Interview with Charles Bigelow

David Walden
Interviewer

Editor:
Dag Spicer

At the May 2017 Desktop Publishing Pioneers Meeting, Charles Bigelow was the one professional type designer present. His career started and has evolved in parallel with the development of digital type technology and business. He has also taught and written about type design and its related history and theory. Given his complete knowledge of the field, the editors of this special issue arranged for an interview with Bigelow. Some summary background on Bigelow is listed at the end of the interview.

***David Walden*: Please tell me about your early involvement with typography.**

***Charles Bigelow*:** My first acquaintance with typographic practice was as editor of my high school literary journal. I chose the font, watched the text be set on a hot metal Linotype machine, corrected the galleys, and pasted up page proofs to guide the printer.

I was always intrigued by connections between science and art. A science museum and an art museum—two small marvels of learning—were near my high school in Bloomfield Hills, Michigan. The science museum excelled in visual and sculptural exhibits: painted woodland dioramas with terrestrial orchid sculptures; fluorescent minerals under ultraviolet light; a huge working orrery of the solar system; full-sized models of Silurian sea life. The museum published a book, *The Vertebrate Eye and Its Adaptive Radiation*—800 pages I tried to read as a teenager but didn't always understand.[1] The art museum excelled in 20th century crafts and textiles, like elegant embroidered hangings by May Morris, but I was fascinated by a big, elmwood sculpture by Henry Moore. Its flowing forms and voids changed with your viewing angle.

In college, I studied calligraphy with Lloyd Reynolds, calligrapher laureate of Oregon. Lloyd taught handwriting as the basis of civilization and as an art you could do with your hands. In 1967, I studied typography at the San Francisco Art Institute with Jack Stauffacher, a Fulbright scholar and later AIGA medalist, famed for his legible and expressive typography. In 1968, Jack hired me as his teaching assistant. Later I moved to Oregon but corresponded with Jack about his search for the typographic form of Plato's Phaedrus.[2]

In 1974, while working as an Oregon magazine art director, I studied vision and color perception with a psychophysicist, Gerald Murch. I read a groundbreaking paper on spatial-frequency theories of visual perception by Fergus Campbell and John Robson, psychophysicists at Cambridge

Published by the IEEE Computer Society
1058-6180/18/$33.00 ©2018 IEEE

University.[3] I should explain that *psychophysics* is the study of relationships between physical stimuli and their perceptual effects.

***Walden*: Can you say more about this theory?**

***Bigelow*:** Murch then was studying the McCollough effect: color aftereffects from viewing alternating black and colored stripes in different orientations. Later he was an executive and color expert at Apple and Xerox. Campbell and Robson studied perception of alternating black and white stripes displayed on oscilloscope screens—visual analogues of sine waves and square waves—at different frequencies. Typography is made of alternating, abstract, black and white shapes, so it seemed to me that psychophysical studies of visual patterns could contribute to understanding the complex patterns of typography.

Psychophysics is quantitative; its analyses are based on numbers. Typography, apart from numbers for things like font sizes, is qualitative; it analyzes text images aesthetically. Digital typography helps bridge the gap between quantitative and qualitative, facilitating studies of how things like type size, complexity, and digital resolution affect reading and letter recognition.

***Walden*: How did your business, Bigelow & Holmes, come about?**

Bigelow: In 1976, Jack Stauffacher invited me to San Francisco to attend slide lectures by three Swiss type designer–teachers: André Gürtler, Christian Mengelt, and Erich Gschwind. Their talks were so clear, their typefaces so precise, and their method so thoughtful that I realized I could do something similar but would need a partner. I contacted Kris Holmes, with whom I had worked in 1974 at a magazine where I was the designer and art director. Kris had studied calligraphy with Lloyd Reynolds and Robert Palladino, but in 1976, she was in New York studying modern dance, working in a publishing house, and studying lettering with type designer Ed Benguiat. Kris Holmes and I formed a partnership, and our first original type design was Leviathan, for a limited edition of *Moby Dick*.

In 1977, we received a grant from the Oregon Arts Foundation to research how to make a font to print stories told by Victoria Howard in a native Oregonian language called Clackamas-Chinook. Melville Jacobs, an anthropologist, had transcribed Howard's narrations in 1929–1930 and published them in a scholarly journal. Our goal was to publish her stories in a more accessible edition, in both Chinook and English. Jacobs had used a Latin-derived orthography, but it still required some new character shapes and diacritics. We wanted to produce the new phonetic characters to harmonize with a typeface fittingly called Syntax by Swiss designer Hans Eduard Meier. Our work was encouraged and assisted by Dell Hymes, a linguistic anthropologist who had studied Wasco-Wishram, a language closely related to Clackamas-Chinook.

For this research, Kris and I visited Linotype in New York in the summer of 1977. There, Linotype's typographic director Mike Parker showed us how to produce a font for photocomposition. Parker had the gift of enthusiasm, making everything he talked about seem fascinating. In passing, he showed us examples of digital, vectorized character outlines for the Linotron 202, a new digital typesetter.

***Walden*: So, you were beginning to see digital type.**

Bigelow: Yes. The very next month, I read an article by Alan Kay in *Scientific American* that showed bitmap digital text on the screen of a Xerox Alto.[4] In 1978, I was invited to teach typography full time at the Rhode Island School of Design (RISD). There, I was lucky to be the thesis adviser for Michael McPherson, another former student of Reynolds. For his MFA thesis, Mike investigated how digital typography would affect graphic design. I researched along with him as he wrote his thesis, "Digital Textsetting." Working with Mike deepened my immersion in digital type; the thesis adviser learned as much or more from the student.

In summer 1979, Kris and I studied calligraphy and type design with Hermann Zapf at the Rochester Institute of Technology (RIT). Zapf showed samples of his Marconi and Edison digital type designs for the German firm of Rudolf Hell, the first to develop digital CRT (cathode ray tube) typesetting machines. Zapf emphasized that it was much better to create new designs than "warmed over" copies of existing faces.

In the summer of 1980, I took a course in computer programming taught by Henry Leitner at Harvard and later a course on the science and technology of information taught by R. Victor Jones, a Harvard physics professor. Jones' lectures on the Nyquist sampling theorem and Shannon's model of information transmission prompted me to write a paper on the sampling, digitizing, and transmitting of type in relation to Campbell and Robson's research on spatial frequency and perception. I later incorporated these ideas in an article on digital typography in *Scientific American* in 1983.[5]

***Walden*: At the May 2017 Desktop Publishing Pioneers Meeting, you mentioned connections with both Donald Knuth at Stanford and the Seybold Group.**

Bigelow: The Seybolds introduced me to Donald Knuth. (I had read his 1979 paper on "Mathematical Typography"[6] but didn't know him.) In 1980, I met Patricia Seybold, a Boston member of the Seybold Consulting Group, and we talked about digital type. Later, at Patricia's suggestion, John Seybold invited me to a conference at Stanford where Donald Knuth demonstrated his TeX and Metafont systems. The metaphor Knuth used in Metafont was that of the stroke, as in handwriting, instead of the contour outline of metal foundry type and photo-type. The stroke metaphor made it hard to copy existing types precisely but encouraged the design of characters in writing systems still strongly linked to stroke-based writing, like Arabic, Devanagari and other Indic scripts, and Chinese.

After the day's talks, Don Day and I stayed up half the night making experimental letters with the help of Knuth's PhD student, Scott Kim, who was Metafonting types that Knuth and the American Mathematical Society had commissioned Hermann Zapf to design for mathematics. The next day we demonstrated some of the experiments of that night.

In 1981, the Seybolds invited me to write about digital type for their journal, *The Seybold Report*. I wrote the article, Kris Holmes lettered and drew many of the illustrations, and editor Jonathan Seybold added an introduction and conclusion.[7] The article appeared in August 1981. It was widely copied by subscribers who asked for more, so we wrote a follow-up that appeared in *The Seybold Report* in two parts in 1982.[8,9]

Donald Knuth saw that digital typography would be the future, and by late spring 1982, he had secured funding for a professorship and persuaded the Stanford Computer Science and Art Departments to cooperate on a master's degree program in digital typography, split between the two departments. He then called to invite me to accept a newly created professorship in digital typography. I wholeheartedly accepted.

***Walden*: Around the time you went to Stanford, you received a MacArthur Fellowship. I assume that was a surprise.**

Bigelow: Barely a week after I accepted Knuth's offer, Roderick MacArthur called to tell me I had been awarded a MacArthur Foundation prize fellowship—a five year, no strings attached, tax-free grant. The foundation's panel deliberated in secret, and there was no way to apply, but their announcement indicated that my fellowship was based on my research on the typography of native American texts and on my research and publications on digital type technology. I had given Knuth my word that I would join him at Stanford, and there was no better place to do my research, so I accepted the MacArthur Fellowship and the Stanford professorship. Even now, I can barely express how exciting it all was.

At Stanford that first year, we admitted students into the graduate digital typography program. I taught full time and organized an international seminar on "The Computer and the Hand in Type Design" for late July to early August. It featured talks by renowned type designers and typographers and interactive demonstrations of three major computer systems for digitizing typefaces: Peter Karow's Ikarus system from URW (Unternehmensberatung Rubow Weber); Camex's Letter IP system developed for Bitstream, the first independent digital type foundry, established in 1981; and Donald Knuth's Metafont system at Stanford. Other digitizing systems were featured in lectures. There were talks about new typefaces, live demonstrations of stone carving, calligraphy, traditional type punch-cutting, and letter casting. Around 150 people attended the week-long conference, and 200 more attended evening lectures by Hermann Zapf, John Dreyfus, and other great typographers. It was the first time so many designers, typographers, engineers, and

scientists came together to see, hear, and discuss the art and science of typography, both traditional and digital.[10] Today, doctoral students study it as a milestone in the history of digital typography.

***Walden*: I gather that you continued your type design, consulting, and other work with Bigelow & Holmes while you were at Stanford.**

Bigelow: In 1981–1982, I had consulted for the Hell Corporation, where digital typesetting had been invented. I worked with Hermann Zapf and Swiss typographer Max Caflisch; it was a most enlightening education. Zapf was then working on a digital revival of an influential typeface cut by Nicolas Jenson around 1470. Kris Holmes was designing an original script typeface for Hell named Isadora. It was shown in the 1982 SIGGRAPH computer art show and later licensed and released by ITC (International Typeface Corporation).

In California, I continued part-time consulting, first for Imagen, founded two years earlier by Luis Trabb-Pardo and Lester Earnest. As a doctoral student of Knuth, Trabb-Pardo had written a fast page rasterizer for an early Canon laser printer. At first, Imagen printers provided a version of Courier along with some of Knuth's Computer Modern fonts, but as customers demanded more fonts, I advised Imagen to hire a full-time typographic expert to develop more fonts.

In 1983–1984, I consulted for Adobe Systems, which John Warnock and Chuck Geschke had started at the end of 1982.

***Walden*: What was Adobe doing with font technology?**

Bigelow: Adobe's game-changing innovation in font technology comprised three techniques that were "in the air" but not previously combined to a sufficient degree. First was character contour encoding with mathematical curves, or splines. Contour spline fonts had been developed a dozen years earlier by Peter Karow at URW, using Hermite cubic curves.[11] Philippe Coueignoux at the Massachusetts Institute of Technology had independently used cubic curves for contour font compression.[12] Spline contour fonts were compact, rotatable, transformable, and adjustable to different resolutions and different raster aspect ratios. Adobe used parametric cubic curves developed in the 1960s by Pierre Bézier at Renault and Paul de Casteljau at Citroën, based on pure mathematics by Sergei Bernstein. Spline techniques were well known in computer graphics research at Cambridge University,[14] the University of Utah,[14] and Xerox PARC.[15]

Adobe's second technique was on-the-fly rasterization of higher-order curves to bitmaps in the printer processor. Previously, some digital typesetters rasterized polygonal or circular arc character contours on the fly, but newer generation microprocessors rasterized Bézier cubic curves fast enough for desktop printers.

Adobe's third technique was the addition of structural data to characters so their contours could be preadjusted to fit digital rasters before scan conversion. Raster grid-fitting improved regularity and symmetry in bitmap text. Karow had invented contour grid-fitting for prerasterization a decade earlier, but for off-line rasterization. I had mentioned the notion of structural information in the 1982 Seybold article.[8,9] Adobe made it practical but kept its grid-fitting technique secret, calling its structural data "hints," a name that stuck for all such methods.

When Adobe made its deal with Apple, it had the PostScript language, a font format, and a rasterizer, but few fonts. For Helvetica and Times Roman, Adobe got phototypesetter proofs, enlarged them by several passes through a Canon enlarger copier, and digitized character perimeters with a pen-input graphics tablet. Next, they fitted Bézier splines through (or around) the digitized points. Some of Adobe's early font output was criticized, however, by typographers at potential customers, including Imagen, Hewlett-Packard, and Apple.

A criticism of the earliest Adobe fonts was that they were unfaithful to the originals; Adobe corrected that by procuring better quality outlines. Another criticism was that the Canon LBP-CX printer chosen by Apple darkened the text image. An Apple designer who had studied with me at Stanford objected to the dark output, so Adobe revised its font rasterizing algorithm to lighten the output, but only for its secret PostScript Type 1 "hinted" fonts. PostScript Type 3 unhinted font format was published, but its print output remained dark on 300 dpi Canon engine printers,

although on high-resolution image setters, the darkening effect was small. The secrecy of the Type 1 font format eventually became a flash point in the impending Font Wars.

***Walden*: How close were you to all that—directly involved or just observing?**

Bigelow: Adobe asked me to provide advice on font quality, but in the fall of 1983, John Warnock told me about the Apple deal and asked if Kris Holmes and I had fonts we could develop for PostScript and Apple—Steve Jobs in particular. Coincidentally, Kris and Jobs had studied calligraphy with the same teacher at Reed College in Oregon, but not at the same time. I told John about our new design Lucida, so-named because it would be made by light—laser or CRT—and was simple and clear. Adobe digitized samples of Lucida, and we laid out our plans to make serif and sans-serif styles in different weights, plus a monospaced version. After Adobe's deal with Apple, Linotype agreed to license its popular Times Roman and Helvetica faces to Adobe and to license PostScript for high-resolution Linotype imagesetters, so Adobe's interest in Lucida waned.

Because of what Warnock called "crufty" outline data in its first digitizing of Times and Helvetica, I advised Adobe to get high-quality Ikarus outline data from URW for future fonts and to license trademark names and intellectual property rights to gain respect in the professional design community. Among the LaserWriter Plus fonts released in 1986, several of the font families were derived from Ikarus data, while design and trademark rights were licensed from ITC and Linotype. None of the fonts, however, were original designs for digital imaging.

***Walden*: You said Lucida went on the back burner at Adobe. Yet Lucida is known as one of the most comprehensive typefaces, so presumably you found ways to keep developing it.**

***Bigelow*:** Despite the disappointment that Lucida fonts were not in the LaserWriters, Kris and I kept working on them. We realized that we would need to digitize our designs ourselves. Metafont was still a research system, not a commercial production tool, and printer companies wanted outline data; so in 1984, we licensed an Ikarus system from URW. It ran on a VAX computer and hard drive that were the size of a laundromat washer and dryer combo but had less memory and processing power than an Apple Watch today.

Imagen's typography manager, Michael Sheridan, thought a new font family for laser printing was a worthy technical and artistic challenge to show that Imagen was innovative in typography as well as in technology. He also thought that competition from a new typeface might persuade Linotype to license their Times and Helvetica types to Imagen. So, Imagen became the first customer for Lucida. The entire summer of 1984 we worked on producing Ikarus digital outlines for Imagen, which then produced raster fonts in several sizes. In September, the first three faces—Roman, italic, and bold serif—had been drawn, digitized, and delivered, and Imagen had rasterized them as fonts for Imagen printers. Sheridan designed a "chapbook" specimen of Lucida to distribute at the ATypI (Association Typographique Internationale) conference in London in September 1984. Imagen formatted the text with troff on a Unix system and used the ImPress controller to print the chapbook on an Imagen 8/300 printer using a Canon LBP-CX engine.

The Lucida specimen caused a stir at the ATypI conference by showing that original type design for laser printing was not only possible but could look good in a tasteful specimen. As Sheridan had foreseen, spurred by the unexpected competition, Linotype quickly licensed Times and Helvetica to Imagen.

The Lucida specimen caused a stir at the ATypI conference in London in September 1984.

Privately at that conference, Sheridan proposed to Peter Karow that URW and Imagen collaborate to develop outline font technology to run "on the fly and in the box" like Adobe's. URW had the technology and expertise, and Imagen had the motivation. This was six months before Apple's launch of the LaserWriter. But Karow demurred, and Imagen went on to develop its own outline font technology based on conic splines described by Vaughan Pratt at Stanford and Sun Microsystems.[16]

In 1985, we designed and digitized Lucida Sans. When Lucida was printed on a Canon CX black-writing engine, we saw the same problem that Adobe initially encountered: the write-black Canon LBP-CX marking engine thickened stems and details of the font, darkening the text appearance. With seriffed Lucida, we had tried to find a compromise between write-white and write-black engines; we didn't know which would become prevalent. Our seriffed design was sturdy and resistant to digital noise, including when faxed, but it looked darker than we wanted. In Lucida Sans, to compensate for the darkening tendency, we made the horizontal strokes slightly thinner than usual. This lightening of the text gave the letter forms more visual modulation, less monotony, and a closer relationship to the ancient Italian Renaissance handwriting and typefaces that we admired.[17] We added slightly more space between letters, having seen that the PostScript version of Helvetica caused some letters to collide. For instance, r and n would connect and look like an m, so Warnock looked like Wamock.

***Walden*: What was next with Lucida?**

Bigelow: Imagen had received requests for a monospaced (fixed-pitch or typewriter-style) font for printing program code, terminal emulation, lists, and other tech texts. Sheridan wanted a font that would be more readable at small sizes and more economical in space than Courier. So, we designed Lucida Sans Typewriter, keeping the vertical proportions and stem weight of Lucida Sans. At 10 point, it looked as big as 12 point Courier, but it used less space and stayed legible down to 6 point on 300 dpi printers. We also designed a bold version, on the same width and proportions.

Hence, by 1986, we had designed three "harmonized" families of Lucida—serif, sans-serif, and typewriter. This concept of harmonized designs is commonplace today.

In 1987, we redesigned *Scientific American* and made additional weights of Lucida Sans, and a new family, Lucida Bright, a sharpening of Lucida serif for magazine publishing. We digitized these for Autologic digital typesetters, and *Scientific American* used them from 1987 to 1996. We also added them to our repertoire for general technology licensing.

Over the next decade, Lucida caught on. Because Adobe hadn't acquired it early on, we kept ownership of it, and as rival font technologies and companies came into competition with Adobe, we licensed Lucida directly to several major firms.

***Walden*: What else was happening with font technology beyond Adobe?**

Bigelow: By 1987, Apple began to chafe under PostScript font royalties and Adobe's exclusive control of PostScript, so Apple hired an experienced font engineer away from Imagen to develop an independent font technology. Kris and I met with Jean-Louis Gassée and Apple's lead font engineer and its project manager. In January 1989, Apple asked Bigelow & Holmes to work on several projects. One was to convert Macintosh bitmap fonts designed by Susan Kare to Apple's new outline font technology, codenamed Bass. Another was to "hint" a font in Bass format as a proof of concept, showing that the hinting could work for a full font. Yet another was to identify third-party sources of high-quality font outlines and software translators from existing font formats to Bass. Apple also licensed Lucida fonts for its new technology, to show it could innovate in fonts. Apple's font technology used quadratic spline outlines that Apple claimed could be rasterized faster than cubic splines and, in addition to global hinting, also used hand-edited local hinting that could achieve higher quality but with greater development effort. Local hinting was an idea that had been developed at Imagen.

Converting Apple's Macintosh bitmap fonts to outlines was nontrivial; it required the redesign of letterforms at high resolution, digitizing spline outlines, and converting to Apple's font technology, while retaining a semblance of the original look and metrics.[18] For proof-of-concept hinting, Kris used Apple's low-level hinting instruction code and rudimentary editor (called Bass-o-Matic or RoyalT) to hint an ASCII set of Lucida Sans. We believe it was the first time an entire font had been hinted in Royal. To obtain third-party font data and translation software, we accompanied Apple's font engineer and project manager to URW in Hamburg, Germany. We also agreed to license Lucida Sans and Lucida Bright fonts to Apple.

In 1987–1988, Folio, a spin-off from Imagen, developed a font format called F3 that used conic splines and a procedural hinting technique. Folio's innovation included a fully automatic hinting

method that did not require any hand-editing, unlike the Adobe, Imagen, and Apple font technologies. Sun Microsystems bought Folio in 1988.

Microsoft sought to acquire font technology for Windows and negotiated with Folio and Sun for F3, without success. In 1989, Microsoft asked me to participate in a blind judging of two other rival font technologies. One was Intellifont from Compugraphic Corporation, which Hewlett-Packard's printer group urged Microsoft to adopt. The other was Nimbus Q from Mike Parker's The Company, which Microsoft preferred. Both font technologies were derived from Karow's Ikarus system, by different paths. The blind judging was inconclusive, so Microsoft negotiated with Apple for Royal font technology. In the fall of 1989, Microsoft and Apple mutually announced TrueType (formerly Royal) at the Seybold Seminar in San Francisco, igniting what journalists called the Font Wars.

These rivalries opened opportunities for Lucida because all these firms had digital font technologies but few or no fonts, and we had Lucida fonts digitized and ready to go.

In 1990–1992, Microsoft licensed Lucida Bright, Lucida Sans, Lucida Sans Typewriter, Lucida Fax, Lucida Calligraphy, Lucida Handwriting, Lucida Blackletter, and Lucida Bright Math for its TrueType implementation in Windows. Microsoft outright purchased Lucida Icons, Lucida Stars, and Lucida Arrows and reconfigured and renamed them Wingdings.

In 1994, the firm of Y&Y, which had made a version of TeX for Windows PCs, brought out Lucida New Math fonts in PostScript Type 1 format for use with Knuth's TeX systems.

In 1999, Sun Microsystems licensed Lucida Sans, Lucida Bright, and Lucida Sans Typewriter fonts for the Java Developers Kit as well as Greek, Cyrillic, Thai, Arabic, Hebrew, and Devanagari fonts in the style of Lucida Sans for Java and Solaris. Our practice of "harmonizing" non-Latin with Latin typefaces has been both followed and critiqued.[19,20]

In 2000, Apple commissioned extensions of Lucida Sans, renamed Lucida Grande, as user-interface fonts in the Macintosh OS X operating system. Those were distributed with OS X beta tests in 2000 and in full release in 2001. Lucida Sans turned out to be nearly ideal for screen displays. On screens with white background, the black text lightened slightly to what we originally intended, and the design's big *x* height (how big the lowercase looks), open letter spacing, and clear, simplified shapes made text legible even at small sizes on screens. Over the next 14 years, up to 80 million Mac OS X users used Lucida Grande on a daily basis.

***Walden*: Wow!**

Bigelow: More Lucida fonts have been distributed by Microsoft, but not standard user-interface font: Wingdings, Lucida Sans Unicode (with non-Latin and symbol characters), and Lucida Console (for terminal emulation and programming). Other Lucida fonts are bundled with Microsoft Office and other applications. But, I should emphasize that numbers of fonts distributed are not the only rewarding and satisfying part of font design. To work on interesting projects with inventive people is exciting and intriguing. For instance, in 1995, we worked with Rob Pike at Bell Labs on Lucida fonts for the Plan 9 operating system; twenty-one years later, we worked with Rob again, now at Google, along with Nigel Tao, developing a family of open source fonts, the "Go" fonts, for free distribution with the Go programming language.

***Walden*: It seems your emphasis on original type design for digital systems has been adopted by others.**

Bigelow: Yes, it was a gradual but seemingly inevitable consequence of the Font Wars. One reason we designed Lucida was to "prime the pump" by example, to encourage creation of original designs for digital printers. Bitstream began to produce original digital font designs by 1987. Adobe released its first Adobe Originals in 1989. When Adobe published its Type 1 font format in 1990, developers of font editing tools enabled Type 1 output, so many more designers began creating digital fonts. The trend continued with TrueType and more font editing and design tools, some free and open source. Today, there are many more font designers and hundreds of thousands of digital fonts, many of them original, imaginative, and unique. Many others are clones, imitations, plagiarisms, and frankenfonts, a consequence of the fluidity and dematerialization of digital font information.

***Walden*: You mentioned the Font Wars earlier. Please say more about that.**

Bigelow: The Font Wars eventually resulted in the electronic typography glowing on the screens of billions of digital devices today, but initially they were a fierce computer industry struggle to dominate font technology for operating system hegemony. As in the Wars of the Roses, there were multiple shifting alliances between smaller fiefdoms and one or another of the great houses contending for the throne. The Font Wars began around 1981, were at their hottest between 1989 and 1992, and lasted until roughly 2001, with occasional later brushfires. The Font Wars were fueled by millions of dollars in research and development, weaponized with mathematics, algorithms, and aesthetics, rife with boasting and vile invective, strewn with squandered opportunities, and yet lit up by occasional flashes of brilliance. They left virtual battlefields, littered with the debris of abandoned technologies, defunct corporations, and melancholy musings on what might have been.

The Font Wars left virtual battlefields, littered with the debris of abandoned technologies, and melancholy musings on what might have been.

***Walden*: I gather it was possible to make a living as a freelance type designer, but it appears like a cobbled-together existence—some type design, some consulting, some teaching.**

Bigelow: I didn't plan for a career as a freelance soldier in the Font Wars, adventuring with most major or minor tech firms at one time or another as the tides of battle shifted across the high-tech landscape. But by accident, desire for independence, and personal inclination, that's how I wound up. My youthful curiosity about science and art, and pleasure in explaining things through writing and enjoyment of teaching, remained constant. I have been lucky to work with Kris Holmes, who has concentrated on elegant and original design, and we have thus maintained our studio for more than 40 years.

In the early 2000s, we took a few years off from type to study film and animation, which we saw as the coming trend in digital technology. In 2006, I returned to typography as Melbert B. Cary Distinguished Professor of Graphic Arts at RIT, coincidentally the professorship that Hermann Zapf held when Kris and I studied with him 27 years before. We last saw him and his wife, calligrapher and type designer Gudrun Zapf von Hesse, in 2007 at RIT. I have since retired from teaching but continue as scholar-in-residence at the RIT Cary Collection of rare books and materials on printing and typography. I write about the history, art, and technology of typography and consult with vision scientists researching reading and legibility. Kris and I keep designing type, like recent OpenType upgrades of the Lucida Math fonts for the TeX Users Group and new scripts by Kris coming out this year.

***Walden*: Thank you for participating in this interview. I look forward to the paper you are writing on the Font Wars.**

Background of Charles Bigelow

Born: Detroit, Michigan, 1945.

Education: Cranbrook School, diploma, 1963; Reed College, BA in anthropology, 1967; Harvard University Extension, CAS (humanities and sciences), 1991; University of California, Los Angeles, MFA in film, 2003.

Academic Employment: University of Oregon; Portland State University; Portland Museum Art School; Rhode Island School of Design; Stanford University; Rochester Institute of Technology.

Honors and Award: MacArthur Foundation Prize Fellowship, 1982; Frederic W. Goudy Distinguished Award in Typography, 1987; Alfred P. Sloan Science Screenwriting Fellowships, UCLA, 2001 and 2002; Samuel P. Goldwyn Screenwriting Award, UCLA, 2002.

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