Scientific WorkPlace and PDFTEX
A White Paper

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June 2003

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Abstract

Beginning with version 5.0, *Scientific WorkPlace* and *Scientific Word* contain support for PDFTEX. This paper describes the implications of this support and explains how these products allow the use of the full range of graphics formats with PDFTEX.

1 The world before version 5

1.1 Hyperlinking with embedded graphics

It has always been possible with *Scientific Word* and *Scientific WorkPlace* to produce PDF output by processing the documents with TrueTEX and then printing using the Acrobat Distiller Assistant printer driver. You had to be careful to include fonts in the PDF file, and to use non-bitmap fonts, but the final result was usually a compact, accurate representation of your document.

On the other hand it has always been possible to use your document as input to PDFTEX. When you use the hyperref package, you get a fully hyperlinked PDF file with a hyperlinked table of contents. But this doesn't work with most documents containing graphics, since the only graphics formats that PDFTEX understands are PDF graphics and a couple of bitmap formats. There is a Perl script that uses GhostScript to convert EPS graphics to PDF, but for most other graphics formats, you have been out of luck.

There has been no convenient way to get the benefits of PDFTEX without sacrificing the ability to use the wide range of graphics files you have become used to using with *Scientific WorkPlace* and *Scientific Word*.

1.2 Using PostScript packages and fonts

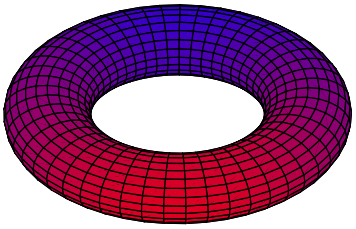
There are a number of LATEX packages that have never been supported by TrueTEX, the version of TEX included with *Scientific WorkPlace* and *Scientific Word*. These packages, such as rotating, do not actually change the DVI file produced by TEXother than by inserting PostScript code which is ignored by the DVI previewer and which is then passed on to the printer. Of course, the only printers that will respond correctly to that code are PostScript printers. Since TrueTEX and *Scientific Word* and *Scientific WorkPlace* are Windows programs that are expected to work with all printers supported by Windows, it has not been appropriate to support packages that will not work on all printers. These packages are supported by PDFTEX though, since PDF supports a richer set of commands for positioning text than does DVI.

2 What's new in version 5

In Version 5, *Scientific WorkPlace* and *Scientific Word* have three new items on the Typeset menu: Preview PDF, Print PDF, and Compile PDF. These operations work by calling PDFTEX in place of TrueTEX. Before a document is passed on to PDFTEX, a temporary copy is written to the disk and all graphics files used within the document are converted to PDF format and written to the disk. Once the PDF compilation is done, the temporary files are deleted and the result appears in Acrobat Reader (if you have selected Preview PDF).

2.1 Imported graphics

Here is an example of a 3-dimensional plot. If you are viewing a PDF document, the plot for this function has been converted from its original form (a Windows metafile) to a PDF graphics file just before PDFTEX was called.



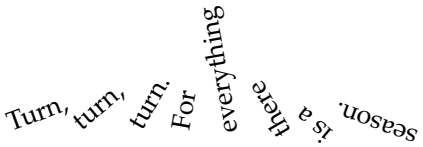
The graphics could be in any of the almost 50 formats supported by *Scientific WorkPlace* and *Scientific Word*.

2.2 Hyperlinking

This document is fully hyperlinked. Each item in the Table of Contents is a link to the corresponding section, and any links within the document, such as this one to an equation in this document and this one to the home page of www.mackichan.com, are preserved in the PDF file. How about this one?

2.3 Rotating

The rotating package is now supported for documents being processed by PDFTEX:



The line above was created using TEX buttons calling the turn environment. Notice that the package makes room for the rotated text, both vertically and horizontally.

A more serious use of the rotating package is in the following table.

	Preserves hyperlinking	Wide variety of graphics	Rotating	Use PS fonts
PDFTEX before *Scientific Word 5*	Yes	No	Yes	Yes
TrueTEX with Acrobat Distiller	No	Yes	No	No
Scientific Word 5 using PDFTEX	Yes	Yes	Yes	Yes

The column headers in this table were written with the rotate environment, which does *not* make room for the text. This keeps the columns from widening to accomodate the width of the column headers. Since the rotate environment does not make any vertical room for the text, the table requires a vertical space of 1.2 inches before it. When you enter the custom vertical space, do not select "Discard at page boundary" or the column headers will intrude into the top margin whenever the table appears at the top of a page. The table columns use "Automatic Width" although they could just as well have a fixed width.

2.4 PostScript Fonts

Since PDF supports the basic PostScript fonts, *Scientific WorkPlace 5* and *Scientific Word 5* now include support for the LATEX psnfss (PostScript New Font Selection Scheme) packages for use with

PDF. The fonts supported are Palatino, Helvetica, Avant Garde, Bookman, New Century Schoolbook, Utopia, Charter, and Zapf Chancery. This document is using Palatino and the mathpple package, which renders mathematics using the Palatino font. Here is a sample of the mathpple rendering of some mathematics:

Theorem 1 *Consider the power series*

$$f(z) = \sum_{n=0}^{\infty} a_n z^n,\ |z| < R(R \neq 0)$$

Let C be a simple piecewise smooth curve which lies inside the circle of convergence. Then we can ***integrate the power series term by term:***

$$\int_C \left(\sum_{n=0}^{\infty} a_n z^n \right) dz = \sum_{n=0}^{\infty} a_n \int_C z^n dz \tag{1}$$

Proof. The function $f(z)$ defined by the power series is continuous on C, so the integrals in (1) are well-defined. We need to show that

$$\lim_{n\to\infty} \left| \int_C \left[f(z) - \sum_{k=0}^{n} a_k z^k \right] dz \right| = 0 \tag{2}$$

Since C lies inside the circle of convergence, the series converges uniformly on C to $f(z)$. For any ϵ, there is an $N(\epsilon)$ so that, *for all z on C*,

$$n \geq N(\epsilon) \Rightarrow \left| f(z) - \sum_{k=0}^{n} a_k z^k \right| < \epsilon$$

By the triangle inequality for integrals and the above inequalities, *for* $n \geq N$,

$$\left| \int_C \left[f(z) - \sum_{k=0}^{n} a_k z^k \right] dz \right| \leq \epsilon \cdot (\text{length of } C)$$

Since ϵ is arbitrary, the limit in (2) is zero. ■