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Reviews of Mathematical Software

\TeX on the Macintosh

Reviewed by Tom Scavo, Yannis Haralambous,
and Werenfried Spit¹

Introduction

There are currently four implementations of \TeX available for the Macintosh family of computers: $\text{CMac}\text{\TeX}$, $\text{Direct}\text{\TeX}$, $\text{Oz}\text{\TeX}$, and *Textures*. The latter is a well-known commercial product which won't be reviewed here; the others are either freeware or shareware and are the focus of this report. It is possible to assemble a complete \TeX processing system on a Macintosh for little more than \$50 in shareware fees; or you can have a completely free \TeX system consisting of $\text{Oz}\text{\TeX}$ 1.42 or $\text{CMac}\text{\TeX}$ 2.0, together with *BEdit Lite* and *Excalibur*, for instance.

When the Mac came out in 1983, many saw it as a totally different approach to personal computing. Rather than memorizing scores of arcane commands which had to be typed in, users could now choose commands from *menus* and click on *buttons* in *windows* using a *mouse*. This new graphical interface was friendly to users and, consequently, the gap between "users" and "programmers" widened.

But \TeX is a programming language. From the typical user's point of view, a \TeX document is a program to be written, compiled (or typeset), and executed (that is, previewed or printed). Other programs produce or convert fonts, give PostScript output, or help with the preparation of indices or bibliographies. In a command-line operating system

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(like DOS or Unix) these programs are sometimes controlled by batch files or scripts.

The traditional command-line way of doing things is in stark contrast to the Macintosh approach where commands are chosen from menus and applications are launched by double-clicking an icon with a mouse. So one question is, do the programs under review sufficiently insulate the user from programming issues and the old command-line interface wherein \TeX originated? We shall see that the various Macintosh \TeX implementations address this question differently.

$\text{Oz}\text{\TeX}$

Despite the version numbers attached to the various Macintosh \TeX programs, $\text{Oz}\text{\TeX}$ is the most mature.² $\text{Oz}\text{\TeX}$ 1.42, for example, is a freeware \TeX program requiring only 880kB of memory and therefore capable of running on a 1MB Macintosh.³ But version 1.42 has its limitations, and serious \TeX users will outgrow it quickly. Version 1.6, on the other hand, implements \TeX version 3.141 and supports "big" \TeX . Basically what that means is that there are fewer restrictions on the size of documents or the number of macro packages that may be input. The base configuration of version 1.6 requires 1300kB of RAM while an optimal setup requires 3100kB. Larger configurations are also possible.

Setting It Up

The $\text{Oz}\text{\TeX}$ 1.6 distribution consists of five archived files (*oztex*, *formats*, *fonts*, *inputs*, and *readme*) requiring three high-density diskettes. You'll need a version of *StuffIt* to unpack the archives and a set of PK fonts—a type of bit-mapped font—to match your screen and printer. Be forewarned, however, that the fonts consume a significant amount of space on your hard drive (a typical PK folder may contain 8MB of fonts, for example).

Version 1.6 comes with three format files: *Plain*, *LaTeX*, and *NFSS-LaTeX* ("big" versions of these format files are obtained by running *INITEX* from the menus). The latter implements the New Font Selection Scheme and makes it easy to substitute a PostScript (PS) font for Donald Knuth's Computer Modern (CM) text fonts. (Note that CM is still used to typeset the mathematics.) Overall, version 1.6 has excellent PostScript font support and will even download PS fonts to the printer on demand.

It is easy to configure $\text{Oz}\text{\TeX}$ using the predefined configuration files accessible from the *Configs* menu. With these files you can change the screen or printer resolution, memory configuration, or printer designation on the fly (see Figure 1, p. 1354). By creating your own configuration files, you can modify virtually any \TeX parameter or specify multiple-search paths to make it easy to organize an assortment of macros, styles, and fonts. Other data, such as the name and location

²An early version of $\text{Oz}\text{\TeX}$ was reviewed in these *Notices* (36, 680–681, July/August 1989).

³In its optimal state, version 1.42 needs 1700kB of memory, however.

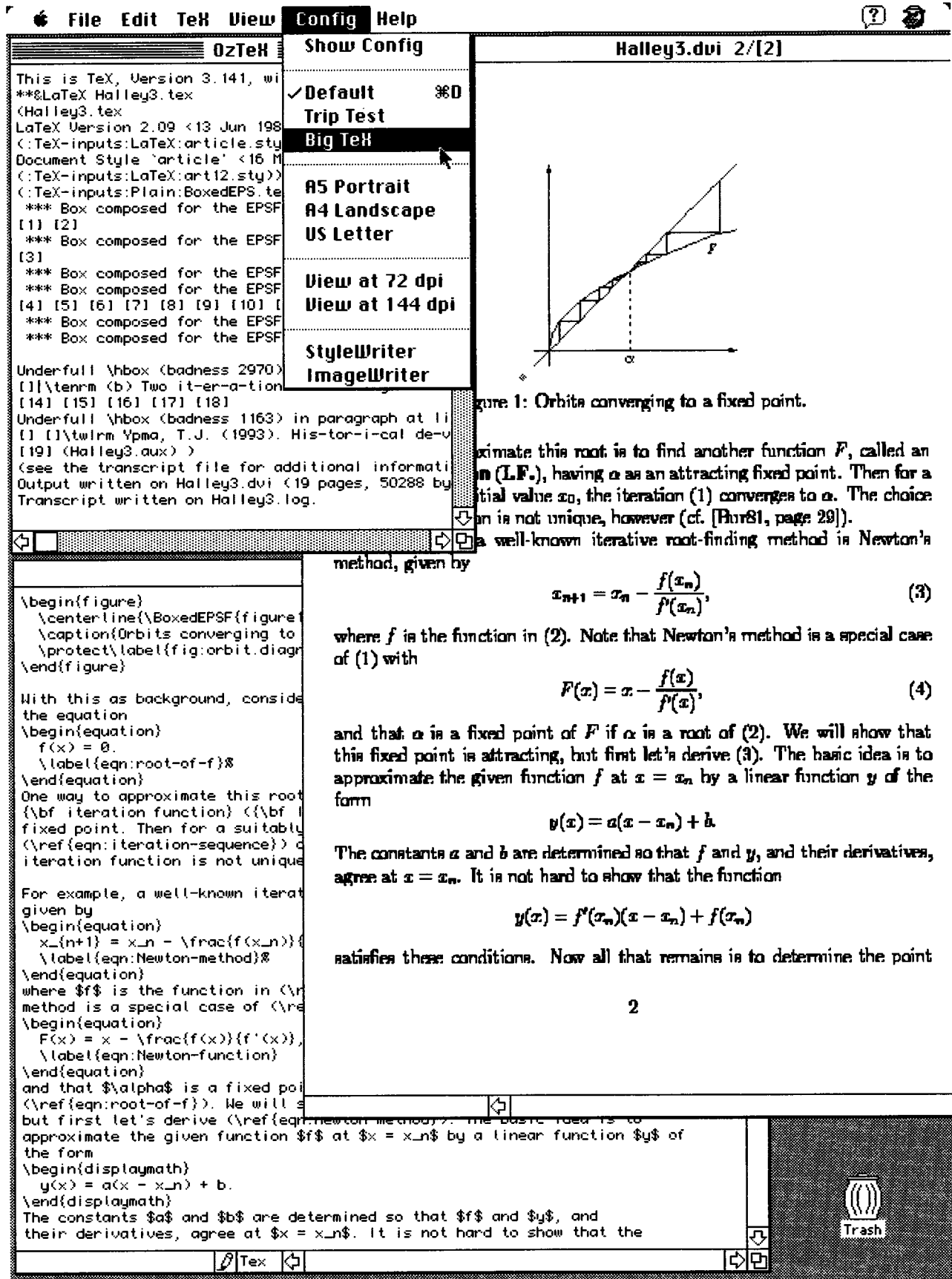


Figure 1: OzTeX

of the default configuration file, command key shortcuts, and menu item names are stored as standard Mac resources.

In general, OzTeX 1.6 works seamlessly with virtual fonts.⁴ It will “devirtualize” a DVI file automatically or on command. There is also a stand-alone application called OzTools which implements a number of standard font-related TeX utilities (PLtoTF, TFtoPL, VFtoVP, VPtoVF).

Using the Program

Formatting, viewing, and printing are completely integrated in OzTeX 1.6. When the .tex file is ready, first choose the appropriate command from the menus to typeset the document (subsequent compilations may be activated with command-T). Then, assuming there are no errors, type command-W to bring up the view window and command-P to print the resulting .dvi file. Note that OzTeX will also view and print DVI files from other systems, and conversely.

OzTeX is one of the slower Macintosh TeX implementations, but version 1.6 does support background printing and typesetting. In other words, you can edit a file that is being printed or switch to some other application while a large document is being formatted. The only restriction is that you may not print and format at the same time.

The program has always worked well with PostScript printers, and now version 1.6 prints directly to non-PS printers such as the ImageWriter, StyleWriter, DeskWriter, and LaserWriter SC. By the way, additional PK fonts have been added to the standard OzTeX distribution to satisfy the needs of StyleWriter users.

OzTeX began previewing graphics with version 1.4, and now it will output these same graphics files on non-PostScript printers. In fact OzTeX 1.6 prints *all* of the common Mac graphics formats (PICT, MacPaint, and EPSF) on *any* printer. Even encapsulated PostScript files will print on non-PS printers since Macintosh EPSF files include a PICT preview which OzTeX is smart enough to use for printing purposes.

Version 1.6 includes a concise 29-page user manual. Most of what you need to know about installation, fonts, and program operation will be found in this document. There are also some fact files accessible from the program's Help menu.

Euro-OzTeX is a repackaging of vanilla OzTeX but with DC fonts (instead of CM fonts) and DC-oriented format files.⁵ DC fonts contain 256 characters as opposed to CM's 128. The extra characters are used mainly for accents so that an accented character is a single character. This makes it easier to hyphenate words containing accented characters, and so Euro-OzTeX is particularly useful for typesetting languages other than English, Latin, Hawaiian, or Indonesian.⁶

What is Missing?

First of all, OzTeX does not include an integrated editor. And although previewing and printing are built-in functions of OzTeX, many other TeX-related activities are not. There are

no integrated METAFONT, BibTeX, or MakeIndex utilities, for example. (But there *are* freeware, stand-alone versions of these programs—see the list of related software at the end of this article.) Despite these shortcomings, OzTeX is very popular and will satisfy the needs of all but the most demanding TeX users.

DirectTeX

Compared to other TeX implementations for the Macintosh, DirectTeX is the more traditional, no-compromise solution. Instead of bringing TeX closer to the spirit of the Mac, it leaves TeX as it is and treats the Mac as though it were a command-line system. This is by virtue of Apple's *Macintosh Programmer's Workshop (MPW)*,⁷ a programming environment strongly resembling Unix.

DirectTeX is a shareware implementation of TeX for the Macintosh which works only in the presence of MPW. Version 2.0 of DirectTeX is built on a “big” version of TeX 3.141 and TeX--XeT, a bidirectional TeX for typesetting Hebrew and Arabic (see Figure 2, p. 1356). The package also includes METAFONT 2.71 and numerous TeX-related utilities (BibTeX, MakeIndex, DVICopy, DVIType, PoolType, GFtoDVI, GFtoPK, GFType, PKtoGF, PKType, PLtoTF, TFtoPL, VFtoVP, VPtoVF, MFT, PatGen, Checksum), as well as more specialized utilities such as Tangle and Weave for Pascal, C, and Modula-2. There is also a special version of METAFONT, called MFtoPK, which creates PK rather than GF files. DVI drivers for previewing and printing on PostScript or QuickDraw printers are included, as well as Erik-Jan Vens' utilities for converting PostScript fonts into METAFONT fonts.

How Does MPW Work?

First of all, MPW is a text editor with powerful searching, sorting, comparing, and markup facilities. It also has a command line. When the enter key is pressed, the current line is interpreted as a command and executed. Multiple commands may be stored in a file (called a *script*) which is executed either by typing its name or via a menu item. As with other Macintosh-TeX implementations, you open, typeset, and preview documents via menu commands; but what actually happens is that scripts are being executed in the background. These in turn call TeX, the DVI drivers, and all necessary utilities.

Many tedious tasks may be automated with scripts. For example, if some fonts or font sizes for a particular document are missing, a script can automatically launch MFtoPK in the background, create the needed fonts, place them in the appropriate directories, and then continue previewing or printing the document. If virtual fonts are being used, DVICopy can be made to devirtualize the DVI file automatically. Text files from different sources (DOS or Unix) can automatically be converted to Macintosh format and vice versa. Public

⁴See a recent *Notices* article on virtual fonts (40, 464–469, May/June 1993).

⁵TUG has recently embraced DC fonts as the new TeX standard.

⁶Thanks to Timothy Murphy for information regarding Euro-OzTeX.

⁷MPW is commercial software (see the related software list at the end of this article). Some believe it is the best available programming environment for the Macintosh.

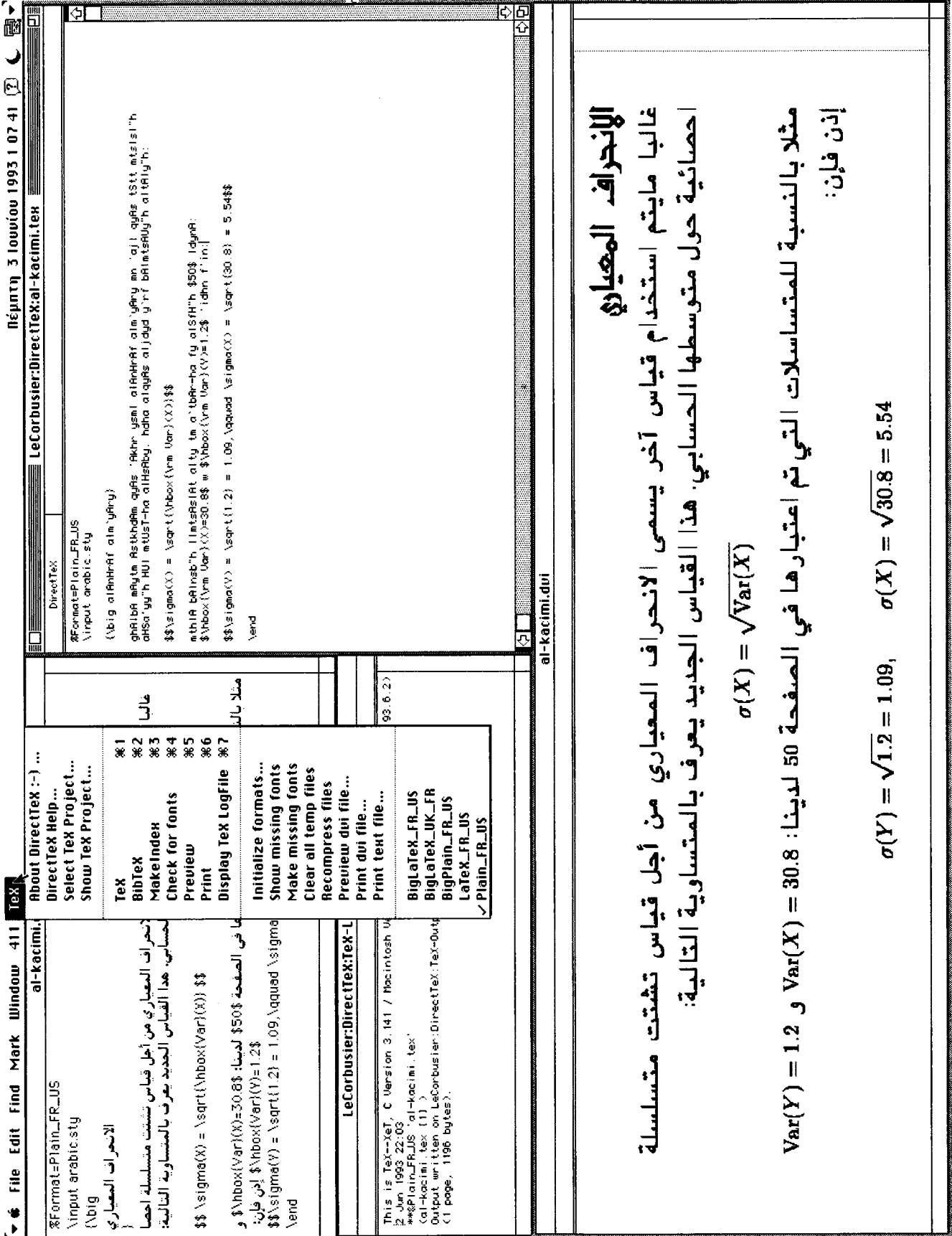


Figure 2: DirectTeX

الانحراف المعياري

غالبًا ما يتم استخدام قياس آخر يسمى الانحراف المعياري من أجل قياس تشتت متسلسلة احصائية حول متوسطها الحسابي. هذا القياس الجديد يعرف بالمتمساوية التالية:

$$\sigma(X) = \sqrt{\text{Var}(X)}$$

مثلاً بالنسبة للمتسلسلات التي تم اعتبارها في الصفحة 50 لدينا: $\text{Var}(X) = 30.8$ و $\text{Var}(Y) = 1.2$ إذن فإن:

$$\sigma(Y) = \sqrt{1.2} = 1.09, \quad \sigma(X) = \sqrt{30.8} = 5.54$$

domain text processing utilities like AWK and Perl can be used.

Using Direct \TeX and MPW Together

One gets a strong sense of order when using Direct \TeX and MPW. All commands issued appear in a special window called a “worksheet” and remain there until erased. A quick glance at the worksheet tells you immediately what’s been done and what remains to be done. In this way the session is neatly recorded and you always know what’s going on.

Standard operations have been assigned to various command keys. Once you’ve chosen your .tex file, command-1 will typeset it, command-2 runs Bib \TeX , command-3 invokes *MakeIndex*, and command-4 checks for missing fonts. Finally, command-5 previews the DVI file, and command-6 prints it. You can modify these command keys or add new ones, if desired.

The METAFONT-related batch files, in particular, save you time and trouble. The system knows exactly which fonts are missing (even if you use several printers with different characteristics) and creates them on the fly.

With Direct \TeX , encapsulated PostScript files may be included in your .tex documents using dvips syntax. Perhaps more importantly, PICT files may be converted into EPSF using a utility called ClipToRez.

What Are the Shortcomings?

First of all, the documentation is rather laconic. And although the programs themselves are very quick, there are noticeable delays, since the scripts sometimes take a long time to perform their respective tasks.

Another problem stems from the fact that MPW cannot run two programs (“processes” in Unix lingo) simultaneously. This means you cannot preview a DVI file and edit the corresponding text file at the same time. Nor can you format the .tex file while the DVI file is being previewed. To get around these problems, however, another DVI previewer called MacDVI is included.

Finally, nonresident PostScript fonts are not downloaded to the printer automatically. You have to do this yourself before printing your document.

The Bottom Line

Direct \TeX is powerful, consistent, and complete. If you like the idea of a Mac programming environment run by batch files and scripts or if you frequently run METAFONT and would like to create missing fonts on the fly or if you use Bib \TeX or *MakeIndex* and want this to happen automatically, then Direct \TeX may be just what you’ve been looking for. But if you’ve never used MPW or have never worked with a command-line operating system, then Direct \TeX may not be for you, unless, of course, you’re willing to spend a couple of afternoons getting used to such an environment.

Finally, Direct \TeX (like em \TeX on the PC) is written and supported by a passionate hacker who incorporates new versions and corrects bugs in a matter of days. There are times when this fact can be of vital importance.

C \TeX

C \TeX 2.0 is a recent port of Unix C- \TeX to the Macintosh.⁸ Its strengths and weaknesses are summarized below:

- C \TeX is reasonably fast.
- The main program includes the formatter and an editor and requires 2MB of RAM. The previewer, which is a separate application, requires an additional megabyte of memory.
- Included in the package is dvips (a program that converts DVI files into PostScript) and a print utility.
- Also included is INITEX, METAFONT, and a large number of font handling utilities (AFM2TFM, DVICopy, DVIType, GFtoDVI, GFtoPK, GFTYPE, MFT, PKtoGF, PKType, PLtoTF, PoolType, TFtoPL, VFtoVP, VPtoVF).
- Specification of path names is handled by a separate application.
- The program provides support for PostScript fonts (a corresponding set of .tfm and .vf files are included) and will download nonresident PS fonts to the printer on demand.
- Extensive documentation is lacking.
- C \TeX is freeware. However, a “big” version is available from the author for \$25.⁹

Installation

Unless you’re familiar with Unix \TeX , installing and using C \TeX may be tricky. Although unpacking the archives is easy (there are fonts, styles, various input files, and two formats—plain \TeX and $\mathbb{E}\TeX$), you’ll have to run a small application to set all the path names or use a program like ResEdit to change the path names directly. Unfortunately, there is no documentation explaining how to do this.

Because of its rather large memory requirements, C \TeX will not run comfortably on small machines. It needs at least 2MB of free RAM, although 4MB may be closer to an actual minimum (two for the formatter, one for the previewer, and one for a good editor). Since \TeX ’s internal memory parameters are not accessible in C \TeX , this cannot be changed. Moreover, the built-in editor provides only minimal capabilities and cannot be disabled to conserve memory. A minor inconvenience is that C \TeX applications cannot be closed by the Finder when the Mac is shut down.

Features

Working with C \TeX is fairly straightforward. From the menus, first choose the desired format and then open a document in an edit window before running the .tex file through the formatter. We’ve found C \TeX to be some 15% faster than Oz \TeX version 1.4, but on a small machine part of this speed advantage is lost by having to load the formatter and the previewer alternately (the previewer does remember the file name, however).

⁸C \TeX is now up to version 2.1. \TeX and dvips have been upgraded to version 3.141 and version 5.516, respectively. These programs will now process in the background, otherwise the functionality of C \TeX has not changed.

⁹The commercial version of C \TeX 2.1 now includes dvips version 5.516 and supports automatic generation of PK files.

The previewer has menu items for two levels of magnification, actual size and screen filling. Other magnifications are obtained by selecting a region with the mouse (see Figure 3). Provided the appropriate screen fonts are available in the Macintosh System file, the previewer readily displays PostScript fonts; but it will not handle virtual fonts unless the DVI file has been preprocessed with DVICopy. Unfortunately, the previewer will not display graphic files of any kind.

For those with PostScript printers, CMacTeX includes a port of Tomas Rokicki's *dvips*, regarded as one of the best DVI-to-PostScript converters available. Since *dvips* is available for almost any operating system, users running TeX on various machines can have the same setup across platforms.

CMacTeX Summary

For those running TeX on multiple platforms or otherwise concerned with compatibility issues, CMacTeX is a good choice. The overhead of large memory requirements and poor documentation might offset this advantage, however. Some of

the included utilities like *dvips*, METAFONT, and the font conversion tools (*GFtoPK*, *PLtoTF*, etc.) are worth getting and using, even if you decide not to use CMacTeX.

Other Applications

Given the religious fervor surrounding text editors, OzTeX's lack of one is perhaps fortunate. One popular text editor is *Alpha* with its extensive L^AT_EX-mode of input. When opening a .tex file, a menu is added to *Alpha*'s menu bar. Under this menu are templates for various document styles, commands, and environments; binary operators, relations, and arrows; the entire Greek alphabet; and much more. Most of these menu commands have corresponding command key equivalents. For example, to type a fraction, either choose the Fraction command from the Formulas submenu or type command-option-F. As a result the string “\frac{}{•}•” is inserted into your document with the cursor automatically positioned between the first pair of braces. Now type the numerator, press the tab key, type the denominator, and press the tab key

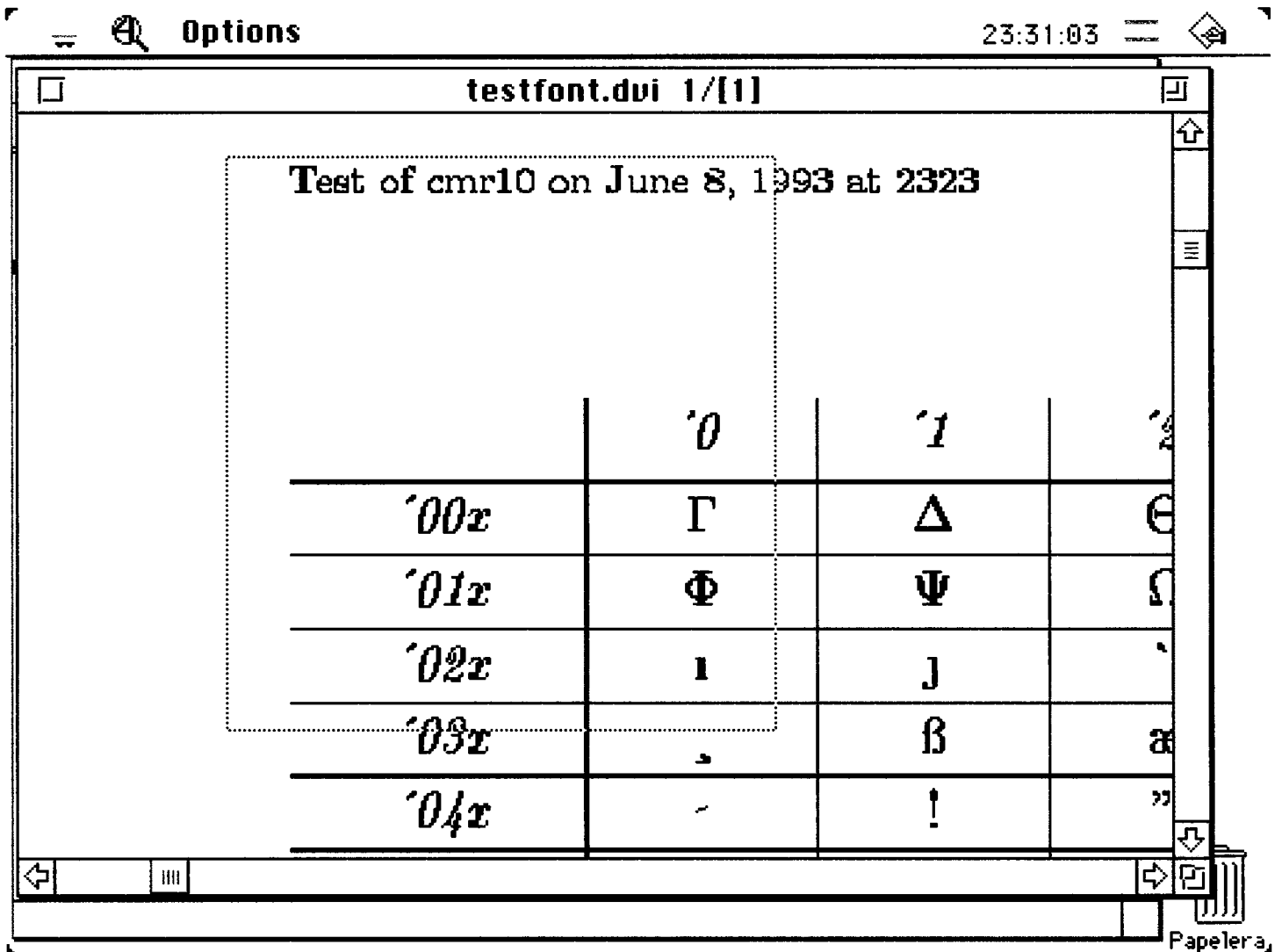


Figure 3: CMacTeX

again. That's all there is to it. Other \LaTeX commands and environments are handled similarly.

There are other Mac text editors which one might use. *BEdit*, for example, is a solid application with many excellent features. But there isn't much support for \LaTeX users, nor is there a built-in macro language. On the other hand, the documentation is better than *Alpha's*, support is excellent, and *BEdit Lite* is free.

Excalibur is an excellent freeware spell checker for the Mac. It does a good job of ignoring \LaTeX commands and will even spell check plain \TeX documents and other text files. Included in the package are facilities for creating and maintaining multiple-user dictionaries in addition to the standard English dictionary. British, Dutch, French, German, and Italian dictionaries are also available; and the author is aggressively soliciting additional language dictionaries from users.

Hyper \BibTeX is a freeware HyperCard stack with facilities for entering, editing, sorting, and searching bibliographic database files compatible with \BibTeX . It also imports and exports \BibTeX -compatible files. Together with Mac \BibTeX ,

Hyper \BibTeX provides complete \BibTeX support on the Macintosh.

Summary

Table 1 shows the various Macintosh \TeX packages at a glance. A few points are worth emphasizing, however:

- When run from the *MPW* command-line, *Direct \TeX* is the speediest of the three programs reviewed here. It is also the most complete (disregarding the fact that *MPW* is required, which is no small investment).
- Although *Oz \TeX* is well integrated and easy to configure, it is missing some important \TeX -related tools, especially *METAFont* and \BibTeX .
- *C \MacTeX* is probably the most compatible of the Macintosh \TeX implementations, but it is still pretty rough around the edges.
- None of the programs reviewed here can be said to have a good user interface, true to the spirit of the Macintosh. On the other hand, the design philosophy behind \TeX is somewhat orthogonal to menus and window-based

Table 1: Comparison of Various Macintosh \TeX Packages

	<u>Oz\TeX 1.42</u>	<u>Oz\TeX 1.6</u>	<u>Direct\TeX 2.0</u>	<u>C\MacTeX 2.0</u>
type of software	freeware	shareware	shareware	freeware
"big" \TeX support	no	yes	yes	no ¹
\TeX -- \XET support	no	no	yes	no
memory requirements	880–1700kB	1300–3100kB	2048–4096kB	2048kB ²
speed	fair	fair	excellent	good
compatibility	good	good	good	excellent
configurability	excellent	excellent	excellent	fair
user interface	fair	fair	fair	fair
integration	good	good	excellent	poor
\TeX tools/utilities	none	some	all	most
WEB tangle/weave	no	no	yes	no
built-in editor	no ³	no ³	yes	yes
built-in previewer	yes	yes	yes ⁴	no ⁵
built-in print driver	yes	yes	yes	no ⁶
multiple path support	no	yes	yes	yes
non-PS printer support	no	yes	yes	no
graphics support	good	excellent	good ⁷	fair
PS font support	good	excellent	good	excellent
virtual font support	none	good	good	fair
ease of installation	good	good	fair	fair
documentation	good	good	poor	none
user support	good	excellent	excellent	unknown

¹A "big" version of *C \MacTeX* is available directly from the program's author for \$25.

²The previewer and print driver are separate applications in *C \MacTeX* , requiring 1024kB and 512kB, respectively.

³A desk accessory called Σ Edit is included with the *Oz \TeX* distribution.

⁴A separate DVI previewer called *MacDVI* is also included in the *Direct \TeX 2.0* package.

⁵*C \MacTeX* includes a separate DVI-to-PostScript translator called *dvi.ps*.

⁶*PSPrint*, a print driver for PostScript printers, is included with the *C \MacTeX* distribution.

⁷The *MPW* tool *C1ipToRez* converts the clipboard's contents into a standard Macintosh EPSF file.

environments, so the fact that the interfaces are primitive compared with other Mac applications is perhaps what you'd expect.

As is usually the case in a comparative review such as this, which program is best depends on many factors. We hope we've given you enough information to make an informed decision.

T_EX-related Software for the Macintosh

- *Alpha*
Version: 5.5
Type: Shareware
Cost: \$25 individual; \$110 site license
Comment: Requires System 7
Author: Pete Keleher
E-mail: pete@cs.rice.edu (registered users only)
Where: ftp from cs.rice.edu
- *BEdit*
Version: Lite 2.3
Type: Freeware
Comment: May be upgraded to commercial version for \$49
Company: Bare-Bones Software
E-mail: bbedit@world.std.com
Where: ftp from world.std.com
- *CMakeT_EX*
Version: 2.1
Type: Freeware
Comment: A "big" version is available for \$25
Author: Tom Kiffe
E-mail: tkiffe@math.tamu.edu
Where: ftp from math.tamu.edu
- *DirectT_EX*
Version: 2.0
Type: Shareware
Cost: \$100
Comment: Requires MPW
Author: Wilfried Ricken
E-mail: wilfr@hadron.tp2.ruhr-uni-bochum.de
Where: ftp from hadron.tp2.ruhr-uni-bochum.de
- *Euro-OzT_EX*
Version: 2.0
Type: Freeware
Comment: Utilizes DC fonts
Author: Yannis Haralambous
E-mail: yannis@gat.citilille.fr
Where: ftp from ftp.cicb.fr
- *Excalibur*
Version: 1.4
Type: Freeware
Comment: English, British, Dutch, French, German, and Italian dictionaries are available
Authors: Robert Gottshall and Rick Zaccone
E-mail: zaccone@bucknell.edu
Where: ftp from sol.cs.bucknell.edu
- *HyperBIBT_EX*
Version: 0.9
Type: Freeware
Comment: Requires HyperCard version 2
Author: Evan Antworth
E-mail: Evan.Antworth@sil.org
Where: ftp from midway.uchicago.edu
- *MacBIBT_EX*
Version: 2.1
Type: Freeware
Author: Jim Studt and Michael Kahn
E-mail: kahn@informatics.wustl.edu
Where: ftp from midway.uchicago.edu
- *Macintosh Programmer's Workshop*
Version: 3.3
Type: Commercial
Cost: \$250 (CD-ROM); \$350 (diskettes)
Comment: Includes shell, assembler, and tools
Where: Apple Programmer's and Developer's Association
P.O. Box 319, Buffalo, NY 14207
Phone: 800-282-2732
- *MacMakeIndex*
Version: 1.1
Type: Freeware
Author: Johnny Tolliver
Where: ftp from midway.uchicago.edu
- *MacMETAFONT*
Version: 1.3
Type: Freeware
Comment: Requires MPW (a stand-alone version by Timothy Murphy <tim@maths.tcd.ie> is available from ftp.maths.tcd.ie)
Author: Victor Ostromoukhov
E-mail: victor@elma.epfl.ch
Where: ftp from midway.uchicago.edu
- *MFtoPK*
Version: 1.0
Type: Shareware
Cost: \$20
Comment: Batch-mode METAFONT produces PK files directly
Author: Wilfried Ricken
E-mail: wilfr@hadron.tp2.ruhr-uni-bochum.de
Where: ftp from ftp.cicb.fr
- *OzT_EX*
Version: 1.6
Type: Shareware
Cost: \$30 individual; \$150 group
Comment: Version 1.42 is still freeware
Author: Andrew Trevorrow
E-mail: oztex@midway.uchicago.edu
akt150@huxley.anu.edu.au (registered users only)
where: ftp from midway.uchicago.edu