# General Delivery

## Comments on the Format of This Issue

Barbara Beeton

The last issue of TUGboat was noteworthy for its new design, specified by the designer Martha Gannet, implemented by David Kellerman and Barry Smith, and bearing on its cover the image of our worthy vessel drawn by Duane Bibby.

This issue returns (temporarily, it is hoped) to the old "scrapbook" format. There are several reasons, chief among them the desire to get it into members' hands before the summer TUG meeting. A second reason, interacting strongly with the first, is the fact that we at the Math Society have not yet succeeded in obtaining the new fonts, and the time required to install them on the Alphatype typesetter (once the METAFONT files are in hand) is greater than the time available before copy is due to the printer. There should be enough lead time before the next issue goes to press to allow the new style to be accommodated in a leisurely fashion.

In the meantime, please contemplate your reactions to the new design (and the old one too), and let us know what they are. (Cal Jackson has already sent in his comments; see page 98.) At the summer meeting, David Kellerman will give a session describing what was involved in implementing the new design. I hope this will be a catalyst for starting a lively discussion.

## *Computers & Typesetting* Coming Out Party

Barbara Beeton

On May 21, 1986, at the Computer Museum in Boston, Addison-Wesley hosted a reception "in celebration of the completion of TEX, Donald Knuth's Computer Typesetting System", as it said on the poster. The five volumes of *Computers & Typesetting* were on display, fresh from the bindery, and they do look slick. (Attendees who looked a little harder could find an earlier work of Don's in a museum display case — volume 1 of *The Art of Computer Programming*.)

There were other goodies on display as well: MicroTEX, MacTEX (both with previewers and laser printer output), and a 5-day old implementation of METAFONT on an IBM PC/AT. Addison-Wesley intends to be a primary marketer of TEX-related software and documentation, as A-W's president, Donald Hammonds, stated in his introductory remarks. Peter Gordon, Don's editor at A-W, added his comments, and then Don described the history of computers and typesetting, starting with Babbage.

The reception was well attended, with many familiar and unfamiliar faces and names present. Don was accompanied by his wife, Jill, and daughter, Jenny. David Fuchs was there, showing off MicroMETAFONT (MicroTEX is now safely in the custody of A-W's technical group), and David Kellerman and Barry Smith were doing the same with MacTEX. Dave Rodgers was watching over Textset's Preview, and dropping hints about what's to be in the next release. Onlookers included Bart Childs, Sam Whidden, Ray Goucher, Alan Hoenig (whose name tag identified him as TUGboat Associate Editor), Georgia and Rick Tobin, and myself; TUG was well represented.

Peter Gordon and Don Knuth have kindly provided the text of their remarks for publication. I think the following pages will give a bit of the flavor of what was a most festive occasion.

## Introducing Donald Knuth and *Computers & Typesetting*

Peter Gordon
Addison-Wesley Publishing Co.
at the Computer Museum
Boston, Massachusetts
May 21, 1986

I am especially delighted to be celebrating here, at the Computer Museum, both the TEX system for computer typesetting and the completed work of its author, Don Knuth. It seems fitting that TEX, which is leading a computer-based revolution in the way books and documents of all sorts are produced, should be presented in a thoughtful, historical context. It seems equally appropriate that Don Knuth should himself be introduced in this setting, given his well-known understanding of

the history of computing and his own important contributions to that history.

In promoting TEX, with the publication of both software and books related to it, and in our use of the TEX system in the production of our own books, we at Addison-Wesley hope to make some contribution to the field as well — a contribution to the future of publishing and communications, and, with that, to the future of science, technology, and education.

Before I go further, I should explain what TEX is, and why people are so excited about it. Simply put, TEX is a computer program. It is a sophisticated piece of software developed by Don at Stanford University, through years of design, testing, and refinement, originally to solve problems he perceived in technical book production, and ultimately to show how the best computer science theory can effectively be translated into practice.

TEX is a tool for typesetting written works with the aid of a computer — articles, reports, proposals, books, you name it — a tool with which writers themselves can specify, through a rich language of commands, exactly what each page will look like when finally printed. Another program developed by Don as a companion to TEX, called METAFONT, even allows users to design the type that will appear on these pages.

The TEX system is particularly useful where the document being written contains mathematical expressions, or where book-like quality in appearance is desirable. These two features — math and beauty, if you will — would alone distinguish TEX from other available computer typesetting systems, and lead to comparison, instead, with more expensive typesetting systems used by professional compositors.

But there is more.

TEX for example, is a portable system, running on a wide range of computers, from micros to mainframes, each implementation fully compatible with the others. This is especially important in mixed computing environments, where a variety of machines is in use — which is almost everywhere in the scientific and technical community.

Related to this portability is TEX's printing device independence. Printed output can be obtained from the same TEX-processed file on everything from a CRT screen or dot matrix printer to a laser printer or even a phototypesetter. A writer, in other words, can proofread his or her text in screen display or local printer output before sending the very same file from which it was produced to a phototypesetter.

I won't go into all the features here. You should really see TEX demonstrated, and ask questions until you learn as much about it as you want.

I do want to point out, though, that TEX is rapidly becoming a standard text processing system in many academic departments and research laboratories throughout the world. It is also gaining increasing recognition for its potential in corporate and industrial, in-house publishing, as well as our own more traditional publishing environments. Addison-Wesley editors, for example, are working with more and more manuscripts prepared with TEX. Among my own authors, Fred Brooks, of *Mythical Man-Month* fame, and Carver Mead, co-author (with Lynn Conway) of the seminal *Introduction to VLSI Systems*, have both converted to TEX.

As early as seven years ago, Gordon Bell perceived the importance of TEX. He wrote then that "Don Knuth's [TEX] is potentially the most significant invention in typesetting in this century. It introduces a standard language for computer typography and in terms of importance could rank near the introduction of the Gutenberg press."

Addison-Wesley first became interested in TEX as an extension of our book publishing relationship with Don dating back many years. As a publisher of many scientific and technical books, however, we soon recognized ourselves the significance of his system for our own business. TEX offered the opportunity to produce such books more quickly and more cheaply than ever before possible, and to provide our authors with increased convenience and facility in developing their works.

We are now deeply involved with TEX in two distinct ways.

First, we are the publishers of TEX. We publish a variety of books related to TEX, including Don's own *Computers & Typesetting* series, about which I'll say more in a minute, and books by other authors. One such book I should mention is *LATEX: A Document Preparation System*, by Leslie Lamport, which describes the "front-end" system he built for TEX, and which he, like Don, placed in the public domain.

We also publish TEX software, as well as other software products related to it. MicroTEX, for example, is a complete implementation of TEX for microcomputers developed by David Fuchs at Stanford. MicroTEX currently runs on the IBM PC family of machines, plus compatibles.

The second way Addison-Wesley is involved with TEX is in the production of our books. Our aim is to learn this new technology as deeply as possible through first-hand experience with it, and thereby

to maintain our position among publishers at the forefront of modern book production technologies.

The publication of Don Knuth's five-volume *Computers & Typesetting* series represents the culmination of his work on TEX and METAFONT. And this, specifically, is what we are celebrating today. You can see the books spread around the room. They were all, of course, typeset, by the author, with TEX.

Volume A is the definitive user's guide and complete reference manual for TEX. This book first appeared in softcover form, and many thousands of copies have already been sold around the world.

Volume B contains the complete source code listings for TEX, and incidentally provides an excellent example of how to write and document a very large program.

Volume C is the user's guide and reference manual for METAFONT, the companion to TEX for font design.

Volume D contains the complete source code listings for METAFONT.

Volume E might become the first coffee-table book in computer typesetting. It graphically depicts over 500 examples of METAFONT programming, the programs that generated all the letters used in the five volumes.

I would like now to introduce Don Knuth. In computer science circles, there would be no need to say anything more. His contribution to the field includes the classic series of books on the *Art of Computer Programming*, about which one reviewer has said, it is as important a work for computer science as Euclid's was for geometry. Don is the recipient of the prestigious Turing Award and National Medal of Science. He is Fletcher Jones Professor of Computer Science at Stanford University.

Don is on sabbatical this year working on a book in theology. If he has been compared to Euclid for his work on the *Art of Computer Programming*, and to Gutenberg for his work on TEX, we can only wonder what the next comparison will be.

With Don today are his wife, Jill Knuth, herself the author of a recently-published book, *Banners without Words*, and daughter Jenny, a student at Brown University. Son John, a student at Stanford, is back home in California minding the computers.

Now, needing no further introduction, here is Don Knuth.

## Remarks to Celebrate the Publication of *Computers & Typesetting*

Donald Knuth
at the Computer Museum
Boston, Massachusetts
May 21, 1986

The title of the books we're celebrating today is *Computers & Typesetting*, and since we're meeting here in the Computer Museum I think it's appropriate to point out that computers have been intimately associated with typesetting ever since the very beginning. Anybody who reads about the history of computers will soon learn that many of the key ideas go back to $19^{th}$ century England, where Charles Babbage designed a so-called Difference Engine and went on from there to plan his Analytical Engine.

Babbage's own machines were never completed, but a Swedish author and publisher named Georg Scheutz read about them and was so fascinated that he and his son Edvard actually built a working difference engine. Thus it was that the first sophisticated computing device came to be built in Sweden. And the most interesting thing, to me at least, was that the output of the Scheutz machine was not punched cards or anything like that; their machine actually produced lead stereotype plates from which books could be printed! Several books were, indeed, printed from the output of this early machine. It was demonstrated in 1856 at the Universal Exposition in Paris, and the souvenir album of that exposition contains the following glowing tribute: "This nearly intelligent machine not only effects in seconds calculations that would demand an hour; it prints the results that it obtains, adding the merit of neat calligraphy to the merit of calculation without possible error."[1] I have copied a page from the first computer-produced book — printed in 1857 — so that you can see how far we've come since then. As far as I know, this page is the first extant output of an automatic calculator.[2]

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[1] Leon Brisse, *Album de l'exposition universelle*, Paris, 1857, p. 194. [Cited in Uta C. Merzbach, *Georg Scheutz and the first printing calculator* (Washington: Smithsonian Institution Press, 1977).]

[2] (Editor's note.) The page, which was displayed among images of METAFONT letterforms, contains columns of figures, neatly aligned and separated by rules, and clearly displays the traces of ink that indicate the edges of pieces of metal type impressed on moistened paper.

I'd also like to say a few words about the history of my own work on computers and typesetting. Last week I went back to my diary of 1977 and found an entry from Thursday, May 5, where it says 'Design of TEX started'. My diary says that I worked intensely on the design all day Thursday, Friday and Saturday; then I went to see *Airport 77* and *Earthquake* to relax! The entry for the following Thursday says: 'Wrote draft report on TEX, stayed up till 5 a.m. typing it into machine'. That weekend I went with my wife on a tour of the Sacramento area with Stanford's Library Associates. We saw many examples of fine printing during that trip, and this encouraged me to read a lot of books about font design during the following week. My diary entry for Saturday, May 21, 1977 — exactly nine years ago today — says that by 5 a.m. that day I had made 'rough drafts of lower case and upper case Roman and italics and digits 0–9'. After a few hours of sleep, I spent the rest of that Saturday writing computer programs to plot curves on a raster. Oh, how little I knew in those days about how difficult it would be to complete this work, which I had sketched out in about two weeks!

Why did I *start* working on TEX in 1977? The whole thing actually began long before, in connection with my books on *The Art of Computer Programming*. I had prepared a second edition of volume 2, but when I received galley proofs they looked awful — because printing technology had changed drastically since the first edition had been published. The books were now done with phototypesetting, instead of hot lead Monotype machines; and (alas!) they were being done with the help of computers instead of by hand. The result was poor spacing, especially in the math, and the fonts of type were terrible by comparison with the originals. I was quite discouraged by this, and didn't know what to do. Addison-Wesley offered to reset everything by the old Monotype method, but I knew that the old way was dying out fast; surely by the time I had finished Volume 4 the same problem would arise again, and I didn't want to write a book that would come out looking like the recent galleys I had seen.

Then a nice thing happened. I was on a committee to revise Stanford's reading list for our department's comprehensive exam, and one of the things we had to do was evaluate a book that Pat Winston had just written about *Artificial Intelligence*. We received galley proofs of that book, and the story we were told was that these galleys had been made on a new machine in Southern California, all based on a discrete high-resolution raster. Apparently one of Winston's students at MIT had flown to Los Angeles with that book on magnetic tape, and the galley proofs we saw were the result. Well, I had had lots of experience with rasterized printing, but only at low resolution, so I thought of it as simply an amusing toy. When I saw these galleys of Winston's book, I was astounded, because the resolution was so good I couldn't tell that the type was actually digital. In fact the digital type looked a lot better than what I had been getting in my own galley proofs.

Digital typesetting means patterns of 0s and 1s, and computer science can be thought of as the study of patterns of 0s and 1s. Therefore, it dawned on me for the first time that I, as a computer scientist, would be able to help solve the printing problem that was worrying me so much. I didn't need to know about metallurgy or optics or chemistry or anything scary like that; all I had to do was construct the right pattern of 0s and 1s and send it to a high-resolution digital typesetter like that machine in Southern California; then I'd have my books the way I wanted them. In other words, the problem of quality printing had been reduced to a problem about 0s and 1s. Therefore it was almost an *obligation* for a computer scientist like myself to study the problem carefully.

Within a week after seeing the galleys of Winston's book, I decided to drop everything else and to work on digital typography. Although Winston unfortunately couldn't be present here today — Pat, I can't thank you enough for having written that book!

Ever since these beginnings in 1977, the TEX research project that I embarked on was driven by two major goals. The first goal was *quality*: we wanted to produce documents that were not just nice, but actually the best. Once upon a time, computers could deal only with numbers; then several years passed when they had numbers and uppercase letters; then they became able to deal with both uppercase and lowercase; then they became capable of working with letters of variable width; and by 1977 there were several systems that could produce very attractive documents. My goal was to take the last step and go all the way, to the finest quality that had ever been achieved in printed documents.

It turned out that it was not hard to achieve this level of quality with respect to the formatting of text, after about two years of work. For example, we did experiments with *TIME* magazine to prove that *TIME* would look much better if it had been done with TEX. But it turned out that the design