

The Beginner's Forest of \LaTeX

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Abstract Images kept floating away, and keeping the style within one project both beautiful and consistent took up a lot of time. I have never been really content with a word processor. For a large project containing lots of math formulas, I assumed that learning to use \LaTeX would take as much time as trying to input the maths in a word processor. The final result was beautiful, but I was very wrong about how much time it would consume: using Greek fonts, making tables, using some packages, and trying to solve issues by reading incomprehensible package documentation (some of which didn't even explain how to use the package, only how it was coded) were very time-consuming indeed.

1 Introduction

The paper that I wrote with \LaTeX is about the mathematical, aesthetic, and natural occurrences of the Golden Section, also known as the Greek letter φ (phi). Mathematically written it would be $\frac{1+\sqrt{5}}{2}$. In words it means “the ratio between the sum of those quantities and the larger one is the same as the ratio between the larger one and the smaller”[1]. It is already apparent that the math typesetting engine of \TeX would be very beneficial to the project. But nice maths was unfortunately not the only thing I needed from \LaTeX .

I started my project with “Programmers Notepad 2”[2] as text editor. This editor has a limited scheme of \LaTeX -command highlights, but is very light-weight. Besides that, the friend who had suggested using \LaTeX had given me two books: “ *\LaTeX echt einfach*”[3] (in German, but I managed), and the perhaps better known “*Guide to \LaTeX* ”[4]. The latter also included a CD with \TeX Live 2003, which I then easily installed.

Since that same friend had once before configured the layout for another project I had done, I already knew how to use some basic commands and I used some of his work as a base for my new project:

```
\documentclass[12pt,a4paper,openany,dutch]{amsbook}
\usepackage[Sonny]{fncychap}
\usepackage{graphicx} % include graphics
```

```

\usepackage{remreset}
\usepackage{babel}
\title%
{De ontdekking van de Phinguin\
{\small De natuurlijke en esthetische verschijnselen
van de Gulden Snede}}
\author{Theresa \and Merina}
\date{\today}
\begin{document}
\maketitle
\tableofcontents
...
\end{document}

```

To make working together with a partner as pleasant as possible, I read some things about document organisation[4, Chapter 3, “Document Layout and Organization” which explained the book structure][5]. With the knowledge gained I organised my document as follows:

```

\frontmatter
\setcounter{tocdepth}{0}
\maketitle
\tableofcontents
\include{inleiding2}
\mainmatter
\include{1algemeen}
\include{2natuur}
\include{3algoritme}
\include{4practicum}
\backmatter
\include{conclusie}
\include{bronnenlijst}
\appendix
\include{appendix} %log of work done
\include{appendix2} %log of meetings with teachers
\include{appendix3} %source of computer program used

```

Having made a solid basis, it seemed to me my first journey in T_EX Land would become a very pleasant one.

2 Using greek fonts

The Golden Section in math formulas is displayed as φ . Since it is a constant number and not a variable, it is incorrect to use the available ϕ , as this gives a slanted phi. Besides, I wanted to be able to write things such as “phylloaxis is derived from $\varphi\upsilon\lambda\omicron\nu$ and $\tau\alpha\zeta\iota\varsigma$ ” with a plain `\textgreek{}` command.

Achieving such things in \LaTeX should be as easy as

```
\usepackage[greek,dutch]{babel}
\newcommand{\f}{\textgreek{f}}
\newcommand{\mf}{\ensuremath\mbox{\textgreek{f}}}
```

and thereafter the command `\f` or in math mode `\mf` should do the trick.

But I encountered several problems with that, the main one being my system giving me an error about “font <insert strange message here> not found”. Then I analysed the error message, which in this case was `Font grmn1200 at 600 not found`.

2.1 Searching the database

If I understand correctly, if the font exists in my system, then it would have to be put into the database so that the system can find the files when called upon by `pdflatex`. Since the files weren’t found, I rebuilt the database with the shortcut available in my Start menu¹. This didn’t work. Then I looked for my database in the `texmf` folder and opened it. I searched for “`grmn1200`”, which I found twice under the headers `./fonts/source/public/cb/drivers:` and `./fonts/tfm/public/cb:.` So perhaps the fonts are actually available in my system and in the database, but still not found. By now, I was rather puzzled what to do.

2.2 Searching the mailing lists

There are several mailing lists for problems about using \LaTeX , of which `texhax`[6] and `comp.text.tex`[7] are the most important ones. I searched the archives of these lists and found a lot of different problems, but most answers I either didn’t understand or they didn’t apply to me. For example, I found a problem that was very similar to mine at <http://tug.org/mailman/htdig/texhax/2006-October/007160.html>. The answers consisted of directions on installing

1. So basically I was using `mktexlsr`.

fonts or packages, which I didn't think was the problem, and finally there was a very elaborate answer which I didn't understand.

2.3 Reinstalling T_EX Live

Since the “missing” files actually existed on my system, I just thought something went wrong somewhere. I reinstalled my distribution then, since I don't understand enough of the system to fix it. The problem still existed after reinstalling. I also searched the mailing lists for problems with fonts in the T_EX Live 2003 distribution, but I couldn't find anything.

2.4 Installing new packages

Since the mailing list did suggest installing some other greek fonts and packages, I decided to try that. I started with the `psgreek` package, and followed the installation instructions in the documentation. Then using it as instructed, I still got the “font <strange message> not found” error, but with `greeregu` at 720 as <strange message>.

Finally, I installed a package called `Ibycus4` on my system by creating a bunch of folders in my `texmf-local` folder, placing the correct files in correct folders and rebuilding the database. With

```
\usepackage{psibycus}
\newcommand{\f}{\textgreek{f}}
```

the intended result of `\f` becoming φ succeeded. The fonts that were missing are still missing according to my system, and updating to a newer T_EX Live version is a future plan for solving it².

3 Tables containing a large amount of text, several columns and several pages long

Since this was a school project, it was required to append a log of what work was done when and another one with summaries of meetings with our supporting teachers. In Word these kind of tables are made easily, and I assumed the same could easily be done in L^AT_EX. I started with a normal table, with `p{width}` as

2. According to the editor of this article, the use of the `babel` package works correctly in T_EX Live 2007.

column formatting so that the text in a column can be several lines long. Also I used widths in `ex` so that I could assess best how much text would fit on one line.

```
\begin{tabular}[t]{|p{10ex}|p{12ex}|p{8ex}||p{25ex}||p{20ex}||}
  \hline
Date & Name & Time used & Work done & Intention\\
  \hline\hline
End of school year & Theresa and Merina & 30 minutes
& consult teacher & think about subject and how to limit the
broad angles we might encounter of the subject\\
  \hline
... & & & \\
  \hline
\end{tabular}
```

which made this:

Date	Name	Time used	Work done	Intention
End of school year	Theresa and Merina	30 minutes	consult teacher	think about subject and how to limit the broad angles we might encounter of the subject
...				

This worked, but was ugly in several ways: the table extends to the page margins and because of the large number of columns there are large gaps of whitespace between words. Also, it was not yet possible to let the table be more than one page. Because of this, the table would float off the page if it didn't fit, leaving large amounts of vertical whitespace.

There are several packages available for \LaTeX , which in small part have been covered in a previous \PracTeX Journal article[8]. However, this article, which deals with a large number of packages, is confusing for a beginner, and perhaps more importantly: it did not yet exist when I was struggling with my table.

3.1 Using `tabularx`

To fix the problem of the table extending to the page margin and make the table, for example, as broad as `\textwidth`, the `tabularx` package provides a fairly

simple solution. I only have to `\usepackage{tabularx}` and change the first line of the table to

```
\begin{tabularx}{\textwidth}{|p{10ex}|p{12ex}|X|X|X|}
```

and the last line of course to `\end{tabularx}`, where X represents a column that may vary in length.

3.2 Using booktabs

While looking for things about tables, I stumbled upon the documentation of the `booktabs` package[9]. This manual is written in a very convincing way. It told me that I was breaking tons of styling rules by making the table as I did³. To solve it I should, of course, use the `booktabs` package. The thing that convinced me to do so was the fact that the manual had version number 1.61803.

The section “Use of the new commands” explained which commands you can use with the package and tried to explain how to use them. Luckily, this manual was one of the few that included an example with an example output. From this I could derive where to use which command, of which I used `\toprule`, `\midrule`, `\cmidrule{a-b}` and `bottomrule`.

3.3 Using longtable

As described earlier, the table would be several pages long, and luckily the package `longtable` is described in the *Guide to L^AT_EX*[4, Subsection 6.2.4, Extension packages for tables]. However, it only gave an example of code without explanation of the command syntax. The `longtable` documentation also didn’t describe this and I ended up studying the source code of the documentation to find out that the commands should be placed *after* each table part:

```
\begin{longtable}[t]{p{10ex}p{12ex}p{8ex}p{25ex}p{20ex}}
  \toprule
Date & Name & Time used & Work done & Intention\\
\midrule \midrule
\endhead %longtable command for general heading
\endfoot %longtable command with nothing in front,
        %since no general footer is needed
\bottomrule
\endlastfoot %longtable command for the last footer
```

3. “Never, ever use vertical rules” and “Never use double rules” were pretty clear rules.

...

Since I am used to the syntax `\command{Things the command has effect on}` this was a very confusing syntax!

With the use of `longtable` however I couldn't use both `longtable` and `tabularx` in one table, since there is no way to combine

```
\begin{longtable}[t]{p{10ex}p{12ex}p{8ex}p{25ex}p{20ex}}
```

and

```
\begin{tabularx}{\textwidth}{|p{10ex}|p{12ex}|X|X|X|}
```

Since having long tables took priority over the functionality of `tabularx` I only used `longtable`⁴.

3.4 Using array

The last issue I dealt with was that of the large amount of whitespace between words when using `p{width}` as column formatting, since the content is automatically centred then. Instead of putting a `\raggedright` in each table cell I used the `array` package, which has a function to insert a command in an entire column, so I used `>\raggedright` in front of `p{width}`.

This worked very nicely, except for the fact that when I included this on the last column I got very scary errors — for those interested:

```
! Misplaced \noalign.
\midrule ->\noalign
                {\ifnum 0='}\fi \@aboverulesep =\aboverulesep
                \global \@...
1.12 \midrule
        \midrule
```

so then I just didn't include it on the last column.

The final result using the packages `longtable`, `booktabs` and `array` was

4. The editor of this article pointed out that the functionality of both packages are combined in the package `ltxtable`.

Date	Name	Time used	Work done	Intention
End of school year	Theresa and Merina	30 minutes	consult teacher	think about subject and how to limit the broad angles we might encounter of the subject
...				

by using

```

\begin{longtable}[t]{>{\raggedright}p{10ex}>{\raggedright}
p{12ex}>{\raggedright}p{8ex}>{\raggedright}p{25ex}p{20ex}}
\toprule
Date & Name & Time used & Work done & Intention\\
\midrule \midrule
\endhead
\endfoot
\bottomrule
\endlastfoot
End of school year & Theresa and Merina & 30 minutes
& consult teacher & think about subject and how to limit the
broad angles we might encounter of the subject\\
\cmidrule{1-5}
... & & & & \\
\end{longtable}

```

4 Learning to use the bibliography

It was easy to find some tutorials on the internet explaining how to make a bibliography in \LaTeX . In my earlier project, I had simply made an enumerated list, but I like things semantically correct. So at first I made this:

References

- [1] GOODWIN, B.C. (1994) How the Leopard Changed Its Spots: the Evolution of Complexity. Londen: Phoenix.
- [2] HAMBIDGE, J. (1924) The Parthenon and other Greek temples: their Dynamic Symmetry. New Haven: Yale University Press.

by using

```
\begin{thebibliography}{99}
  \bibitem{goo94} \textsc{Goodwin, B.C.} (1994)
How the Leopard Changed Its Spots: the Evolution of
Complexity. Londen: Phoenix.\
  \bibitem{ham24} \textsc{Hambidge, J.} (1924)
The Parthenon and other Greek temples: their Dynamic Symmetry.
New Haven: Yale University Press.\
\end{thebibliography}
```

however, the use of `BIBTEX` sounded appealing to me. It was easy enough to make a new file named `phinguin.bib` and include the bibliography, since it was explained very well by an article of the `PracTeX` Journal[10] by using

```
\bibliographystyle{unsrtnat}
\bibliography{phinguin}
```

and including book names with

```
@Book{ham24,
Author = {Jay Hambidge},
Title = {The Parthenon and other Greek temples: their Dynamic Symmetry},
Publisher = {Yale University Press},
Address = {New Haven},
Year = {1924},
}
```

Something that I did have a problem with was including internet links. There is no `@Webpage` for that sort of thing and my books mentioned nothing on the matter. I came up with the following, with `\-` indicating points where the url can be hyphenated,

```
@Book{smi03,
Author = {Smith College},
```

```
Title = {Phyllotaxis},
Year = {2003},
Publisher = {http://\-maven.\-smith.\-edu/\-~phyl\~-lo/\-Con\~-tact/
\~-in\~-dex.\~-html},
}
```

but it feels very wrong.

A large benefit of all this trouble was the ability to cross-reference without thinking too much. After loading the package `natbib` the common author-year notation used in natural sciences could be used. The package offered more possibilities than just the `citet` and `citep` that I was looking for! I quickly forgot about all the commands and kept the documentation at hand. The large number of \LaTeX packages and their commands can be pretty overwhelming, most of the time.

5 Maths with someone who doesn't know \LaTeX

One of the best features in \LaTeX is the logical structuring of a document. Since I myself have interest in the evolution of HTML⁵ I am very much aware of the benefits of such structuring. However, the person that I worked with had only learnt to work with a word processor (which is very common in high school here) and actually liked working with it. I decided to relieve her from installing a \LaTeX -distribution and to teach her the few basic commands we needed.

To let her check her math-equations thoroughly, I told her to use the \LaTeX -previewer available on the internet[11]. I also taught her the basic commands of `\frac{a}{b}` and `\sqrt{x}`, and I tried to explain the differences between using `$ <math formula>$` and `\[<math formula>\]`, but this was very illogical to her. In addition to that I showed that when you want to have a space after the phi, she needed to add an extra `_` so that it became `\f_`. This she did, but perhaps too frequently, because the “terminating a command by having a non-letter appear at the end” is very strange for someone who has no experience with coding.

Teaching her to write mathematics was fairly easy, since it is fairly easy with \TeX , but teaching her how commands work and what their *semantic meaning* is, is something else. For example, she tended to use `__` to make a new

5. HyperText Markup Language, which grew from a purely semantical markup language to a mixture of semantical and presentational markup, and now again to a more strict separation of presentation and meaning.

paragraph, since leaving a line open between paragraphs gave only an indent in the standard output. I told her this was *very* wrong, but I knew that this is just standard behaviour for someone who works with a word processor:

From $\mf^2 = \mf + 1$ follows that $\mf = 1 + \frac{1}{\mf}$.
 If we write this out, we get: \ \

```
\mf = 1 + \frac{1}{1+\frac{1}{1+\frac{1}{1+\frac{1}{1+\frac{1}{\dots}}}}}}\ \
```

Also, the automatic numbering of equations by using the appropriate environments gave an equation number to the left⁶. She didn't like how that looked, so naturally she switched to the use of: $\frac{ES}{BS} = \frac{AE}{BD}$ (1). This of course gave inconsistent results.

The use of \mf for φ does not work in the previewer, so we had some problems with producing the maths. She could use ϕ in the previewer, but it was at that time that she told me she had installed something called MikTeX. "Oh! But that's a L^AT_EX-distribution!" I told her and helped her compile a document. This didn't work on her distribution, since it lacked many packages that I used in the project. I made a different L^AT_EX-file for her which she then could compile and I could later easily incorporate in the entire project by commenting out the preamble (and "`\end{document}`") I made for her:

```
\documentclass[12pt,final,a4paper,reqn,openany,dutch]{amsbook}
\newcommand{\f}{f}
\newcommand{\F}{F}
\newcommand{\mf}{mf}
\newcommand{\mF}{mF}
\newcommand{\textgreek}[1]{#1}
\newcommand{\comment}[1]{#1}
\newcommand{\citet}[1]{#1}
\newcommand{\citep}[1]{#1}
\newcommand{\epigraph}[2]{#1,#2}
\newcommand{\epigraphwidth}{}
\newcommand{\citeauthor}[1]{#1}
\newcommand{\degree}{\ensuremath{\^\circ}}
```

6. The standard output of most classes is an equation number to the right, but not with the `amsbook` class. Now I have learnt I could have simply put `reqno` as class option, but I couldn't find this option in my books or on the internet, since only `leqno` was mentioned. Then there came the strange ways of the mind into play, and I did not logically derive that I should use the option `reqno`. Notice that I did, however, try out the option `reqn` which doesn't exist, in the class options in one of the examples.

```
\usepackage{graphicx}
\begin{document}
```

Working together like this went pretty well! I did clean up her code in the end though and tried to load the `parskip` package to control the spacing of paragraphs. This gave very creepy errors⁷ again, and since the *Guide to L^AT_EX* mentioned how to get the same effect, I copied their

```
\setlength{\parindent}{0pt}
\setlength{\parskip}{1ex}
```

into my preamble.

6 Conclusion

After having written this article, I can only conclude that I have learnt a lot. The many examples that I have given are pretty basic usages of L^AT_EX, but I have put a lot of effort in learning it. I suppose I had wished there already was a L^AT_EXpedia[12] with a lot of practical information.

The books *Guide to L^AT_EX* and *L^AT_EX echt einfach* proved to be my friends in need and the PracT_EX Journal provided huge amounts of other information, too. The only problem with these friends is that their knowledge ends somewhere, and going beyond where these resources leave off, with the large amount of documentation to be waded through, is either too overwhelming or incomprehensible. A lot of packages document the code of the package, but not how to use it.

References

- [1] Golden section. http://en.wikipedia.org/wiki/Golden_section.
- [2] Programmers notepad 2. <http://www.pnotepad.org/>.
- [3] Roland Willms. *L^AT_EX echt einfach*. Franzis Verlag, Poing, 2005.
- [4] Helmut Kopka and Patrick W. Daly. *Guide to L^AT_EX*. Addison-Wesley, Boston, fourth edition, 2004.

7. I just tried to reproduce the errors, but the project now worked perfectly fine with the package, so I don't know what the problem was.

- [5] Dave Walden. Travels in T_EXland: L^AT_EX for productivity in book writing. *The PracT_EX Journal*, 2, 2006. <http://www.tug.org/pracjournal/2006-2/walden/walden.pdf>.
- [6] Texhax. <http://tug.org/mailman/listinfo/texhax>.
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- [8] Lapo Filippo Mori. Tables in L^AT_EX₂_ε: Packages and methods. *The PracT_EX Journal*, 1, 2007. <http://www.tug.org/pracjournal/2007-1/mori/mori.pdf>.
- [9] Booktabs documentation. <http://www.ctan.org/tex-archive/macros/latex/contrib/booktabs/booktabs.pdf>.
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- [11] L^AT_EX previewer. <http://www.tlhiv.org/cgi-bin/LaTeXpreviewer/index.cgi>.
- [12] Lapo Filippo Mori. L^AT_EXpedia: the future of L^AT_EX documentation. *The PracT_EX Journal*, 1, 2007. <http://www.tug.org/pracjournal/2007-1/mori2/mori2.pdf>.