribes of his era. The best among them, the chief of the scribes, was a guy named Alcuin from York. So he got Alcuin of York and Alcuin recruited guys from all over the world -- Peter of Pisa, Paul the Deacon, Theodulf the Visigoth [of Orléans], and they came to work in Charlemagne's court. So, this was the kind of stuff that you could learn from Lloyd if you listened, as well as how to write Chancery Cursive.

**Kirschenbaum:** And he was professor of calligraphy?

**Bigelow:** He was professor of literature and art history, but he taught the calligraphy course and by then he was famous and tenured and there was really nothing they could do to stop it.

**Kirschenbaum:** And why was calligraphy taught at Reed?

**Bigelow:** Because Reynolds taught it.

**Kirschenbaum:** But it established a tradition because he was followed by Robert Palladino.

**Bigelow:** Yes, exactly, and again I never have been totally successful at things. I was an anthropology student mostly because I wanted to study mythology. I didn't want to study literature because I figured everybody knew that; I wanted to study the ancient stuff. So when you read these Greek myths, even when they're polished, you realize that before, this was just an oral tradition. People told these stories and then later the dramatists-- well, maybe Homer, or whoever was Homer, wrote these things down and then the dramatists wrote down stories from mythology. I thought I wanted to get back to the roots; where do these stories come from, where does poetry come from, not just what we hear about it. I didn't get to study those things the way I thought, just as high school wasn't what I had hoped it would be.

But you had to take a qualifying exam at Reed in your major subject in order to be allowed to become a senior and to write a thesis. So, usually anthropologists flunked the history exam. We had to take economics and history and historiography and other things, and I thought I don't want to fail that history exam. I liked history and I got a book -- it was something like "The History of Europe From the Beginning." I had always listened in my courses and I read it through, and there was this puzzling question, "Compare the Great Man Theory of history with Annales Theory or the Social Movement Theory." I was ready and I wrote about Charlemagne. I passed that but I flunked the econ qualifying exam because I hadn't studied and I hardly went to class. But they said, "You can't become a senior unless you take economics courses." But

they met at the same time as calligraphy so that summer I went to summer school and took two courses in economics, one in economic history and one in labor economics, so that I could pass them and take calligraphy.

**Kirschenbaum:** And because it must be said there's somebody else who became fairly famous who studied calligraphy at Reed under Robert Palladino. I'm trying to recall the name.

**Bigelow:** Steve Jobs--

**Kirschenbaum:** <jesting> Steve Jobs; that's the name I was thinking of.

**Bigelow:** He wrote about that. He gave a talk at Stanford about that. I don't think he mentioned Palladino's name -- I have to look. Lloyd Reynolds retired a few years after I studied with him modern European humanities. He got Reed to hire a calligrapher who had been a Trappist monk, a Cistercian monk, and he was the calligrapher for his monastery. And he studied with another famous priest, Father Edward Catich, who had studied the Trajan inscription in Rome and could write by hand with a brush exactly like the Roman sign writers of two thousand years earlier. Catich was a phenomenal character and Palladino-- Bob Palladino studied with him. So Jobs studied with Palladino and my current partner and wife, Kris Holmes, (we first just started as a design team) also studied with Palladino and very briefly with Catich so that tradition led to these different things. And some people said Steve only knew calligraphy, he didn't really know about typography, but the fact is he had that aesthetic value that this was important.

### **Early Printing Career in San Francisco and Portland, Oregon**

**Kirschenbaum:** And did you meet Kris Holmes at Reed or was that later?

**Bigelow:** I did meet her at Reed, but several years later. I'd gone off and worked in San Francisco; I'd studied typography with a man named Jack Stauffacher at the San Francisco Art Institute and I really thought that was terrific stuff too.

**Kirschenbaum:** I was going to ask you about that so tell me about how you got from Reed to San Francisco, studying at the San Francisco Art Institute.

**Bigelow:** Well, I wanted to study film; I like storytelling so I wanted to go study in Poland with the directors I liked or maybe go to UCLA, but I went to San Francisco because it was the hippie era and the summer of love and I thought oh, I'll go the art institute and study there. But I didn't actually turn out to like the film courses, but I liked Jack Stauffacher's typography course. And he is still alive; he's in his nineties now but he's a very vigorous, wonderful guy and he loved type and I think that's what he -- just like Reynolds -- loved writing.

Stauffacher loved type with a lot of energy. It wasn't just like "Oh, boy, type." It was like "Look at this. Look at that. How do you do this? How do you do this? How do you do that?"

**Kirschenbaum:** Were you learning to print?

**Bigelow:** Yeah, I learned to set type by hand and print it on a press. I printed a little book of poetry that I had written. It was called "A Martian Passport." It was about some future in which the early colonists of Mars had a new vision of how society would work. They were short, little anecdotes about them and they had funny names.

**Kirschenbaum:** How about the title?

**Bigelow:** It was called "The Martian Passport."

**Kirschenbaum:** I love the title.

**Bigelow:** I made up names from anthropology-- one of the characters was called Xenon Leonardo and another was called Tharsus Chairmount and they had little wisdoms and they felt that traffic, that congestion had destroyed the essence of Mars and so these were remarks about a revolution that had changed the way things were done.

**Kirschenbaum:** I'm thinking about what you've said so far and it seems you've always had this interest in history and words and in the visual. So did you feel that was beginning to come together in the study of typography and printing at that point?

**Bigelow:** It did because with calligraphy and typography there's these visual shapes but they're in the service of language and literature and just daily life and so I was fascinated that these abstract shapes represented language. In high school, I edited the high-school literature magazine and we went to a print shop-- it was actually on the same vast campus of the museum and the high school and there was a famous art school there where Eero Saarinen taught and Charles Eames taught. I could get free of the study halls as the editor, I could go to the print shop and the head of the print shop was a guy named John Backus and he moved very slowly so we called him Flash Backus and his major domo was a woman named Effie May; she was a lot like Roseanne Barr, the comedian. She had a tough-talking way and we were just boys and she had really put us in our place and so I enjoyed that, and they had a linotype machine-- the old linotype machine that had the etoin shrdlu keyboard, not the QWERTY keyboard, and the linotypist was clearly a drunk. Later I thought that they're inhaling so much lead that they actually have lead poisoning. It makes their hands shake and they drink to kind of calm their hands down. So that was my first introduction to type, but I didn't really know the history. Stauffacher later taught me what it really was.

**Kirschenbaum:** And you found your way to the Oregon Times. Was that your first job in the industry?

**Bigelow:** Well, I wound up getting out of the institute. I didn't go to film school as I had wanted and I moved back to Oregon and I did freelance book design, I wrote columns for not an independent newspaper, but essentially countercultural newspaper and then I worked as art director at the Oregon Times. I met Kris Holmes earlier. An Italian mime whom I'd known who was a friend of Stauffacher's in San Francisco, came up to teach at Reed in Oregon, Carlo Mazzone-Clementi; he was just a character. And I had worked for the San Francisco mime troupe briefly designing things and taking photographs for them in San Francisco and they had earlier done commedia dell'arte so I wanted to see what Carlo taught, but I could juggle a little bit so I traded with him; I would teach his class how to juggle and then I could get to take his commedia classes. And one of the people was this nice girl, Kris Holmes, a Reed student, and we met and we were friends, but not close or anything and then I didn't see her for years, and then I was art director at the Oregon Times and Kris came in looking for work as a calligrapher. She had her portfolio and I looked at it and I said, "Well, it's nice to see you again. I don't have any work for calligraphers, but I need a paste-up artist to help me." Remember yesterday we were talking about they got type and they waxed it and pasted it down. So, I said, "Do you know how to?" She had worked at Hallmark Cards for a while. I said, "Do you know how to do that?" and she said, "Oh, sure." And so, we hired her but then she moved to New York. She was actually a dancer and she moved to New York to study dance and on the side. She worked in Harcourt Brace as a paste-up artist. Then we reunited a few years later and then became serious about a studio. I just scuffled around trying to find work here and there designing posters and so forth and at the Oregon Times was the first time I was really an art director. It was a funky monthly political magazine, there was nothing grandiose about it,

**Kirschenbaum:** What did it teach you?

**Bigelow:** How to organize, which I never liked to do, but I got organized, how to work with people, how to get people to do stuff, how to get the type all set right, and the biggest problems were that the fundamental issue, the editors and the writers always wanted more words, but we could only afford a certain size magazine. But they also wanted it to be readable. And so I couldn't set the type too small to get all their words in because then the readers couldn't read it So, there are constant friction with me and with the schedules. They mentioned this yesterday, that every minute a certain newspaper was late, every minute it cost \$7000 in 1960 dollars. We had the same problem and we were tiny, little. We went to a big newspaper and they put our magazine on the press, it was a big rotary press, a litho rotary press, and they would turn it on and you heard, "zzz," it'd rev up and it would run for maybe a minute, and then it's go "vvv" down and our 5000 copies were printed.

**Kirschenbaum:** And that's all it took.

**Bigelow:** That's all we had space for. So, I had to kind of herd these different people together to actually make the schedule and that was always difficult. I had to get the writers to cut stories to fit them or get the editor to cut them; it was fascinating.

### **Gerald Murch**

**Kirschenbaum:** Were you also taking classes again at this point with Gerald Murch?

**Bigelow:** I started to in 1973, '74-- or was it '74, '75-- I've forgotten-- Gerald Murch was a psychophysicist who'd gotten his degree in Germany.

**Kirschenbaum:** What is a psychophysicist?

**Bigelow:** Yes. He taught perceptual psychology, but it doesn't mean a crazy physicist of course; it means in the nineteenth century, Weber and Fechner were two German physicists who basically wanted to understand how physical stimuli, physical facts affected your psychological state. And they did things like you'd have two objects and you'd have to hold them up and select which one is heavier; then if you wanted to know which one was-- say this one's heavier-- how much heavier does the next one have to be to make a difference. And they came up with this theory that a lot of perceptions worked logarithmically rather than incrementally and it was true of sound and light and so on. So Murch had studied deep color and he studied these things. So I took first a course in perceptual psychology and then a course in color vision and there I saw science. I had always loved it but this-- how you apply scientific principles to visual principles.

**Kirschenbaum:** Was that the sense that it would be useful to you in your work or was it more just following an interest that was compelling to you?

**Bigelow:** I did it specifically because I thought that typography had a flaw-- a fundamental flaw in which-- from Reynolds and Stauffacher I learned these important facts about aesthetics and the aesthetics of letter forms, but this was received wisdom passed on for centuries and yet it all depended on what goes on in your eye and brain and I thought isn't there a scientific view of this? If a certain typeface is supposed to be more legible, do I know that because my teachers told me and their teachers told them or somebody wrote an opinion a hundred years ago or can we demonstrate it in some measurable scientific way? And there I discovered in Murch's courses what I thought was a wonderful explanation; it turned out not to be as wonderful as I had hoped, but it was important; and that is that the human eye responds differently to different levels of detail to make it simple. As details get smaller, they're very much harder for your brain to understand them, not just in the optics of the eye, but in how the brain processes it. And oddly enough, when they get bigger you have trouble also. So I was able to map that to kind of the type sizes that you used -- that small sizes are harder to read and that

big sizes, too. We don't bother to do it, and then this occurred later when I thought more about digital typography. I didn't believe what people had told me about what was important and legible and there was a theory, in fact wisdom, that the beautiful is also the legible and the legible is also the beautiful. It turns out that they're actually sort of orthogonal, they're separate, and that what you think is beautiful in a big font, a big typeface, may not be readable in a small size in a book and the typeface that you see in this book that you can read easily, when you blow it up it might look clunky; it doesn't have the kind of elegance that you might expect. So these things puzzled me and I wanted to see if there was some explanation.

**Kirschenbaum:** Was this the crystal goblet approach to typography?

**Bigelow:** Well, that's one of them, yes. Beatrice Warde is one of the greatest and one of the very few women typographers of the first part of the twentieth century and she said this, that there's a functional view that type should be functional, that the knowledge, the content in the printed work should flow into your consciousness easily and the fact that you might have an ornamental tankard was actually an impediment to this, that we wanted typefaces that would just communicate effortlessly like wine in a crystal goblet; the glass doesn't interfere with your appreciation. You see the color. You hold it by the stem so you don't obscure the color of the wine, you smell it because it has this big open bowl, and then you can sip it and receive that knowledge.

**Kirschenbaum:** Would it be accurate to say that you weren't satisfied with just receiving that as a truism; you wanted to understand the scientific basis of it?

**Bigelow:** Exactly, and I actually still work on that today with a vision scientist, but we can talk about that later; his name is Gordon Legge at the University of Minnesota and he's a psychophysicist too and he was inspired by the very same papers that I read in the 1970s, but he actually went and studied with the guys who wrote those papers, Campbell and Robson at Cambridge and so Gordon really knows the stuff. I think I know it; I imagine it ,but I'm not a mathematician to understand it like he does.

### **RISD, First Work with Digital Type, MacArthur Award**

**Kirschenbaum:** And if I have my chronology right, by the end of the decade, by the end of the 1970s, you had found your way to RISD where you were teaching? Is that correct?

**Bigelow:** Yes, in 1978 I went to RISD.

**Kirschenbaum:** So, how did that happen?

**Bigelow:** I had a friend who went to RISD. He was sort of like me, living in Portland, and he decided he wanted to go back to school and learn graphic design and he went to Rhode Island School of Design, and somebody had asked me to apply there several years earlier, five years earlier, and I did but I was rejected for a job that was given to a friend of the chair of the department. When that person left, they were kind of bereft of a teacher. And so Kris and I had a studio where we were working, in Portland, and I was printing some fine editions of things and doing hodgepodge jobs here and there and they called up and they said, "Well, if we offer you this job would you take it?" and Kris says, "He'll take it." <laughs> So, I went to RISD and Kris went to work at a firm in Massachusetts called Compugraphic which made type.

**Kirschenbaum:** That's fascinating. I wasn't aware of that connection.

**Bigelow:** I taught at RISD for three years, and in 1980, I think it was, Jonathan Seybold was there. I had met his sister, Patricia, and I had explained these ideas. I was taking a course at Harvard on the physics of information, and I can't remember today the name of the professor. I couldn't look it up; I couldn't find it. But anyway, it was a wonderful course, and he talked about, not information theory so much, but the physics of information, and he showed the issues of digitization of signals and signal processing. And it reminded me of those things I had studied in Murch's course about the kind of limitations and the so-called bandwidth of human vision. And then I saw you could put these things together, that the problems of digitization in some ways gibed with the psychophysics as it was emerging in the '60s and '70s. So I explained this to Patricia Seybold and she and her father invited me to come to Stanford to see the work of Donald Knuth with a group of other people; and that was fascinating, Metafont and the tech language for laying out things. And I read his book, and I thought, "This is really cool." It's sort of utterly unlike anything I'd seen before. I don't know what I thought, but what word would describe it?

**Kirschenbaum:** I want to get into that in some detail, but it's fascinating to me that, by the end of the 1970s, clearly you already had some sense of the computer revolution that was coming.

**Bigelow:** I saw an article in "Scientific American" about Xerox PARC, and they had those Altos, these little mini personal-not miniature, but early prototype personal computers, and one of the images was of children learning to use computers by looking at these screens and using mice and tools. And there were some fonts on the screen, and I looked at them and I said, "Those are terrible fonts. These people need better knowledge." And I was going to write to them and say, look, I want to come down there and work at this place, whatever it is, Xerox, P-A-R-C they called it, PARC, and you need a typographer who really knows this stuff. But instead, I was invited to RISD, and so I took the job there.

**Kirschenbaum:** Yes.



**Bigelow:** Eventually I went back to California four years later, five years later.

**Kirschenbaum:** And you must also through Kris's work have had some sense of what was happening in the newspaper industry?

**Bigelow:** She worked for Compugraphic that made the first optical typesetting machines. They used photographic machines, and they had just installed a program called Ikarus, which is a German digital type production system that you could take analog images, by which I mean just smooth, drawn or cut, carved or photographic shapes, and turn them into splines like Bézier splines.

**Kirschenbaum:** Explain what a spline is.

**Bigelow:** Sure. In the 19th century and the 20th century, mathematicians worked out ways of describing curves, and one of the kinds of curves that people used practically were to define ship holes and aircraft, airfoils, the shapes of wings. And one of the ways they would do it is that you'd get a very thin slat, like a Venetian blind, a piece of a Venetian blind, and you'd tack it down in one place and you bend it and you get a curve out of it. And you can constrain that curve along its way, and this they called a spline; it was the physical, very, very, thin piece of metal or wood. But mathematicians then could define mathematically these things, and later on, computerists like Pierre Bézier in France and Paul de Casteljau reduced that to a mathematical curve so that they could make automobile bodies. You wanted to make a fender shape, you could use what later became called CAD/CAM, computer aided design, to render these curves. So the spline became a generic term for any one of this large class of possible curves that could be defined by computer, and shapes of various sorts could be created and then turned into forms, visible forms. So Ikarus used these, and Peter Karow, the German physicist, he was a high-energy physicist at the Hamburg High-Energy Cyclotron; DESY it was called. He started a consulting firm with some friends, and somebody asked him to work on this, and he thought, well, I'll use these Hermite splines, cubic splines, to define things based on some 19th century mathematics that had nothing to do with typography or anything else. And then he made machines, but he converted the Hermite third-order splines to arcs of circles, because the plotters of those days could often input circles, but they didn't know about cubic equations. So Kris got fascinated by this, and so she would get her way into the Ikarus system. She was an artist doing designs and inking, but she would do that. So then we actually saw or she saw what it was like, and I thought, oh, once again, this is really good, because we have the mathematics of shapes; you have the perception of shapes; you have the questions of information. So I took a summer course in computer programming at Harvard, and then I took a winter course again in PASCAL programming, and I thought I've got to learn this stuff. This is really going to be the future.

**Kirschenbaum:** I'm just struck, too, by how often you've continued your own education, taking courses as the need and the opportunity came up.

**Bigelow:** Yes, and oddly enough, I never understood that; I just did it. Although I never wanted to be a teacher, but as I was working in Oregon, I was asked to teach a course at the University of Oregon, part-time in one semester, and I liked it. You can explain things and tell people stuff, and the students were interested, and it was a lot of fun, and from there, I went on to teach more and more.

**Kirschenbaum:** And how long were you in the Massachusetts/Rhode Island area?

**Bigelow:** Just actually not very long, but I went in 1978, taught at RISD. I met Donald Knuth in '80 or '81. In '81, he suggested if he could create a position at Stanford, would I come and join him to do digital typography, and I said, yes, I would do that. And then I was secretly nominated for a MacArthur fellowship, but slowly kind of some news leaked out about this. And I forget exactly who all, but I was asked, "Who might be able to evaluate my career?" and among them was William Bright, a linguist at UCLA, who was a wonderful guy who has now passed away, and John W. Seybold, Jonathan's father, who's also passed on, and a few other people. And apparently what they said was very persuasive to the MacArthur Foundation, and so I learned one day in the-- I got a call from some guy, and he said, "My name is Roderick MacArthur, and I want to tell you you've won this."

**Kirschenbaum:** And what year was that?

**Bigelow:** 1982. I think it was the spring.

**Kirschenbaum:** And you weren't even 40 years old at that point. That's very, very young for the--

**Bigelow:** I was 37 I think, yeah.

**Kirschenbaum:** That's very young for the MacArthur.

**Bigelow:** Or 36, yeah. There are younger people, so I wasn't the youngest, but yeah, it was tremendously exciting. Oh, you're surprised and thrilled and exhilarated, and you'd heard hints of it, but you can't believe that it could happen to you, and then Stanford, a week later, said, well, Knuth called and said, okay, we'd like to hire you.

### **Bigelow and Holmes Studio**

**Kirschenbaum:** What year did you establish the Bigelow and Holmes Studio, and where was it located? Please tell me all about it.

**Bigelow:** Okay, so 1976, Kris was working in New York, and I was working in Portland, and I was working still working for this magazine. And I had written a small grant, Youth Grants in the Humanities, to see how to use typography for this Native American language that I had studied as an undergraduate at Reed, and there were these Indian myths transcribed by a guy named Melville Jacobs, who'd been a student of Franz Boas at Columbia. And I fell in love with these stories. As I said about the Greeks, by the time you see the Greek mythology, it's been really polished by poets and generations, but the Indian stories were just spoken by old men, usually, to young men. Linguists would come. And they were kind of raw and exciting and utterly unlike the European myths. You get an idea, okay, we got Zeus and Achilles and Odysseus and stuff and we've heard of it, but these guys, they had coyotes and skunks, and they were trading eyeballs, and they were getting in trouble, and there were sexual escapades, and there were talking feces; a lot of stuff that has been bowdlerized out of other things. But they also had this whole theory that they were all the animal-- well, they weren't animals; they were the spirits of certain qualities, and at a certain crux in history, some of them became animals, and some became people. And the people were coming, and they knew that they could no longer have this sort of more abstract spirit world where there'd be people here, but the people could gain spirit power.

I just loved it, and I got a grant to work on it with a wonderful anthropologist, Dell Hymes. And so I was working on that, and Kris was in New York, and I wanted to develop a special type font so we could set these stories in type, and this was part of the grant. I was going to work on it, and in 1976, I kept in touch a little bit with Kris. And she decided that she would go into graphic arts rather than pursue a dance career. She saw all the great dancers of New York and saw that maybe she could have a longer career than as a dancer and also maybe a more successful career as a graphic artist. So I wrote to her and said, well, think about this. I got this little grant, and we can start a studio here in Oregon, and she said, well, why don't you come to New York? And I said, well, I don't know. So, we kind of compromised, and Kris came back to join me in 1976, and we had a friendly relationship, and we started the studio, and we got several small jobs.

We designed initial capitals for a new edition of "Moby Dick," a fine edition printed by Andrew Høyem in San Francisco. I like to say that he paid us and we did it and it was fantastic. That book is now worth, oh, I don't know, 20 times what we were paid. And I said, "If you'd only given me a book, I could turn it into real money." But we were commercial, and we wanted to spend that money right then. So we started that studio.

We broke it up when I went to RISD and Kris went to Compugraphic and worked, and then just a year later, we met again. We moved in together in Cambridge, Massachusetts, which was halfway between our respective employment. So she commuted north, and I commuted south. And then in 1981, we had an opportunity to work for a German digital type firm, Hill, Doctor Hill, in Kiel, Germany. And in 1979, I had the summer off, and Kris had persuaded Compugraphic to let her go to Rochester Institute of Technology where Herman Zapf, the great type designer of

the 20th century, was teaching a summer course in type design and calligraphy. So we went there, and Zapf was a revelation, just as Stauffacher and Reynolds had been. Zapf sort of opened up the world of what it really was like to be a professional typographer. And RIT loved him, and they gave him the first of a series of awards called the Goudy Award based on American type designer Fred Goudy, and they made him a professor, the Carey professor of graphic arts. So that took Kris and me further into the world, not only of typography and font production, kind of the creative world. How do you make new shapes, new types? How would you do this? And so in '81, we decided we're sick of our jobs; we'll start our studio again. And then in '82, we moved it to Palo Alto, because I came to Stanford.

**Kirschenbaum:** In the 1985 "Mac World" profile about the studio, it mentions that it was, by that point, divided into what's described as an analog and a digital room. What happened in each of those rooms, and was that a unique arrangement at the time?

**Bigelow:** It wasn't unique and it wasn't fully bifurcated.

**Kirschenbaum:** Okay.

**Bigelow:** There wasn't a wall in a sense. There was only two of us, two to three people working there. We had the digital devices. We had arranged with Peter Karow to use his Ikarus program. Originally, I'd started with Donald Knuth's Metafont, but the Metafont metaphor was based on a moving stroke. But practical typography uses an outline, because type has been engraved as outline shapes since Gutenberg, basically.

**Kirschenbaum:** Yes.

**Bigelow:** So Ikarus was better adapted to that with spline shapes and outlines and the ability to be converted to digital forms. So how did it work? Well, Kris would, say, make a drawing. Originally, Kris and I both drew, but then she was so much better at it that she would do that. And in the digital realm, we had a tablet, an electronic tablet that could receive input: you put a cursor with a crosshair on it and hit a button or two buttons or some combination of buttons, and it would send a code to the computer saying, at this point, like in high school algebra, at this coordinate point, there is a point of a certain kind. And then you'd go to the next one, and it knew that there was supposed to be a connection here. And eventually, this was like splines and the mathematics of the Ikarus program would then draw a smooth curve through this succession of points.

**Kirschenbaum:** This must've been all specialized hardware. Where did the hardware come from?

**Bigelow:** We did a bunch of fonts for the Digital Equipment Corporation for an early workstation, the VAXstation. And we did all these bitmaps, and they said, well, we're going to pay you this much, and we said, no, we want a computer. And we got a VAX 730, which was the smallest of the VAX computers. And the VAXstation. So, we essentially traded the bitmaps for this piece of hardware, and Karow could install the Ikarus program on our VAX. It was the size of a big industrial washer-dryer combination. And people often talk about how little memory and so on. It didn't have much, but it was the most powerful thing we could afford and run it. Had to run on 220-volt current, and it had to have its own room and an air conditioner and stuff. We ran the VAX there.

**Kirschenbaum:** And that was in the studio with the VAX?

**Bigelow:** That was in the studio. The VAX was in a kind of a cubby hole, with its own air conditioner. And then the things to enter it in and to proof it and to correct it and to write the code were in the digital area. And Kris had light tables and so forth that worked, drawing the shapes on dimensionally stable Mylar with a very, very fine, sharp pencil, automatic pencil. And later, we hired two of my former students, both from RISD and from Stanford; they'd come to Stanford when they graduated. We hired them to help us; Carol Twombly helped Kris, and Dan Mills helped me. But Kris then and later would also do some of the digital work, because she'd learned Ikarus working at Compugraphic, though it wasn't her main job.

**Kirschenbaum:** I'm just trying to visualize. So all of the work with Ikarus, was that done on the tablet? Was there also a screen display?

**Bigelow:** We had two screens. One was kind of an old-fashioned screen that would display the shapes, and one was the VAX workstation screen, and we could display shapes on that. But that was a raster display, sort of like any modern computer, like the Alto, because we had both.

## **Lucida**

**Kirschenbaum:** So, let's talk about Lucida. Tell me when that work began and how it began. I'm interested in not just the conceptual foundations of the typeface, which you've written about quite a bit, but also the day-to-day of designing it, the material, tools, the workflows, what it was like on a day-to-day basis to do that.

**Bigelow:** Okay. The conception came when I was working on these Native American texts, and I thought it'd be great to have a book that you have a serif and a sans serif type, one for English, one for, in this case, Kiksht; it's called Chinookan. And it'd be nice if they were alike in some ways but still a different, and I thought serif versus sans serif. And I read a very influential paper by a guy named Erich Schultz-Anker in Germany about a new type called

Syntax, which was a sans serif type but based on humanist handwriting, not on the modern kind of Helvetica-like type. And we corresponded with Hans Meyer and worked on the idea of developing extra characters for Native American languages. So I thought, okay, for us to develop a type, we wanted to develop a type for low-resolution or medium-resolution printers and screens.

**Kirschenbaum:** Why? Why did you perceive that as a need? Was it just obvious to you at that point?

**Bigelow:** Well, it was obvious because they were all these things emerging: Laser printers and screens. And the types, I thought, weren't very good. Zapf called it kind of warmed-over thing. You take Times Roman, and you put it on the screen, and it doesn't look very good, because it was designed in 1931, 1932 for printing conditions. And also it was a challenge. If a technology changes, do you or do you not change how you design things? So we thought, oh, well, let's make a serif and sans serif type-- But kind of a simplified version for this new technology. That was the conception. I discovered that a Dutch designer, Jan van Krimpen, had done the very same thing in the 1930s, serif and sans serif combination, and a beautiful script, Cancelleresca Bastarda. Basically, it had been developed in the Vatican chancery. We had these ideas. The way it would work is that you had this concept, and I worked very hard on trying to understand what kinds of types would look good at low resolution. One thing is you want a big X-height. A lot of good types have big X-heights, and a lot of good types have small X-heights, but when you don't have much resolution, the big X-height is an advantage-- Because the type looks bigger and it covers more pixels, so you get a little bit better definition.

We established some parameters. How big should the X-height be? How thick should the stems be? And how wide should the letters be? And we noticed, for example, that in digital types on screens and printers, the tight spacing of something like Helvetica, the letters would almost touch. And somebody mentioned the bad lower-case R in Helvetica bold, but that was true of Helvetica always. In the early days of Adobe, this was a little bit before or about the same time we were starting our studio, if you spelled "John Warnock," the R would meet the N, and it looked like "John Wamock" in Helvetica. We wanted more space, and this went back to my vision studies where you're talking about the frequency of perceiving vertical and horizontal lines, and it has to do with weird processing way back in your brain as to how things are seen.

**Kirschenbaum:** Yes.

**Bigelow:** So, we tried to bring in this vision science in a funky way. It was hard to measure it, but we estimated. So we'd figure out this and sort of look at the shapes, and then Kris would draw these shapes. We also took graph paper and would sketch out what they should look like on the screen, and we would compare them, very low screen resolutions to a smoother 300-dot print resolution and then to the smoothest digital resolution. And I remember at one point, I think Liz Bond, who was at Xerox doing their bitmaps, she made a comment that

they're just using graph paper, but graph paper was the way we studied these things like bitmaps. So you could have advanced tools, but if you sketched in the bitmap and held it far enough away it merged into exactly the kind of thing you would see. So Kris would draw these on this paper, and you put it on the tablet, and we would enter in the Ikarus stuff. And character by character you enter in these shapes, and then you convert them to something you can print. This wasn't easy before the advent of PostScript and laser printers; but we would print them out and look at them; you put them on the wall and then you step back. Although I didn't really connect it, the same thing my dad taught me looking at Impressionist paintings: They look different close up; they look different far away; and your vision operates differently depending on the scale and granularity of things.

**Kirschenbaum:** That's a great connection.

**Bigelow:** And so if you look at the font stuff, you see flaws, and people always say, well, if you're far enough away, you don't see those flaws. No, it's the opposite. You see flaws sometimes at a small size that you didn't ever see at the big size. So we did a lot of proofing, and since we didn't know what it should look like, we weren't copying anything. We were just trying to make it look good. John Dreyfuss, a famous-- well, not famous worldwide -- but he was a much older colleague of ours. He was the type director at Monotype. He followed Stanley Morrison; he was a kind of a protégé of Stanley Morrison. And he quoted, I think it was Arthur Freed, who was a Broadway producer and writer; and he quoted Freed's advice to a young writer, and he said, "Don't try to be different. Just try to be good. To be good is different enough." And so we didn't try to make our type look like something. We just tried to make it visually good as we saw it, and that was different enough.

**Kirschenbaum:** And you did not have permission to do this. You just saw the need to do it; is that correct?

**Bigelow:** Yes, yes, it was entirely on speculation. It was a tremendous risk, actually.

**Kirschenbaum:** Just so we have them, what were the dates when you began work on Lucinda?

**Bigelow:** Kris began sketching it out in 1983. I organized this big conference at Stanford in 1983, and just before and just after that, Kris said, well-- we saw what was going on at Imagen. Adobe hadn't started yet, but there were laser printers, and stuff was cropping up, and Kris said, "I think we'd better start now." And as you heard yesterday, people always said, "We better start now."

**Kirschenbaum:** Right.

**Bigelow:** So Kris started sketching, and I started measuring and suggesting things. She kept working on it. In 1984, we closed the deal with DEC and then made the deal with Peter Karow to get the equipment, which we installed in 1984. 1984 is when we moved from just analog and the graph paper and sketching and cutting. We had learned to cut Friskit photo masks for optical type, so we would cut these and use them photographically. But that's when we became digital, the summer of 1984.

**Kirschenbaum:** I see. And did you have any interest in the personal computer revolution, which was well underway? Did you have an Apple or a Commodore or something like that?

**Bigelow:** Oh, yes. Well, I thought about it, but when we discovered we could get this much more advanced hardware on a VAX, we didn't do that. But some people from Apple came and took some of my courses at Stanford, and one was working on the Lisa, the fonts for the Lisa. So we went to Apple and saw the Lisa fonts. And we saw some of the Mac fonts, but those were done in a separate division, the Mac group by Susan Kare. I sat down with the Lisa and used their font digital editing software and tried it out and messed some things up. That wasn't released yet, but we got to sort of see a glimpse of it, and so as soon as the Lisa came out, we bought one. And then as soon as the Mac came out, we bought one of those. So yes, but our first personal computers were not the PCs -- nor the early DEC computers, but the first post-Apple II, the Lisa and Mac. And that would be in '84 for both of them.

**Kirschenbaum:** That reminds me of the story that Zuzana Licko tells that she got a Macintosh within a week or two of them becoming commercially available. And I wanted to ask you that it sounds like there was very much a kind of community, a scene that was taking shape at Stanford around you and Donald Knuth and the Seybold seminars. And what was the wider sort of type design community, at least in the Bay Area, like at this point, and did you know all these people? Did you know the émigré folks?

**Bigelow:** I didn't know them personally-- And in fact, I never have met them.

**Kirschenbaum:** She says she wrote to you and that you never wrote back.

**Bigelow:** I never wrote back. It's shameful. But one of my students, a couple years later, wrote to her, and the first thing she said was, well, you said you're a student of Charles Bigelow at Stanford. Oh, well, he never wrote back to me when I wrote to him. And my students at Stanford were almost to a person wonderful, and he said, well, is that true? And I said, yes, it is true, and I said I'll tell you why. I was working all the time, night and day. I was working with Kris in our studio; I was consulting for the Imagen Corporation and then later for the Adobe Corporation, and Stanford only let me do outside consulting one day a week, except I could work on the weekends. Donald Knuth had invited me to come to Stanford and work with him, so my first allegiance was to Knuth and my students. I said I didn't have time to write. Zuzana Licko wrote to me and to Knuth, and it wasn't within our sphere on our radar scope.



**Kirschenbaum:** Yes.

**Bigelow:** Because we didn't write. And I said so I asked my student, "Did you write back to her and ask her questions?" And he said, "Yes, I did." And I said, "What happened?" "She didn't write back. "<laughs> So if you're really busy, you sometimes have to cut out these other things.

**Kirschenbaum:** It's interesting, too, because I think she had a very different approach to digital type design than you did, and for her, it was all about really emphasizing the imperfections of this new medium and essentially turning them into assets or distinctive attributes.

**Bigelow:** Exactly. I agree. Culturally, I think it was a reaction, because phototype and early digital type on the big machines produced such beautiful, clean, smooth contours and shapes. Helvetica and Universe were two of the most popular sans serif types, and graphic designers had made a cult almost of something that they would call clean stuff. And this had been going on for maybe 20 years by the time the Macintosh came out, and there began to be something that, I don't think Zuzana called it that, but grunge typography. And I said, well, it's the logical reaction. We've gone too far in the clean direction; young people were tired of hearing about how they should be clean, so they went in the dirty direction.

There's Mary Douglas, an English anthropologist, cultural anthropologist, and she wrote a book called "Purity in Danger." And one of the great remarks she made is she contrasts order and dirt, and she says where there is order, there is dirt. Or I think she said it the other way: Where there is dirt, there is order. Dirt is the stuff that doesn't fit into order. And Zuzana, to some extent, and others made a virtue of the dirt part. The pixels that everybody else wanted to disguise she made prominent. The crummy rendering that people wanted to somehow disparage, she and her cohorts made into virtues, and for a while, it was tremendously popular.

### **"Scientific American" Article (1983)**

**Kirschenbaum:** I'd like to read you something you wrote in your 1983 "Scientific American" article. "Perhaps the most challenging problem that confronts the digital type designer is to make effective use of the enormous flexibility inherent in digital technology." What did you mean that the enormous flexibility in the technology was also its greatest challenge?

**Bigelow:** Oh, there's many ways in which that's true. One is that, as Donald Knuth said, it's just ones and zeros. By the time you get down to the bitmaps that actually get printed, it could be anything. So given the fact that you have very large possibilities, how do you choose the ones that are going to be either legible or pleasurable or exciting or rebarbative? Some types are ugly for a purpose; they are to catch your attention. So also with the Bézier splines

and others, they are enormously flexible shapes, and if you make some little errors, you can get a Bézier spline that, instead of making a beautiful curve like this, it'll put a loop in it or a flower pattern or a little cusp or something. And so in a practical sense, as designers today use these tools, they use only a small subset of the possible curves; so that's one sense, that technically you do that. The other is, back to my questions why I took perceptual psychology from Gerald Merch, which is: How do we know what shapes we should make? We can make almost any shapes now. Which ones are the ones that civilization needs to echo Lloyd Reynolds? What should we do? And that's a hard decision.

**Kirschenbaum:** This is maybe a good time to ask you to show me that "Scientific American" issue, and I'm wondering if you could just say something about the impact of that article.

**Bigelow:** Okay, I think I have it right here. The lead cover is about termites and chemical senses and weapons, but the type article is here, and I can probably show you the first page of it. Here, essentially, is the photograph or a digital representation of the fundamental problem of digital type, which is at one point you have solid, clean, clear characters, and as resolution goes down to digital typesetters and then to laser printers and finally, at the bottom, to screens, the shapes stop being these beautiful, smooth, sculpted shapes, and they become impressionistic, kind of pointillism, minimalist pointillism. So in 1982, I proposed to "Scientific America" [sic] that this could be a good article. They'd had an article on digital typesetting in the 1960s, and now 20 years had gone by, and I said, "You should really get into this." And I'd written articles for "The Seybold Report." Jonathan's father, John W. Seybold, had commissioned them, and Jonathan edited them, and they appeared in 1981 and 1982. And the reaction to those "Seybold" articles was phenomenal.

I was still living in Cambridge and working there. I got phone calls from all over the place, people wanting me to consult on stuff, so I could go out and make money consulting, which really just involved talking. It was what I was doing as a teacher, but the pay was better, so I thought, okay, this is great. So I proposed this, and "Scientific American" accepted it, and I wrote it in 1982 for them, and it came out just in time for the ATypI seminar I had organized at Stanford in the summer of 1983; they exactly coincided, so we ordered a couple of hundred copies of this issue and handed them out.

**Kirschenbaum:** Well, I'm wondering, too, if "Scientific American" -- that must have been one of the first instances when the general public really encountered these ideas about digital typography.

**Bigelow:** Yes, other than the earlier article in the '60s, this is the first mass-market publication. I forget they had a publication of a million copies or 500,000-- Some huge number. And they had a professional editor. In those days, the scientists or engineers wrote the articles; then they had an editor turn them into acceptable English. And that was really very exciting,

because then we could hand them out, and people were interested. And this was two years before the LaserWriter.

## Imagen

**Kirschenbaum:** And you finished Lucida around the same time?

**Bigelow:** We finished it in 1984, a year later. And I was consulting for Adobe then, and we showed it to Adobe, and we even digitized part of it. But Adobe at first didn't have any type. They'd cut the deal with Steve Jobs, and they said, do you have something that we could put in this device? We've got the page description language; we've got that, but we don't have any fonts. And this goes back to macroeconomics, supply and demand. There was demand for the fonts and almost no supply. And the big firms, Linotype and Monotype and others, didn't want to give up their libraries, because they sold machines as well, and they were afraid of the consequences of letting their digital fonts out. So we did this and we tested it, and then Adobe made its deal with Linotype. And an intelligent part of that was now they had type not only for laser printers but also type for typesetters, and they were the common types that graphic designers already knew. By 1985, Helvetica'd been around since 1957, Times Roman since 1932, Courier since 1956. These were very well-known types, and Xerox Parc had made versions of them.

So, Adobe did that, but we were disappointed that Lucida didn't appear. But we kept on going, and a small firm called Imagen that was spun off from Stanford with Luis Trabb Prado and Lester Ernest, who'd been a director of the artificial intelligence lab at Stanford under John McCarthy. They were interested, and they had hired a typographer named Michael Sheridan who'd worked at Autologic, which was a digital typesetting company. I forget how "Scientific American" was on an Autologic machine then, but anyway, Mike was a typographer. He'd worked with a typesetting and printing firm, a high-quality firm in Los Angeles. So he came to Imagen, and he was excited about the idea of a new type. So they did Times Roman and Helvetica and Courier, too, but he wanted something new, and so we worked very hard, and we just cranked this stuff out. And then our friends at Imagen made the final bitmaps, and we were able to show the first fonts, Roman, italic and bold, in September of 1984 at a typography conference in London.

**Kirschenbaum:** Who were Imagen's clients?

**Bigelow:** They made laser printers, and they basically, they connected to Unix and other kind of academic clients.

**Kirschenbaum:** I see.

**Bigelow:** I'm not sure of all of the them, but NASA and technical places, universities.

**Kirschenbaum:** So really a different market from what Apple was doing with Adobe at that point.

**Bigelow:** Yes, and interestingly enough-- Luis Trabb Pardo will know more, because I consulted for Imagen in 1982, 1983 and then stopped. But Imagen was uncertain in some practical way as to what their role was. Some people at Imagen thought they were going to become a laser printer company selling actual printers like Hewlett-Packard. Others thought that they should license their technology; as it turned out Adobe did, because first Canon that made the laser printer engines for Hewlett-Packard and Apple came to Imagen first and said, "We want to license your rasterization technology for our printers," which would've turned into the Hewlett-Packard printer. But Imagen thought, well, we don't want this competition, or I don't know what they thought, but anyway, they ultimately didn't make a deal with Canon.

And Digital Equipment Corporation asked the same thing. They didn't want to buy printers; they wanted to buy technology. But Imagen made printers, and only several years later, after Adobe's success, did Imagen think, oh, we have all this technology. They developed their own rival page description language to postscript they called document description language, and Hewlett-Packard licensed it, and it looked like it was going to be a fabulous success, and then at some point, Hewlett-Packard abandoned it. And so Imagen had two kinds of customers: the OEM customers for printers, individual universities and academic customers, and then finally the technology licensing.

### **Kris Holmes and Lucida**

**Kirschenbaum:** This might be a good time to show Kris Holmes's dossier there and maybe we can take a look at some of the Lucida fonts.

**Bigelow:** Sure.

**Kirschenbaum:** And whatever else that you think we should see from there.

**Bigelow:** Okay. So, Kris really studied calligraphy harder than I did. And she studied also with Edward Catich. And she studied in New York with Ed Benguiat, who was a well-known designer for the International Typeface Corporation. She did a vastly successful typeface called Souvenir and several others that were all the rage in the 1970's. So, Kris had all of these interests. And let's see if I can find the earliest Lucidas here.

**Kirschenbaum:** And there's Isadora in there, too, which I think is interesting.

**Bigelow:** Let me see if I can find Isadora. So, for Dr. Hell, the computer company in Germany, Kris designed an original scriptface. And I don't know if you can see this here. But anyway, there's a big D that shows the very swoopy lovely quality. And here Kris combined the thick/thin styles of the English writing masters with the broad edged pen styles of the Renaissance writing masters and came up with a new kind of joining script that was very elegant. Hell produced it and later sold it to the International Typeface Corporation. And Kris entered a big letter, the O here, which you see, in SIGGRAPH in 1982. And they accepted this because it was a big bitmap. And the SIGGRAPH, which is the Special Interest Group Graphics of the-- Association of Computing Machinery, hadn't seen this kind of thing before. It was artistic looking. So, it was in the show. And here's Kris talking about it. So, she did have this wonderful talent for-- and still does -- for making these scripts. She did other typefaces based on calligraphic styles. But here was the first Lucida designs from 1984. I don't know how well they come across on the screen but probably fairly well. And these are the ones that she and I worked on.[editor note: these images can all be seen by going to the video of Bigelow's oral history interview] at the Computer History Museum website: <https://computerhistory.org>

**Kirschenbaum:** Can you really zoom in on those? Is it worth having Chuck sort of hold them up and talk about them in some detail? Can you capture that?

**Bigelow:** Basically, we have a Roman and an italic and a bold and a bold italic. So, you have this cross-cutting of weight and style. Some people call that style posture. It's inclined, or it's vertical. They're all based vaguely on Renaissance handwriting, which I'd studied if with Lloyd Reynolds, and Kris with Robert Palladino. We call it Humanist Minuscule. And so, we thought well, it was good enough for the Humanists, it should be good enough for the modern era. But we had to simplify it, and thicken it, and coarsen it for the laser printer. So, you don't see much of true Renaissance handwriting anymore. But the underlying skeletons and ideas are there. And we made it sturdy. There were two kinds of laser printers. One wrote white, and it intended to erode the characters and make them lighter. Those came from Xerox. And the other kind made the characters darker. And that was the Canon engine that Adobe and Hewlett Packard used.

So, we tried to find an intermediate weight and color. In printing on the Canon engine, the Lucida-- the original Lucida -- came out a little bit dark. But on screens, it came out a little bit light because the screens illuminate the background. And it erodes away some of the dark shapes. That was in 1984. And Imagen and then another firm wanted a sans serif font, which we had in planning. So, we rushed the sans serif into production. So, we then had that early idea that I had dreamed of which is a serif and a sans serif. But otherwise they had the same proportions, the same capital heights, the same inner skeletons, and other harmonious features. And then Imagen said, "Well, we do a lot of computing, sell a lot of machines to technical places and universities where people do computer programming. What can you do for that?" So, we said, "Well, we'll take Lucida Sans, and we'll make a typewriter font out of it." So, we called it Lucida Sans Typewriter. It's all fixed pitch. And if you set it at twelve point, it sets ten characters

per inch like Courier. But it's darker and bolder. So, programmers started setting it very small, eight point, even six point, and they could read it because of the very big X height. And then if you set it at ten point, it was the same as Elite type. You got twelve characters per inch. So, we carefully proportioned it.

And Kris made an example where she set a text with the first line in Lucida Sans proportional, and the next line in Lucida Sans Typewriter, and so on, alternating the styles. And when you first read it, you didn't notice the difference. That was, we thought, good. And on the other hand, it meant that people didn't always tell the difference between the proportional and the typewriter. So, then we did a version of Typewriter with serifs, one more like Courier. And those were the first three -- again we did Roman, italic, bold, bold italic. But this one-- for the Typewriter, we simply slanted the italic rather than making it a true cursive like we did with Lucida and Lucida Sans. By a true cursive, I mean the shapes of the A, and the G, and the E are distinctly closer to handwriting than they are in the Roman fonts. And there's some evidence that people can read Roman faster than italic. And they can read slanted Roman a little bit faster than they can read the cursive Roman, although the cursive Roman is more elegant. So, we thought well, for programmers, they're not going to worry about the aesthetic level. We'll slant it. It's easier. And it has exactly the same metrics, not bigger, not narrower. And it was successful.

**Kirschenbaum:** And I, to this day, have Lucida on the computers that I use, on the Macs that I use, the PCs that I use. So, how did that happen? How did Lucida become so widespread? How did it move beyond Imagen?

**Bigelow:** Imagen sold maybe tens of fonts, hundreds of fonts for their printers. But it was wonderful. It kept our studio alive in that era, money coming in. And we could make fonts. I did some consulting for Microsoft when they were trying to decide which font technology to adopt. And they looked at several. They looked at font technology that was developed by some people who'd left Imagen and were bought by Sun, called F3, or Folio Font Format. And they looked at a format based on Icarus done at Compugraphic. And they looked at another format sort of based on Icarus done by Peter Karow. And they went to Apple and were interested in True Type. I think they came to Sun first for Folios F3 format. And they were rebuffed by Sun for complicated reasons that I never quite understood. But partially it was just a collision of different culture and different personalities.

And I did some consulting for Microsoft on this and then went away and did my job. And they came back. And they said, "Okay, we've settled on a font format." And they wanted me to help judge between two formats, the Peter Karow format called NIMBUS Quick, which was peddled by Mike Parker who'd been at Linotype, and the Compugraphic Intellifont. And it was a political battle because Intellifont was adopted by Hewlett Packard, which made the printers. But Microsoft sort of preferred the NIMBUS Quick thing. So, I worked as a consultant. I did a blind test. It might have been a double-blind test. I didn't know which one I was looking at. And I just evaluated them. So, quite some time later, they chose neither one. They went back to Apple

that had then been scared by Adobe's speed at creating Adobe Type Manager to compete with TrueType. Apple hadn't released TrueType yet. And yet, here was Adobe already getting customers.

**Kirschenbaum:** Can you talk for a moment about the significance of TrueType?

**Bigelow:** Sure. Well anyway, Microsoft said, "Well, we've got TrueType now. And we want you to consult on the quality of the fonts we're making because we're going to spend a million dollars trying to make our Times and Courier better than Adobe's." So, I said, "Well, certainly I'm happy to help." And then they said, "What have you got?" It's kind of a typical Hollywood thing. People go in to pitch a script, and the guys say, "Ah, we don't care. Anything else you got?" So, we showed them all of these ideas we had for Lucida, and they liked them. They said, "Oh, can you fit these in somehow?" But anyway, the significance of TrueType is that it's both business and technical issues. Adobe invented this very good format they called PostScript Type 1. And they kept it proprietary. You had to license the whole PostScript. And they didn't reveal the trade secrets of Type 1. But it was quite good. And I knew a little bit about how they did it because I had consulted for them.

**Kirschenbaum:** And Type 1, was it a format for storing fonts?

**Bigelow:** It was a format for storing. It was also a format that allowed the printer, the laser printer, to render the fonts. You put these fonts in memory in the printer. And originally, they were in read only memory. And the printer could then rasterize them at any given size. You could scale them to any given size. It solved a lot of the old problems of bitmaps because there were no bitmaps until, on the fly, the printer would be asked to do so by whoever was sending a document, "I need Times Roman twelve point." And the printer's internal workings would say, "Where's the twelve point? Where's the Times Roman? Now, I've got these images. I'm going to scale them to twelve point. And I know that I'm doing it for a three hundred dot print engine. So, I know how many dots I need." They scale this thing against a grid, like graph paper, just as we did earlier, and many people did, and determine which of the dots to turn on, and make black, and which white.

But Adobe charged royalties for this. And as you may have heard, after Steve Jobs left or was ejected, Jean-Louis Gasse became in charge of this. And Apple had some objections to the amount of royalties they were paying to Adobe. And as you heard from John Warnock and Chuck Geschke yesterday, there was friction between them for I don't how long-- I was not privy to any of this, but you could deduce it from behavior. So, Apple decided they wanted to have their own format. And they worked hard at this. And coincidentally, they put out an ad. And there was a person who worked on fonts at Imagen Corporation. And he took the job at Apple. So, then there was some conflict between Imagen and Apple over intellectual property. So, Imagen warned Apple, "Don't you take anything from our proprietary Top Font technology." And lawyers got involved.

So, Sampo had to kind of start from scratch. Sampo was a great strapping kind of Viking-like guy. He's of Finnish origin, but worked in Silicon Valley. So, he developed this TrueType format. And Apple chose this name. Originally, it was called Royal. Apple adopted this name to say that they had a higher resolution than Adobe. Adobe had a thousand dots per inch, and TrueType had two thousand and forty-eight. And that made it truer to the original in some sense. They were technically different. But Apple developed it to get away from Adobe's royalties and from Adobe's control. And Apple enunciated then, which they still do, which is, "We need to be in control of our basic technology." They later translated it into, I think, "We need to be in charge of our destiny. We need to control our destiny." And this was one of their first steps, to not license technology from outside. So, that was their motivation.

And they announced it to Adobe privately, I think, in 1989. And Microsoft licensed it and announced it at the Seybold Seminars in '89. And by then, Warnock had reacted, as you also heard yesterday, that Adobe was going to respond. One of the things about TrueType was you could use special hints that Sampo had learned about at Imagen, hints meaning just these controls of how you shape the shapes to the grid, how you adjust it. And it did pretty good screen resolution. So, Adobe accepted the challenge and came up with Adobe Type Manager. But Microsoft had adopted True Type. And everybody knew that the six-hundred-pound gorilla was going to produce TrueType. And it swamped all of the other competition except Adobe's. But for us, it was tremendously significant because Microsoft did license these fonts. And as I said, Kris and I had all these different typefaces that we developed. And only a few ever got out. And they got out in the hundreds of thousands.

So, this is the-- you might zoom in on it. The is the Microsoft TrueType font pack for Windows. It came out in the spring of 1992. And they included twenty-two fonts from our little studio, which by then only had two people, me and Kris. Our employees had gone to Adobe. So, twenty-two fonts, and they shipped hundreds of millions of them. So, it was not one, not two, but three or four orders of magnitude more than we'd ever done before. And pretty soon, we were seeing these everywhere. So, the first great thing was the license to Imagen for us because our fonts got out, and we felt some affirmation and confirmation of our risk and our desires. This was the second huge burst in which we saw that now there was a mass market product used by computer users around the world.

I went to Paris for something. You probably can't see it, but there's a typeface here called Lucida Blackletter. It's not Fraktur like the German Fraktur. It's based on a sort of Burgundian Batard, a French style of handwriting that was turned into type and first used in English by Caxton. So, we adopted it, again, as we did other things to the grids and restrictions of these things. So, it's not an exact copy. So, I walked into a restaurant in Paris. And their whole menu was in Lucida Blackletter. So, I said to the proprietor, "I'm the designateur des police de caracteres. This is mine." He said, "Ooh, la, la. You know, it's my favorite." And he said, "I have the Hewlett Packard, the laser printer." And he brought me a color printout of the menu; they charged me for the meal, but I got the menu.



**Kirschenbaum:** I was going to ask: Did you get a free meal? No?

**Bigelow:** I did not. But I was happy to pay for it. For us the significance was that TrueType broke through Adobe's monopoly on fonts. Apple has also licensed fonts. But the first ones we did for them were to take Susan Kare's bitmaps and turn them into TrueType. And that we did. And then they were popular. Then they could be rasterized on screen on the Mac and scaled to any sizes. They were Chicago, Geneva, New York, and Monaco, which was a fixed pitch font. But we'd already had experience doing that with Lucida Typewriter. So, we did that. Some people actually preferred the old bitmap versions, even when they scaled up and looked castellated or jagged. Others liked the smooth versions.

### **After Lucida**

**Kirschenbaum:** What do you consider your most significant design work after Lucida?

**Bigelow:** Well unfortunately, after we did these Lucida fonts, we were going to move on to other things. But the cost of trademarking fonts internationally, because our customers were big like Microsoft, and Apple, and Hewlett Packard, the cost of making international trademarks -- and these firms want you to have this intellectual property so that nobody sues them in some other country for something -- it was so high that we realized that we'd called the Lucida Sans, which just means the sans serif of Lucida, Lucida Bright, a kind of sharper version of Lucida, Lucida Sans Typewriter. We moved on, and Kris designed Lucida Handwriting, and Lucida Casual, and so on. So, we did those. -

**Kirschenbaum:** There are economic reasons then to continue expanding the same family.

**Bigelow:** We spent a lot of money on a trademark. I don't mean to sound totally mercenary here, but it's very complicated. It takes a lot of money. So, we thought okay, let's just call Lucida a family in which it's the brand name. And we have kind of ordinary language ways of distinguishing the differences of Lucida. So, you have Chevrolet, you have Malibu, and so on. But the most recent thing we did, which is not called Lucida, for engineers at Google who developed a programming language they call Go. And one of them, Rob Pike, worked at Bell Labs. And we had licensed Lucida to Bell Labs for a programming language called Plan 9, which is obscure, but kind of in its cult way, well known. And then they did the Go language.

Just last year, they said, "Look, we have this language. We distributed it for free. It's open source software. Anybody can exchange it for any reason, and copy it, and can even go in and change it." And we'd never allowed that before because we didn't want people artistically to mess up our designs. And we defended that even when the big companies like Microsoft and Apple wanted to manipulate stuff without our permission. We had to say, "No, you have to have our permission. We'll work with you, but you can't do it on your own."

But, with Rob Pike there was just something about the proposal that we liked. He said, "You know, what do you think? What about it?" We said, "Okay, we can do it." And we'd done some free fonts, but they weren't open. And we took those. And we adjusted them to the Go format in TrueType because the Go language, they'd developed TrueType rasterizing tools and graphical tools. And we settled with Go that we would do not just the Roman types, or the Latin-based types, but we would add in Greek, and Cyrillic, and a bunch of symbols and graphic characters that Microsoft had defined. So, instead of a font of two hundred and fifty characters, we had like six hundred and sixty characters. And we did it in a tremendous hurry, always in a hurry. We did it in a tremendous hurry for the birthday celebration of Go. I forget how many years old it was, but some years. And they announced it. Put it up on their site. And people began to download it and use it.

And it was kind of a relief. Often you have to protect things, your trademark, your designs, your patents, your copyrights. And you have to correct things. And you have to deal with clients and stuff. The Go just shot out there. And now there's websites in Greek where they use the Greek version of Go in Greek. So, a Greek mathematician sent us his website, Antonios Tsolomitis at the University of the Aegean. And he's on the island of Samos. Kind of takes me back to my freshman year in college hearing about the Greeks. So, that I think it is just us trying to adapt to the changing commercial and non-commercial world. I think that's significant. Whether the type will become vastly used, I don't know. But anybody can use it for web fonts or anything.

**Kirschenbaum:** How much of an influence have non-Western fonts and lettering been on you?

**Bigelow:** Very. Early on, we observed that popular typefaces often had non-Latin versions. Times Roman was the first because customers in other countries would ask for Times Roman, but for Greek or for Cyrillic. And Helvetica, when it became popular, had the same question. So, we thought we'd reverse that. Let's design Greek and Cyrillic before people want it because, if it was a mark of success for a typeface incrementally, what if we designed them? Maybe it will help them be a success now. So, we did these Latin, Cyrillic, Greek. Then Kris designed an Arabic for Apple and also for Sun Microsystems. And then Sun asked us for Devanagari, which is the name of the writing system. It's almost but not quite an alphabet. Some people call it an alpha-syllabary. But it's used for Hindi in modern writing and for Sanskrit. So, the wonderful thing about the non-Latin types for us was you have these rules and rigid concepts about how things should be shaped.

And suddenly, here's a totally different tradition. How do you understand these forms? How were they written originally? We followed the same thing we did with Lucida. Kris would get out her calligraphy pens and write them out to understand where things get thick, where they get thicker, where they get thin, are there serifs --well, they're not serifs, but they're something. How are they oriented? So, we felt this was a new way to learn about shapes. And what we did, because our customers wanted it, is we harmonized them with the Lucida, especially in the sans

serif. So, we called it harmonized designs. And we did these first in 1993 for Microsoft, later for Sun, and later for Apple.

Only this last year, I was reading a book about digital type. And there, I come across an article by a German scholar questioning the concept of harmonized types. And all of it refers back to the article we wrote in 1993 about the types we did in 1992. And on the one hand, he says, "Okay, this is the initial point that people talk about this." Although there were such things earlier. We weren't the first. We were just the first to kind of do it all in one font and all in a font that can be handled. And you had to wait until TrueType to do that. He says, "So, there are some things in favor of this concept and some things against it." And so, even though he disagreed with some of our ideas, and I never claimed that they're absolutely the right thing, it was kind of great, as a scholar, an academic, to read that people are taking this in a scholarly way seriously instead of just industrially.

### **Teaching at RIT**

**Kirschenbaum:** And you found your way back eventually to the academic world at the Rochester Institute of Technology.

**Bigelow:** Yes, I took a leave from Stanford to work in the industry, and then I never went back. And Stanford, like many good schools and responsible schools, limited how much time you could spend in commercial enterprises. So, there was one day a working week. But it turned out, I needed seven days a week to do all this work for these firms in the early 1990s. So, I went part-time, and then I just finally stopped. And I went to Los Angeles. Kris was interested in studying animation. And so, we went to Los Angeles. And she enrolled at UCLA in animation. And I thought well, I need to do something. So, I enrolled in the film school because I had an idea that film would be like the early days of digital typography. With the characteristics of film in 1999, when they went digital, would people be making short films that went squirt over the Internet with a very low bandwidth by today's standards. Would it change the aesthetics of filmmaking? And I tried to interest young directors. And I was much older. I said, "Let's make some films for the Internet. We can get them into sixty, seventy, ninety megabytes. You can get it across the web fast." And they said, "No, no, we want to make features, beautiful film, Cinerama or whatever, widescreen". So, I couldn't really interest people in this. If I'd been smart, I would have joined YouTube and made cat-- cute kitten videos.

**Kirschenbaum:** Yes.

**Bigelow:** Well, it did happen that film went digital. And people began to do Internet movies and Internet serials and everything, but about ten years later when the bandwidth of the Internet was enough to move a lot of data. So, I thought this idea is good for young people. Young people should do it. And as you heard yesterday, John Warnock is working with the Sundance Institute to promote these ideas among young filmmakers. So, I thought well, this is

not probably going to pan out. Although I had a lot of fun writing movie scripts and won awards, not for the movies because they never got made into movies, but there's awards for scripts. And I wrote kind of science fiction film noir, which were not far in the future, just scientific aspects.

**Kirschenbaum:** We call that Cyberpunk these days. <laughs>

**Bigelow:** Well, one was about endangered species in ecology. And the other was about designer plagues in Southeast Asia-- in Singapore and Borneo. So, it was just a tremendous amount of fun. But then Rochester Institute of Technology invited me to become a distinguished professor there. And I thought okay, I love teaching. I'm going to go back. I kind of missed it. And I went back to RIT for the next six years. And then I retired again.

**Kirschenbaum:** What kind of teaching did you do there?

**Bigelow:** I did everything. The regular typography teacher went off to do something else. So, they asked me to teach the freshmen, which was sort of grueling. You know, I'm a distinguished professor. And here I'm going to school at eight in the morning to teach freshmen who were already half asleep, or never had woken up. And then I taught advanced typography. I advised a thesis student on how to study the congeniality of reading on digital devices. It wasn't a study of legibility, per se. It was a study of how people enjoy it, whether they like it or not, and how do you handle these new e-readers, the Sony reader, and the Kindle, and the iPad, and so forth. So, I really enjoyed that.

And I did other studies about perception of type. I taught book design. I taught a course called typography research, which I really loved because I only cherry-picked the best students. And I only had maybe five to eight students in a class, which I really enjoyed because I had time for them now. And I had them each do a project. I introduced a lot of stuff. And then they chose something to work on.

And contrary to RIT's views of things, I once taught math and science to high school dropouts. And I felt there was no way I could get them to follow normal academic procedures because they'd had that and dropped out. So, I had a lot of fun trying to think of ways to teach. And I did this the opposite end of the scale to some grad students and to advanced undergrads. I never had a lesson plan. I never had handouts. I never had tests. I completely threw away everything I despised about academics and just taught.

**Kirschenbaum:** Was it all in a studio environment?

**Bigelow:** Well, we were in a classroom.

**Kirschenbaum:** In a classroom, okay.

**Bigelow:** And they did studio exercises. One exercise was what color are the vowels. If the early people who invented writing had had color printers and color computers, would they have made the vowels different colors. And so, their job was to figure this out and then write a poem using the colors to show rhyming schemes or other such things. Some of them were really good at this. Two of them were colorblind, not blind, of course, but they had color, red/green, deficits. But it was just a lot of fun. And they did fantastic stuff. One guy who was actually studying imaging, he used eye tracking. And he used an idea that Denis Pelli, a friend of Gordon Legge, the guy I've worked with, I wrote a paper with Pelli once. He added noise to the letters and then could see how much people could read it. But in this case, the student, my student did it in Chinese. And the question was how coarse, how high frequency or low frequency did the noise have to be before people couldn't read it. And then he tracked the reading. And then he made a video of it. He should have published it, but instead he went on to get a PhD, which he's still working on. But I just thought these are the great things. These are where they're unfettered. They don't have to meet any criteria. They can do what they want. Some did boring stuff. But I love the ones where they are advanced.

**Kirschenbaum:** It sounds like you've recreated that environment you found at Reed.

**Bigelow:** Actually, you're right. They didn't have handouts. And I often was a bad student. I just sat and listened. And I only worked on the things that were fascinating to me. So, I'm completely forgiving of students who just want to do what they're interested in.

**Kirschenbaum:** We have been going for about two hours. Is there anything that I haven't asked you about that you wanted to speak about? And if not, I have more questions.

**Bigelow:** Oh, ask your questions.

**Kirschenbaum:** Oh, well. I wanted to give you that opportunity.

**Bigelow:** One thing I do want to say.

**Kirschenbaum:** Yes.

**Bigelow:** We talked about TrueType and Type 1, and there was a lot of talk about it the other day. And I mentioned some font formats that didn't succeed. But there was one wonderful font format that was technically brilliant and wonderful to use that did not succeed. And it has to do with just the random contingency of commerce and business. I had this conference at Stanford in 1983. And one of my colleagues in computer science, Vaughan Pratt, who had been a thesis student of Knuth and then taught at Stanford, was inspired. So, he developed a new font format based on conic sections going all the way back to Apollonius of Paragon, the first Greek mathematician that really analyzed conics. But he worked in modern

computing, Vaughan Pratt did. So, a firm called Imagen adopted that for their outline fonts. And then some of them spun off, and they created a new firm, Folio, that did this. And Folio was bought by Sun. And it looked like it would be adopted for UNIX programming through Sun's UNIX Solaris. And it was easier to use if you were a designer. But it was competitive with Type 1 and TrueType in terms of machinability.

And a group of Sun vice presidents somehow didn't get it. They didn't see why it should be a standard. Microsoft wanted it before TrueType. But Sun turned them down. And so, then it languished. And eventually, it died. I tried to persuade Sun, and so did others, to put it into Sun's UNIX and make it a standard, give it away if necessary. But their argument was if it's so great, we should keep it for ourselves. And if it looks like it's failing because we're keeping it for ourselves, it must not be any good. So, either way, you lose on this one. When Java came out, one of the people who worked on this F3 Folio stuff later joined the Java group. And they made a little personal digital assistant, like a precursor to the iPhone, but in 1992/'93/'94, a dozen years before the iPhone. And they put a Sun workstation into a little handheld device.

**Kirschenbaum:** Wow.

**Bigelow:** And it was fabulous. It had an animated touch-sensitive interface. I just thought this is fantastic. And Sun didn't know what to do. It was a consumer device. And Sun sold workstations to OEMs and others. And they didn't know what to do with it. But as a part of it, James Gosling, a brilliant programmer who developed stuff developed this little language and called it Oak. And it ran this little device. It was an offshoot of C. But it was not like C++. It was an offshoot. And this project called the Green Project died. You can look it up on the web and find the Sun Green alumni and the Green Project.

But this language had some charm to it. And people wanted to use it. They couldn't use the word Oak because that was trademarked. So, they called it Java because, what is it, a computer program is a way of turning coffee into code. So, they called it Java. And they had a cup with some steam coming off it. And it almost died the same sort of death as the Folio font project. But somebody at Sun, Gosling himself, and others said, "Wait, we've already killed the wonderful thing in the F3, Font Folio Format. Let's not kill this the same way." So, they convinced the Sun vice presidents to let them release it. And then it became a huge success. So, it's just this contingency that some really excellent things sometimes never make it into the mass market, especially when you have behemoths like Apple and Microsoft with their entrenched technology.

**Kirschenbaum:** I have one more question for you. And as somebody myself who studies the long history of writing and technology, I'm struck by the degree of consciousness of that history that's been in the room with us for the last couple of days. You have Paul Brainerd naming his software after Aldus Manutius.

**Bigelow:** Yes.

**Kirschenbaum:** You have John Warnock's anecdote about having a page of the Gutenberg Bible framed on his wall. And this is really meant as a serious question. Will names like Warnock and Knuth and Bigelow, will those be names that we speak of in the same way, is it the same scale of achievement? What do you think about that?

**Bigelow:** I think so for Warnock and Knuth. I can't say for myself. I could see the future a little bit back in the '70s and '80s. But I didn't see where I fit in. You could just see where trends are going. It's like Herodotus. I've mentioned this. When you start reading Herodotus, he says, "This is display of the inquiries of Herodotus of Halicarnassus. So, that the achievements of mankind," I think he says men, "Shall not lose their luster and color with time. And so that the glorious deeds done by some by the Greeks and some by the Barbarians will not be forgotten." And this computer history thing is a step toward that. We don't forget those things. Somebody mentioned yesterday if only we had the notebooks of Alan Turing. But we don't. So, I think that digital fonts are probably not going to die. So, the Lucida fonts will continue on long after Kris and I are gone because they'll be out there in digital form. And the Go fonts and others may go on, especially if they're open and free. So, in that way, the deeds of men and women, in Kris's case, will live after them since people are quite curious about this.

But there's something else about your question whether the artifacts, even the virtual artifacts like fonts, can live on and maybe the names will live on. Knuth has published several very important books. But I haven't. I've spent a lot of my time on the fonts and writing articles. So, maybe I will not, as a name, survive. But people will know these typefaces. The great Swiss linguist, Ferdinand de Saussure, when he had sort of developed his final theories of language, defined the synchronic and the diachronic, that you can look at language in its depth tracing back our modern English words to ancient Indo-European. The English word black comes from an Indo-European word meaning quite, but somewhere in its long five-thousand-year history, in Germanic it meant bright, shining. And then it came to mean those things left over by brightness, namely those things that have been burned by fire, meaning things like charcoal that are black. And it winds up in English as black. So, you can trace this diachronic thing. But in English, modern day, you can say film noir, a French word for black; there's noir novels and noir films, and so on. You can see how words are used in one moment in time. So, a lot of this history stuff, we're taking slices through moments in time. And you're asking how long will this extend through time. It's harder.

**Kirschenbaum:** It's hard to know.

**Bigelow:** But of course, you can hope. One of the things you do this stuff for, one of the reasons Kris and I looked so much at history, is we wanted to make our designs a part of historical trends, to continue what we thought was good about the past, even if we don't do it the

way we should have or the way you might want. Hopefully, if it was good in the past, maybe it will extend into the future.