LaTeX Fundamentals

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Contents

Todo list

In this document I will talk about the key features of LaTeX and philosophy behind it. If you have not met LaTeX before, it is crucial for you to be comfortable with the concepts I am outlining in this document, or even better, read some books on how to get started on LaTeX. I will also present some history on how LaTeX was born, so if you would like to know about anything similar like that, please continue reading.

1 Some History

LaTeX was created as a set of different macros for TeX, which at the time was quite popular amongst scientists and people producing literature. This short paragraph by Leslie Lamport (the author of LaTeX summarizes the reasons behind its creation very well on his website[1]:

> In the early 80s, I was planning to write the Great American Concurrency Book. I was a TeX user, so I would need a set of macros. I thought that, with a little extra effort, I could make my macros usable by others. Don Knuth had begun issuing early releases of the current version of TeX, and I figured I could write what would become its standard macro package. That was the beginning of LaTeX. I was planning to write a user manual, but it never occurred to me that anyone would actually pay money for it. In 1983, Peter Gordon, an Addison-Wesley editor, and his colleagues visited me at SRI. Here is his account of what happened.
>
> *Our primary mission was to gather information for Addison-Wesley "to publish a computer-based document processing system specifically designed for scientists and engineers, in both academic and professional environments." This system was to be part of a series of related products (software, manuals, books) and services (database, production). (La)TeX was a candidate to be at the core of that system. (I am quoting from the original business plan.) Fortunately, I did not listen to your doubt that anyone would buy the LaTeX manual, because more than a few hundred thousand people actually did. The exact number, of course, cannot accurately be determined, inasmuch as many people (not all friends and relatives) bought the book more than once, so heavily was it used.*
>
> Meanwhile, I still haven't written the Great American Concurrency Book.

2 Concept of Declarative Formatting

As you see, LaTeX is just a set of macros for the TeX typesetting system created by Donald Knuth. What is more, it does not add anything in particular very important apart from emphasizing the point made by TeX:

> the content and the formatting should be as separate as possible.

The above statement implies the following ideas:

- The author can focus on the text more and he does not get distracted by temptation to change the looks of the contents by pressing various buttons and tweaking so that it appears nice in the text *before* final version is ready.

- One should make the formatting of the document meaningful. What I want to say, is that for example to emphasize some word you do not put a command

```
1  \textit{emphasis}
```

, which would look like *emphasis*, but you'd rather use a existing command (or create/redefine one), so that you would write something like

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[1]The URL is http://research.microsoft.com/en-us/um/people/lamport/pubs/pubs.html#latex

```
1  \emph{emphasis}
```

or

```
1  \emphas{emphasis}
```

and you get the same.

Well this has several advantages:

1. If you need to change the looks of how you emphasize the words in the text, you just change the definition of the command you are already using. This simple change might save you a lot in the long run.

2. You do not have to think about how it will look in text if you want to put emphasis on the text. You just know, that that word will be emphasized and that's it.

3. The built in command \emph already takes care of the fact that if you want to emphasize some text in already emphasized text, it will still get emphasized.

   For example:

   This is very *important text.*

   can be achieved by:

```
1  \emph{This is \emph{very} important text}.
```

- Since the formatting is completely separated from the content, it is very easy to make the document look nice if the author has followed the LaTeX conventions and the formatting of the text is abstract.

There is a very great short article on this if you follow this link[2].

3 Reading List Before Starting Your First Document

You can find a very good on-line book[3] which can help you get started. Before continuing any further, you should read or at least skim through the first 5 chapters:

Introduction Mainly what is LaTeX and what software is needed for it. It may serve as an addition to what is already written in the 'setup' tutorial;

Absolute Beginners Definitely read this if you hear the term LaTeX the first time, although others should also skim through this as it might consolidate your knowledge;

Basics The same as above chapter;

Document Structure This might be more useful for *Absolute Beginners*;

Errors and Warnings A very important chapter which might help you a lot to understand what your LaTeX program is telling you when you make a mistake. It is advised to read it if you have problems with some LaTeX documents before reporting to anyone;

If you like to have real books, check your preferred library for "LaTeX - User's Guide and Reference Manual" by Leslie Lamport. And if you are thinking of buying one, consider buying this book first as nothing can be better than the LaTeX author himself explaining how to use the system.

After having reading all the information I have presented here, I hope, that you will be able to appreciate how LaTeX is done and it will be easier for you to start using LaTeX the right way and after some time to notice, that producing document in LaTeX takes you less time than in any other tool.

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[2]The URL is http://web.science.mq.edu.au/~rdale/resources/writingnotes/declform.html

[3]The URL is https://secure.wikimedia.org/wikibooks/en/wiki/LaTeX

4 Description of the Tutorials in this Repository

Here I will outline general contents of the repository so that it would be easier to find various topics which are described in numerous tutorials I produced over the summer.

4.1 How to Setup Your Machine

In this tutorial I have compiled a lot of information on how to prepare you machine to use LaTeX. In there you will find everything you need to know about a LaTeX distribution, editing with an IDE or a simple text editor, managing your bibliography database using sophisticated tools.

4.2 Intermediate Skills

There are number of tutorials which where written with chemists in mind, so there are tips on how to deal with problems, which might arise for the majority of you writing reports, papers and other documents.

4.2.1 Managing Abbreviations and Glossaries Cleverly

If you have ever tried to put together a big document and you needed to ensure the integrity of all abbreviations you used and then you needed to compile a list of it, then you will appreciate the usefulness of this tutorial. It deals with automated, cross-referenced usage of abbreviations and, moreover, it gives you directions how to manage glossaries with some specific LaTeX packages.

4.2.2 Managing Bibliography

In this tutorial I have described how to use different packages for bibliography management and citations and it encapsulates most of the needed commands for your everyday typesetting needs. If you do not know how to make the reference list to appear in the way you want, or you want something like footnoted citations, then you will find some directions or code in this tutorial.

4.2.3 Cross-referencing in LaTeX

LaTeX is very useful when it comes to cross referencing. However, its vast capabilities might sometimes make you feel clumsy or lost, so it is quite important to get some of the concepts right from the first time. This tutorial is only 2 pages long, so it should not take too much time to skim through.

4.2.4 Mathematical and Chemical Equations

In this tutorial I have made some notes on how to produce different formats of equations and how to cross-reference them. If you haven't used `mhchem` package, then you should check out the subsection on quick typesetting of the equations of chemical reactions.

4.2.5 Different Fonts and Encodings in LaTeX

In this tutorial I am talking on how to customize your LaTeX document in order to get required fonts. There is also section on how to incorporate Unicode characters into text if needed (although LaTeX has very powerful macros to typeset almost any character you might want). There you can find information on alternative LaTeX compilers, which for more technically inclined might be something worth trying out.

4.2.6 Including Graphics, Producing Graphics in LaTeX

This is probably one of the most useful tutorials for scientists dealing with a lot of graphics. It covers basics of how to include simple figures and it also includes some notes on how to overlay any figures with latex code. The overlaying method is done with a very powerful `tikz` package, which can be even used to create entire figures if needed.

4.2.7 Table Creation

In this tutorial I have given some quick notes and examples on how to make appealing tables using several LaTeX packages, such as `booktabs` and `array`. It also includes information on how to include tables, which span over both columns in two-column documents.

4.3 Template-Related Things

4.3.1 Making Posters

This tutorial quickly reviews some possible solutions for poster production in LaTeX. Since there are numerous ways how to make a poster, there is not a single perfect solution which might suit all, hence this is more or less a compilation of notes where to find information and what packages to use.

4.3.2 Producing Presentations

Presentations, like posters, are very personal, hence in this tutorial there are some notes on how to use several packages and there is some discussion on the work-flow on making the slides. However, since it is very narrow field, it would be really hard to give you one big tutorial on how to achieve things and, therefore, you will find more or less guidelines and links to useful resources on presentation making in LaTeX.

4.3.3 Template Instructions

In this tutorial you can find some notes on how to use the templates found on this website. I hope that it will complement to the documentation already existing in the templates quite well and you will be able to use the templates without any troubles.

4.4 Advanced Topics

There are two more tutorials, which would be more suitable for people who already know everything from the tutorials listed above and would like to start creating their own macros or find out about tools which can make your work easier.

4.4.1 Customizing LaTeX to Your Own Needs: Defining Macros

This tutorial is on defining your own macros which would make your text more meaningful. For example if you want to emphasize a package name by using a bold-face font, then you should create your own macro for that with a name `pkg` or something similar. This helps in two ways: first, you do not have to worry about making the looks of all package names consistent, and second, you give to your text more meaning as it can be clearly seen that what you emphasize is a package name. Second part of the very same tutorial is about counters and using them to enumerate chemical structures combining with the packages mentioned in the graphics tutorial.

4.4.2 Getting Incremental Updates and other Goodies

This tutorial is on Version Control System usage with LaTeX which in simple-world terms means easier collaborative work and access to almost any version of the file at any time. This tutorial was written in order to make git version control system more accessible to chemists and to provide an alternative

(most say, that it is a better one) to the old Subversion (SVN). However, the Computing Officers have already created a SVN server in the Department, so using it might be your only choice as of now. For those who want invest time into newer and more advanced technology (git) there are several notes on how to make that happen in the nearest future.

5 List of Useful Links and Resources

Here is a list of very useful internet resources on LaTeX typesetting system:

- CUED LaTeX website[4] very good resource for some LaTeX related matters;

- PracTeX journal[5] is a very good place for novel uses of LaTeX and one can find very interesting tutorials there;

- stack**overflow** archive[6] of answers to various LaTeX related questions.

- Good LaTeX practices[7] on stack**overflow**.

- The aforementioned LaTeX wikibook[8]

- CTAN LaTeX repository[9]. This is the major database of packages and document classes. If you do not find what you want here, probably it does not exist (yet).

- The LaTeX font catalogue[10]. A very good place to know how to get fonts working.

- TeXamples page[11]. A good resource on TikZ graphics package usage. It contains a lot of examples and might be the best way to start learning it just by examining everything.

- Metapost related links[12]. This is yet another way to produce good quality scalable graphics. This library is based on the MetaFont library by Donald Knuth (the TeX father).

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[4] The URL is `http://www.eng.cam.ac.uk/help/tpl/textprocessing/`
[5] The URL is `http://tug.org/pracjourn/2010-2/toc.html`
[6] The URL is `http://stackoverflow.com/questions/tagged/latex`
[7] The URL is `http://stackoverflow.com/questions/193298/best-practices-in-latex/196724`
[8] The URL is `https://secure.wikimedia.org/wikibooks/en/wiki/LaTeX`
[9] The URL is `http://www.ctan.org/`
[10] The URL is `http://www.tug.dk/FontCatalogue/`
[11] The URL is `http://www.texample.net/`
[12] The URL is `http://www.tug.org/metapost.html`