

# What Is New in L<sup>A</sup>T<sub>E</sub>X?

## II. T<sub>E</sub>X Implementations, Evolution or Revolution

G. Grätzer

This is the second of a series of columns updating the mathematical community about some current developments in T<sub>E</sub>X and T<sub>E</sub>Xing.

—Andy Magid

### The Advice of the Red Queen

Donald Knuth coded T<sub>E</sub>X on a mainframe computer. It migrated quickly to Unix, and most mathematicians used T<sub>E</sub>X on a terminal attached to a mainframe or a Unix workstation.

T<sub>E</sub>X was conceived as one of four applications necessary to produce a mathematical article or book. At the command line you invoked an *editor* to type (edit) the source file and then you quit the editor. Again, at the command line, you instructed T<sub>E</sub>X to typeset the source file; this produced the *dvi* file. Another application invoked at the command line presented the *dvi* file on the monitor and/or printed it (on a remote printer). You noted the changes you wanted to make, opened the source file with the editor, made the changes, and the cycle continued.

Personal computers became powerful enough for a T<sub>E</sub>X implementation in the mid 1980s. Michael Doob [2] and [3] gives a snapshot in 1990. Reporting on a Mac implementation, TEXTURES, Doob (who has a Unix background) writes, “The fact that you can edit your source file, run T<sub>E</sub>X, and preview the result from within the TEXTURES program is both unique and very helpful.” Such implementations we then called “integrated”. For a detailed review of two products as of 1994 (TEXTURES and PCT<sub>E</sub>X for Windows), see George Grätzer [4].

---

*G. Grätzer is Distinguished Professor of Mathematics at the University of Manitoba. His email address is grätzer@me.com.*

There was a recurring complaint about my L<sup>A</sup>T<sub>E</sub>X books before the fourth edition [5] because I assumed that the reader had a T<sub>E</sub>X implementation and knew how to use it. Readers wanted me to guide them through installation and use of T<sub>E</sub>X. But this was not possible. Norman Walsh’s book [8] in 1994 lists fourteen T<sub>E</sub>X implementations for Mac and Windows, in addition to the older Unix and Linux implementations (which were made even more diverse by the dozens of editors, some quite T<sub>E</sub>X capable). Each one of these required special instructions to obtain (many utilizing ftp downloads), install, and start to use.

L<sup>A</sup>T<sub>E</sub>X’s strength lies in the hundreds of packages that are available to perform specific tasks. In the previous editions of [5], I had to describe how to obtain a package and how to install it.

Fast forward to today. [5] now has an appendix giving detailed instructions on how to install WinEdt and MiK<sub>T</sub><sub>E</sub>X for Windows and T<sub>E</sub>XShop with T<sub>E</sub>X Live for the Mac. In my opinion, this covers 90% plus of all users and *almost all* PC and Mac users. And Unix and Linux users do not need my help, they are all technical experts...

It is equally dramatic that these two installations give you not only a T<sub>E</sub>X implementation, but also all conceivable L<sup>A</sup>T<sub>E</sub>X packages—in excess of 1,000! No more where to get it from, how to unpack it, and where to put it. In addition, these implementations give you everything from T<sub>E</sub>X to L<sup>A</sup>T<sub>E</sub>X to pdfT<sub>E</sub>X, pdfL<sup>A</sup>T<sub>E</sub>X, even X<sub>3</sub>T<sub>E</sub>X and X<sub>3</sub>L<sup>A</sup>T<sub>E</sub>X (see [7]).

Evolution or revolution. You decide. Things are progressing really quickly to make the installation and use of L<sup>A</sup>T<sub>E</sub>X easy. As the Red Queen famously said to Alice (in Lewis Carroll [1]), “Now *here* you see, it takes all the running *you* can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!”

## How We Got Here

### The foundation: CTAN

In the 1980s there were a number of ftp sites that provided T<sub>E</sub>X-related material, such as L<sup>A</sup>T<sub>E</sub>X packages. In 1991 at a EuroT<sub>E</sub>X conference, the idea of a unified site was proposed: CTAN, the Comprehensive T<sub>E</sub>X Archive Network. It was built in 1992 by Rainer Schöpf and Joachim Schrod in Germany, Sebastian Rahtz in the UK, and George Greenwade in the U.S. Today, it is maintained by Rainer Schöpf, Joachim Schrod, Robin Fairbairns, and Jim Hefferon. The main CTAN nodes serve downloads of more than 6 TB per month, not counting the seventy-five mirror sites worldwide.

### teT<sub>E</sub>X

In 1994 Thomas Esser decided to build a complete T<sub>E</sub>X distribution for Unix users; he called it teT<sub>E</sub>X. He aimed at creating a distribution that

- provides a T<sub>E</sub>X system that consists only of free software;
- is simple to install, use, and maintain;
- includes as much useful documentation as possible.

Esser maintained by himself this forerunner of the T<sub>E</sub>X installations. Since each release took longer to prepare, in 2006 he stopped supporting teT<sub>E</sub>X, and suggested that the teT<sub>E</sub>X users should switch to T<sub>E</sub>X Live.

### MiK<sub>T</sub>E<sub>X</sub>

Maybe the best current T<sub>E</sub>X implementation for Windows is MiK<sub>T</sub>E<sub>X</sub>, developed by Christian Schenk in 2000. MiK<sub>T</sub>E<sub>X</sub> updates itself by downloading new versions of previously installed components and packages. It introduced “download on demand”: it will download and install any package that has not yet been installed but is requested by the current document.

MiK<sub>T</sub>E<sub>X</sub> 2.8—with some nice new features—should be available by the time this article appears. But Schenk writes, “Now that T<sub>E</sub>X Live has a nice package manager of its own, I do not expect much interest in the MiK<sub>T</sub>E<sub>X</sub> package manager for Linux.”

### T<sub>E</sub>X Live

T<sub>E</sub>X Live is a collection of T<sub>E</sub>X installations that has been developed by an extraordinary collaboration of TUG (T<sub>E</sub>X User Group) and the German, Dutch, and Polish T<sub>E</sub>X Users Groups (DANTE e.V., NTG, and GUST) over the last twelve years. It is developed to work with Windows, Mac OS X, and most flavors of Unix and Linux. At the start, for a number of years, it was under the direction of Sebastian Rahtz; presently this role is assumed by Karl Berry.

The origin of the project was the 4AllT<sub>E</sub>XCD for MS-DOS users developed in 1993 by the Dutch

T<sub>E</sub>X Users Group. T<sub>E</sub>X Live started out with the goal of extending this project to include all major operating systems. This proved to be too ambitious at the time. The discussions, however, led to the formation of the TUG Technical Council working group on a T<sub>E</sub>X Directory Structure (TDS), necessary for the creation of consistent and manageable collections of T<sub>E</sub>X support files. A complete draft of the TDS was published in the December 1995 issue of *TUGboat*, and the recommendations therein formed the foundation of T<sub>E</sub>X Live.

The major signposts of T<sub>E</sub>X Live are

- The first edition appeared in May 1996.
- Karl Berry launched a major new release of Web2c, which included nearly all the features that Thomas Esser had added in teT<sub>E</sub>X. The second edition in 1997 was based on Web2c, with the addition of the configuration script of teT<sub>E</sub>X.
- The fourth edition included a complete Windows setup.
- The major change for T<sub>E</sub>X Live 5 in 2000 was the removal of all nonfree software.
- Mac OS X support was added in the seventh edition of 2002.
- T<sub>E</sub>X Live 2006–07 added X<sub>Y</sub>L<sup>A</sup>T<sub>E</sub>X.

T<sub>E</sub>X Live 2008 is the result of a major redesign and re-implementation of the T<sub>E</sub>X Live infrastructure. Among the many benefits is a file manager that allows easy upgrades (which MiK<sub>T</sub>E<sub>X</sub> has provided for many years). Lua<sub>T</sub>E<sub>X</sub> has been added, which provides an excellent scripting language. The new script `tlmgr` manages T<sub>E</sub>X Live after the initial installation. It handles package updates, language files, and local additions. For a complete listing of new, changed, and deleted features, and the acknowledgments, see the documentation

<http://www.tug.org/texlive/doc/texlive-en/texlive-en.html#news>

<http://www.tug.org/texlive/doc/texlive-en/texlive-en.html#ack>

I hope that the hundreds of volunteers who contributed to T<sub>E</sub>X Live do not resent the very sketchy presentation of this huge project or the omission of their names and contributions due to space limitations.

### Helping the Users

Curiously, as the T<sub>E</sub>X installations get so much more technically complicated, the main direction of the development is clear: from the user's perspective, everything is getting so much simpler.

On my Mac, I download MacT<sub>E</sub>X (which includes T<sub>E</sub>XShop and T<sub>E</sub>X Live). I get a standard Mac installation dialog box: I confirm the location of the installation on my hard disk, click on install,

and I am done. Compare this with the thirty-page installation manuals of just a few years ago.

Consider the extreme technical difficulties Jonathan Kew had to overcome to code X<sub>Y</sub>TeX (see [7]). The benefit to a user is that any font installed on the computer can be used by simply typing the name of the font. What could be simpler? Compare this with the difficulty of installing and using a new font in a typical Unix setup.

But real progress is being made on a different front as well. L<sup>A</sup>T<sub>E</sub>X has a well-deserved reputation of having a steep learning curve. A lot more attention is being paid now to helping the beginner.

Richard Koch came up with some interesting ideas for T<sub>E</sub>XShop. In the Help menu, you can choose *George Grätzer's Short Course*, and you get Part I of the book [5]. You can also choose *T<sub>E</sub>XShop Demos* to get video presentations for novices on how to use T<sub>E</sub>XShop.

In my books, I often point out that the gentlest learning curve for L<sup>A</sup>T<sub>E</sub>X is provided by a knowledgeable friend, who sits down with you and gets you started, and who is available most any time to help you out. Of course, few of us have friends with so much free time to share.

Probably, the next best thing is a video presentation. I got so encouraged by Koch's idea that I turned the *Short Course* into a series of video presentations. You can find it at

[http://www.ctan.org/tex-archive/info/Math\\_into\\_LaTeX-4/](http://www.ctan.org/tex-archive/info/Math_into_LaTeX-4/)

I think this idea of Koch's is the future of user assistance: to provide a series of video presentations on

- how to get started with the application,
- how to get started with L<sup>A</sup>T<sub>E</sub>X,
- the main features of T<sub>E</sub>X implementation.

There is an example topic of the third type: for book writers, Koch introduced a very helpful new feature in T<sub>E</sub>XShop; at the click of the mouse, index entries pale to a very light yellow, making the marked-up book easy to edit. A two-minute video presentation demonstrates how to set this feature up by modifying the tool bar and how to activate/deactivate this feature.

T<sub>E</sub>X Live now comes with extensive documentation (in many languages). It also provides the command line utilities `texdoc` and `texdoctk` (the latter with a GUI interface) to help you find what you need.

WinEdt 6 provides access to this documentation and its Help menu provides an interface to the *Short Course* and its video presentations.

Intermediate users of WinEdt will find a ready-to-compile L<sup>A</sup>T<sub>E</sub>X thesis, an AMS article, and a document that demonstrates how to include graphics, how to use the `hyperref` package, and how to deal with international characters.

## On the Horizon

This is the first year that T<sub>E</sub>X Live appears with file management features. This lays the foundation, but we need more.

We need to download and install packages on demand (as required by the document). Once we have that, we could get away from the one gigabyte size download for the initial installation. At the first installation, we should get maybe a hundred or so of the most often used packages, and the rest should come as necessary. Of course, the full download could always be an option if you go on vacation with a notebook computer to a remote place with no Internet connection.

Even better, at the first installation, you should be able to choose

- minimal installation,
- full installation,
- selective installation.

The last would provide you with a list of packages, and you select the ones you need installed. Any re-installation should only update the packages you chose to have in the first place.

Although X<sub>Y</sub>TeX takes care of your need for text fonts, math font support is presently lacking. This is okay, since very few math fonts are available today. However, there are some math fonts on the horizon. Once they are ready, it would be nice to be able to invoke them with the same ease as we can now invoke text fonts.

Coming soon to a computer near you: the STIX project, with thousands of math symbols. We shall discuss this in Part III of this series.

## Acknowledgments

In Parts I and II, I was helped by many T<sub>E</sub>X experts: Barbara Beeton, Karl Berry, Michael Doob, Jim Hefferon, Victor Ivrii, Jonathan Kew, Richard Koch, Herb Schultz, Aleksander Simonic. For their patient teaching of a nontechnical L<sup>A</sup>T<sub>E</sub>X user, thanks.

## References

- [1] LEWIS CARROLL (Charles Lutwidge Dodgson), *Through the Looking-Glass, and What Alice Found There*, with 50 illustrations by John Tenniel, The MacMillan Co., London, 1871.
- [2] MICHAEL DOOB, T<sub>E</sub>X and the single CPU, I, *Notices Amer. Math. Soc.* **37** (1990), 270-273.
- [3] ———, T<sub>E</sub>X and the single CPU, II, *Notices Amer. Math. Soc.* **38** (1991), 1243-1246.
- [4] GEORGE GRÄTZER, Advances in T<sub>E</sub>X implementations. II. Integrated environments, *Notices Amer. Math. Soc.* **41** (1994), 106-111.
- [5] ———, *More Math into L<sup>A</sup>T<sub>E</sub>X*, Springer-Verlag, New York, 2007, xxxiv+619 pp.
- [6] ———, A gentle learning curve for L<sup>A</sup>T<sub>E</sub>X, *The PracT<sub>E</sub>X Journal*, 2008, issue 3.
- [7] ———, What is new in L<sup>A</sup>T<sub>E</sub>X? I. Breaking free, *Notices Amer. Math. Soc.* **56** (2009), 52-54.
- [8] NORMAN WALSH, *Making T<sub>E</sub>X Work*, O'Reilly & Associates, Inc., Sebastopol, CA, 1994, xxxvi+483 pp.