5 Textual tools

Every text-handling system needs to support a repertoire of tools for doing things with text. LaTeX implements many dozens, of which a small selection of the most frequently used is given here:

- footnotes and end-notes;
- marginal notes;
- cross-references, both normal ones and bibliographic citations;
- indexes and glossaries;
- typesetting in multiple columns.

5.1 Footnotes and end-notes

The command `\footnote{Like this}`, followed by the text of the footnote in curly braces, will produce an auto-numbered footnote with a raised small number where you put the command, and the numbered text automatically printed at the foot of the page.[1] The number is reset to 1 at the start of each chapter (but there are packages to override that and make them run continuously throughout the document, or even restart at 1 on each page or section).

[1] Like this.

LaTeX automatically creates room for the footnote, and automatically reformats it if you change your document in such a way that the point of attachment and the footnote would move to the next (or preceding) page.

Verbatim inside footnotes

Because LaTeX reads the whole footnote before doing anything with it, you can't use the `\verb` (inline verbatim) command inside footnotes on its own: either use the `\VerbatimFootnotes` command from the fancyvrb package, or precede `\footnote` with `\protect`, or use (abuse?) the `\url` command instead (which you should be using for Web and email addresses in any case).

Footnotes in titling commands (`\title`, `\author`, etc) are generally regarded as Bad Style, and you should avoid them; if you can't, they produce the symbols *, †, ‡, §, ¶, ||, **, ††, and ‡‡ for the values 1–9 (and an error message for the tenth such footnote). In accordance with standard publishing practice, footnotes inside a `minipage` environment produce lettered notes instead of numbered ones, and they get printed at the bottom of the minipage, *not* the bottom of the physical page (but this too can be changed).

There is a package (endnote) to hold over your footnotes and make them print at the end of the chapter instead or at the end of the whole document, and there is a package (fnpara) to print many short footnotes in a single footnoted paragraph so they take up less space. It is also possible to have several separate series of footnotes active simultaneously, which is useful in critical editions or commentaries in the Humanities: for example, a numbered series for the original author's original footnotes; a lettered series for footnotes by subsequent commentators or authorities in later editions; and a roman-numeral series for your own footnotes. It is also possible to format footnotes within footnotes.

If your footnotes are few and far between, you may want to use the sequence of footnote symbols above instead of numbers. You can do this by redefining the output of the footnote counter to be the `\fnsymbol` command (with the *`footnote`* as its argument):

```
\renewcommand{\thefootnote{\fnsymbol{footnote}}
```

There are also ways to refer more than once to the same footnote, and to defer the positioning of the footnote if it occurs in a float like a Table or Figure, where it might otherwise need to move to a different page, but these techniques are out of scope here.

5.2 Marginal notes

You can add marginal notes to your text instead of footnotes. You need to make sure that you have a wide-enough margin, of course: use the geometry package (see section 3.1.2 on page 55) to allocate enough space, otherwise the notes will be too cramped. or as well as

There are several packages to help with formatting marginal notes, but you can also define one yourself. Add this new command to your Preamble:

```
\newcommand{\marginal}[1]{%
  \leavevmode\marginpar{\tiny\raggedright#1\par}}
```

Then you can use `\marginal{Some text}` where you need it. Be careful, however, because marginal notes are aligned with the line where the command starts, so a very long one followed too closely by another will cause LaTeX to try and adjust the position so they don't overlap.

We're jumping ahead a bit here, as we haven't covered how to define your own commands yet. I won't even try to explain it here, although the astute reader can probably deduce it by inspection. See Chapter 7 starting on page 157 for more information about making up your own commands.

5.3 References and citations

This is one of the most powerful features of LaTeX. As we mentioned when discussing Figures and Tables, you can label any point in a document with a name you make up, so that you can refer to it by that name from anywhere else in the document (or even from

another document) and LaTeX will always work out the right cross-reference number for you, no matter how much you edit the text or move it around.

As we well see later, a similar method is also used to cite documents for a bibliography or list of references, and there are packages to sort and format these in the correct style for different journals or publishers.[2]

5.3.1 Cross-references

You label the place in your document you want to refer *to* by adding the command `\label` followed by a short name you make up, in curly braces:[3] exactly as we did for labelling Figures and Tables in section 4.2.2 on page 79.

```
\section{New Research}
\label{newstuff}
```

You can then refer to this place from anywhere in the same document with the command `\ref` followed by the name you used, eg

```
In section~\ref{newstuff} there is a list of recent
projects.
```

☞ In section 13.5 there is a list of recent projects.

- Note the use of the unbreakable space (~) between the `\ref` and the word before it. This prints a space but prevents the line ever breaking at that point, should it fall close to the end of a line when being typeset.
- The `\S` command can be used if you want the section sign § instead of the word 'section' (there is also a `\P` command that produces the paragraph sign or pilcrow ¶).

Labels MUST be unique (that is, each value MUST occur only *once* as a label within a single document), but you can have as many references

[2] Be aware that in some disciplines where cross-references are not much used, the word 'references' may be used to mean 'bibliographic references'.

[3] This section is labelled `normalxref`, for example.

to them as you like. If you are familiar with HTML, this is the same concept as the internal linking mechanism using # labels (or IDs in XHTML or HTML5).

Labels in normal text: If the label is in normal text, as above, the reference will give the current chapter/section/subsection number (depending on the current document class).[4]

Labels in Tables or Figures: If the label is inside a Table or Figure, the reference provides the Table number or Figure number prefixed by the chapter number (remember that in Tables and Figures the `\label` command MUST come *after* the `\caption` command).

The `\ref` command does not produce the word 'Figure' or 'Table' for you: you have to type it yourself, or use the varioref package which automates it.

Labels in lists: A label in an item in an enumerated list will provide the item number. In other lists its value is null or undefined.

Labels elsewhere: If there is no apparent countable structure at the point in the document where you put the label (in a bulleted list, for example), the reference will be null or undefined.

The command `\pageref` followed by any of your label values will provide the page number where the label occurred, instead of the reference number, regardless of the document structure. This makes it possible to refer to something by page number as well as by its `\ref` number, which is useful in very long documents like this one (varioref automates this too).

Unresolved references are printed as two question marks, and they also cause a warning message at the end of the log file. There's never any harm in having `\label`s you don't refer to, but using `\ref` when you don't have a matching `\label` is an error, as is defining two labels with the same value.

5.3.2 Bibliographic references

The mechanism used for references to reading lists and bibliographies is very similar to that used for normal cross-references. Instead

[4] Thus I can refer here to the label at the start of this section as `\ref {normalxref}` and get the value ' Section 5.3.1 on the facing page'.

LaTeX records the label values each time the document is processed, so the updated values will get used the *next* time the document is processed. You therefore need to process the document one extra time before final printing or viewing, if you have changed or added references, to make sure the values are correctly resolved. Most LaTeX editors handle this automatically by typesetting the document twice when needed.

of using `\ref` you use `\cite` or one of the variants explained in section 5.3.2.3 on page 114; and instead of `\label`, you attach a label value to each of the reference entries for the books, articles, reports, etc that you want to cite. You keep these reference entries in a ***bibliographic reference database*** that uses the BibTeX data format (see section 5.3.2.2 on page 112).

This does away with the time needed to maintain and format references each time you cite them, and dramatically improves accuracy. It means you only ever have to enter the bibliographic details of your references once, and you can then cite them in any document you write, and the ones you cite will get formatted automatically to the style you specify.

5.3.2.1 Choosing between BibTeX and *biblatex*

LaTeX has two systems for doing this, BibTeX (old) and biblatex (new): both of them use the same file format, called BibTeX.

- the older BibTeX system uses a separate file for each style format (eg Harvard, Oxford, IEEE, Vancouver, MLA, APA, etc), plus a sort-and-extract program also called *bibtex*, which creates the formatting for the references in LaTeX. The drawbacks of BibTeX are that *a*) it doesn't handle accented and other non-Latin characters very easily; and *b*) the style format files (`.bst` files) are written in its own rather strange and unique language, making them extremely difficult to modify.

- the newer biblatex system is a standard LaTeX package with options for the different style formats. There is also a new program (*biber*) to replace *bibtex* for sorting and extracting the references

Bibliographic reference databases

Although it is possible to type the details of each reference manually, it's much easier to use a program designed for the purpose. There are several available (see Wikipedia's list), including Zotero and Mendeley. Both are open-source, but *Mendeley* was recently bought out by Elsevier; although it was still free of charge at the time of writing there have been concerns about Elsevier's use of your data. Their features vary but *Zotero*'s primary benefit is that it can grab bibliographic metadata from web pages, so that you don't have to type it in. Both can extract the metadata from the PDFs of articles you download from journal sites. And both can export the data in BibTeX format, which is essential.

Once your data is in BibTeX format, you can manage your collection of references with any of the many free BibTeX-based database programs such as JabRef (see Figure 5.1 on page 117).

Endnote and Reference Manager are commercial products which do not use the BibTeX data format, but which can export RIS format which *Zotero*, *JabRef*, and *Mendeley* can all import.

You add your entries to whichever system you choose, usually by downloading references from an online database like *Web of Science*, *JSTOR*, *PubMed* etc, or by using *Zotero* to gather the entry from a web page (you can also type references in by hand). *JabRef* lets you click an icon or menu entry and the LaTeX citation command will be inserted into your document editor at the cursor location.

from your BibTeX file.[5] The main advantages are that *a*) biblatex works with UTF-8 characters, so accents and other writing systems are handled natively, especially with XeLaTeX; and *b*) biblatex is written entirely in LaTeX, providing a much more extensible data model, so updating or writing layout formats it is much easier than with BibTeX.

Many basic formats are included as options within the biblatex package, but there are add-on subpackages to handle additional format-specific

[5] In fact, the old *bibtex* program can be still be used instead of *biber* with *biblatex*, but this would be perverse.

features, such as biblatex-apa, biblatex-chicago, etc (see the example in section 5.3.2.4 on page 118).

The biblatex package with the *biber* program is therefore recommended, as it is under active development. However, there are a few classes and packages which have not yet been rewritten and may still require BibTeX style formats, and there are some less common style formats which are not available prepackaged for biblatex. However, the flexibility of the biblatex data model means altering or extending style formats to create your own is much easier than it is for BibTeX, although this is not a task for the beginner.

Cheatsheet

Clea F Rees has written an excellent cheatsheet with virtually everything on it that you need for quick reference to using biblatex. This is downloadable as the package biblatex-cheatsheet from CTAN.

5.3.2.2 The BibTeX file format

The format for BibTeX files is used for both *biber* and *bibtex* programs, and is specified in the original BibTeX documentation (look on your system for `btxdoc.pdf`). The biblatex package and its updated style formats provide more fields and more document types.

There is a required minimum set of fields for each of a dozen or so types of document: book, article (in a journal), article (in a collection), chapter (in a book), thesis, report, conference paper (in a Proceedings), etc, exactly as with all other reference management systems. These are all (entry types and entry fields) listed in detail in the biblatex documentation (Lehman, Kime, Boruvka & Wright, 2015, sections. 2.1 & 2.2, 6).

Each BibTeX entry starts with an `@` sign followed by the type of document, followed by the whole entry in a single set of curly braces. The first value is the unique key (label) that you make up, followed by a comma:

```
@book{fg,
...
```

```
}
```

Then comes each field (in any order), using the format:

```
keyword = {value},
```

There MUST be a comma after each line *except the last*.

```
@book{fg,
   title         = {{An Innkeeper's Diary}},
   author        = {John Fothergill},
   edition       = {3rd},
   publisher     = {Penguin},
   year          = 1929,
   address       = {London}
}
```

Most TEX-sensitive editors have a BIBTEX mode which understands these entries and provides menus or templates for writing them. The rules are:

- Omit the comma after the last field in the entry (*only* — eg after `{London}` in the example);
- Some styles recapitalise the title when they format: to prevent this, enclose the title in double curly braces as in the example;
- Also use extra curly braces to enclose multi-word surnames, otherwise only the last will be used in the sort, and the others will be assumed to be forenames, for example the British explorer can be sorted under T with `author = {Ranulph {Twisleton Wykeham Fiennes}}`;
- Multiple authors go in the one `author` field, separated by the word `and` (see example below);
- Values which are purely numeric (eg years) may omit the curly braces;
- Fields can occur in any order but the format must otherwise be strictly observed;

- ☐ Fields which are not used do not have to be included (so if your editor automatically inserts them as blank or prefixed by OPT [optional], you can safely delete them as unused lines).

Here's another example, this time for a book on how to write mathematics — note the multiple authors separated by and.

```
@book{mathwrite,
  author =       {Donald E Knuth and Tracey Larrabee and Paul M Roberts},
  title =        {{Mathematical Writing}},
  publisher =    {Mathematical Association of America},
  address =      {Washington, DC},
  series =       {MAA Notes 14},
  isbn =         {0-88385-063-X},
  year =         {1989}}
```

Every reference in your reference management software MUST have a unique key value (label or ID): you can make this up, just like you do with normal cross-references, but some bibliographic software automatically assigns a value, usually based on some abbreviation of the author and year. These keys are for *your* convenience in referencing: in normal circumstances your readers will not see them. You can see these labels in the right-hand-most column and at the bottom of the screenshot in Figure 5.1 on page 117, and in the examples above. You use this label in your documents when you cite your works.

There are many built-in options to the biblatex package for adjusting the citation and reference formats, only a few of which are covered here. Read the package documentation for details: it is possible to construct your own style simply by adjusting the settings, with no programming required (unlike the older BibTeX styles, which are written in a programming language used nowhere else).

5.3.2.3 Citation commands

The basic command is \cite, followed by the label of the entry in curly braces. You can cite several entries in one command: separate the labels with commas.

```
\cite{fg}
\cite{bull,davy,heller}
```

For documents with many citations, use the Cite button or menu item in your bibliographic reference manager, which will insert the relevant

command for you (you can see it activated for the *TEXStudio* editor in Figure 5.1 on page 117).

How the citation appears is governed by the reference format (style) you specify in the options to the biblatex package (see section 5.3.2.4 on page 117) or in a `\bibliographystyle` command if you are using BIBTEX (see section 5.3.2.5 on page 118). There are three common formats used:

authoryear: There are two types of this format: one with the year in parentheses and one with the whole citation in parentheses.

The first type is used in phrases or sentences where the name of the author is part of the sentence, and the year is there to identify what is being cited; in biblatex this command is `\textcite{fg}`

...as has clearly been shown by Fothergill (1929).

The second type is used where the phrase or sentence is already complete, and the citation is being added in support: in biblatex this command is `\parencite{fg}`

...as we have already clearly shown (Fothergill, 1929).

numeric: This format is popular in some scientific disciplines and produces just a number in square brackets [42]. The references at the end of the document are numbered in sort order.

alphabetic: This format is also popular in some scientific disciplines and produces a three- or four-letter abbreviation of the author's name and two digits of the year, all in square brackets [Fot29]. The references at the end of the document are labelled with the same format in sort order.

To direct your reader to a specific page or chapter, you can add a prefix and/or a suffix as optional arguments in square brackets before the label.

```
...as shown by \textcite[p.12]{mathwrite}.
```

The prefix gets printed at the start of the citation and the suffix gets printed at the end, but all still within the parentheses, if any. As they are both optional arguments, and as suffixes are far more common

Table 5.1: Built-in citation style commands and formats (biblatex)

Style	Command	Result
authoryear	`\parencite{fg}`	(Fothergill, 1929)
authoryear	`\textcite{fg}`	Fothergill (1929)
authoryear	`\footcite{fg}`	[1]
numeric	`\cite{fg}`	[42]
alphabetic	`\cite{fg}`	[Fot29]
authoryear	`\cite{fg}`	Fothergill 1929

[1] Fothergill 1929.

than prefixes, when only one optional argument is given, it is assumed to be the suffix.. The example here therefore produces Knuth et al. (1989, p. 12).

If you are using *bibtex*, you can only specify a suffix, as the sole optional argument.

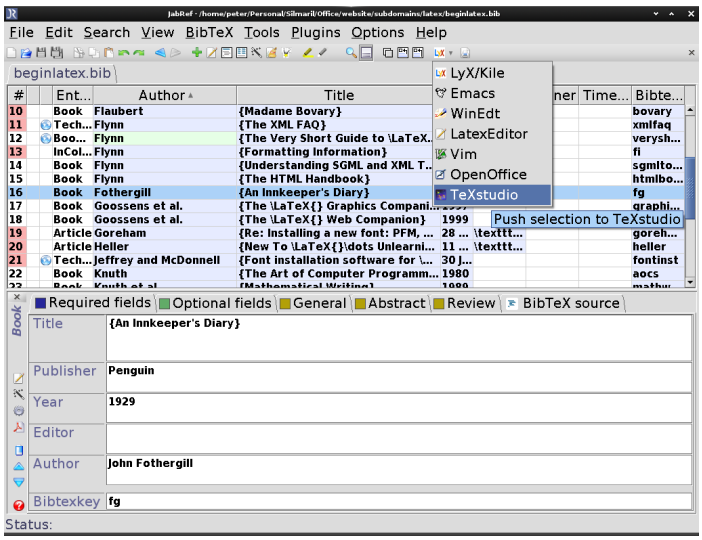
Footnoted citations are common in History and related disciplines, to the extent that scholars in these fields actually call their references 'footnotes', which is confusing. The command `\footcite` does these (see Table 5.1) but it is only relevant for author-year styles (in numeric style it just produces the number, which looks wrong).

There are many variant forms of these commands, either for specific styles like Harvard, IEEE, APA, MLA, etc; or for grammatical modifications like capitalising name prefixes, omitting the comma between name and year, or adding multiple notes; or for extracting specific fields from an entry (eg `\titlecite`). If you have requirements not met by the formats described here, you can find them in the documentation for the biblatex package.

If you are using BibTeX, the commands you can use are not standardised except for `\cite`. Instead, they depend on which style format you use, for example the popular natbib package, which implements author-year citation for the natural sciences, uses `\citet` and `\citep` instead of `\textcite` and `\parencite`.

Your reference management software will have a display something like Figure 5.1 on the facing page (details vary between systems, but they all do roughly the same job in roughly the same way), showing all your references with the data in the usual fields (title, author, date, etc).

Figure 5.1: JabRef displaying a file of references, ready to insert a citation of Fothergill's book into a LaTeX document being edited with TeXStudio



Your BibTeX file, saved or exported to a `.bib` file from your reference management software, looks like the examples in section 5.3.2.2 on page 112.

If your software doesn't save BibTeX format direct, save it in RIS format, then open the `.ris` file in something like *JabRef* and save it as a `.bib` file from there.

5.3.2.4 Setting up biblatex with *biber*

You set up your document with the following packages:

1. the babel package with appropriate languages, *even if you are only using one language*. The default language is American English, so there are commands to map this to other language variants (shown in the example for British English);

2. the csquotes package, which automates the use of quotation marks around titles or not, depending on the type of reference;

3. the biblatex package itself, specifying the *biber* program and the style of references you want, either `numeric`, `alphabetic`, or

authoryear; or a publisher's style (in this example I am using APA format); and any options for handling links like DOIs, URIs, and ISBNs;

4. finally, the name of your BibTeX file[s] (see the panel 'Bibliographic reference databases' on p. 111) with one or more \addbibresource commands.

```
\usepackage[frenchb,german,british]{babel}
\usepackage{csquotes}
\usepackage[backend=biber,doi=true,isbn=true,
  url=true,style=apa]{biblatex}
\DeclareLanguageMapping{british}{british-apa}
\addbibresource{myrefs.bib}
```

Finally, you need to add the \printbibliography command at the point in your document where you want the full list of references you have cited to be printed. See section 5.3.2.6 on the facing page for details of how XeLaTeX produces the references.

Versions of *biber* and biblatex

One important point to note is that biblatex and *biber* are step-versioned; that is, each version of the biblatex package only works with a specific version of the *biber* program. There is a table of these dependencies in the biblatex documentation PDF. If you update biblatex for some reason (perhaps to make use of a new feature), you MUST update your copy of *biber* to the correct version, and *vice versa*, otherwise you will not be able to produce a bibliography.

5.3.2.5 Using BibTeX

The BibTeX method is deprecated, partly because it does not handle UTF-8 character-encoding correctly, and partly because its unusual internal programming language makes it hard to extend.

The principles underlying BibTeX are identical to biblatex: you create and maintain your BibTeX file of references in exactly the same way, and you use the `\cite` in the same way. But there is no basic package to load with options: instead, you specify the name of the style you want, using a `\bibliographystyle` command in your Preamble, plus any additional packages needed to help with the formatting. You then use the `\bibliography` command to give the name of your BibTeX file (*without* the `.bib` extension) *at the point you want the references to be printed.*

```
\bibliographystyle{apsr}
\usepackage{natbib,har2nat}
...
\bibliography{myrefs}
```

In this example the American Political Science Review (APSR) Harvard-like reference style has been selected (common in the political and economic sciences), which normally means numerical citation, but the author wants the Natural Sciences (author-year) form of citation, which is provided by the natbib package, which in turn requires the har2nat package to handle Harvard-style formatting. The natbib package provides `\citet` for textual citation like Fothergill (1929), and `\citep` for parenthetic citation like (Fothergill, 1929).

There is an option on all the `cite` commands and variants to let you specify a suffix to the citation, so `\citep[Foreword, p.13]{fg}` produces (Fothergill, 1929, p. 13, Foreword).

See section 5.3.2.6 for details of how PDFLaTeX produces the references.

5.3.2.6 Producing the references

Because of the record—extract—format process (the same as used for cross-references), you will get a warning message about 'unresolved references' the first time you process your document after adding a new citation for a previously uncited work and running *biber* or *bibtex*. The *bibtex* program produces a bold **??** where the unresolved reference will be; *biber* produces the entry label in bold instead. This will disappear once LaTeX has been run again, which is why so many editors have a Build function to do the job for you.

Your LaTeX editor's Typeset or Build button or menu entry should therefore handle the business of running *biber* or *bibtex* for you. If not, here's how to do it manually in a Command window:

For XeLaTeX with *biber*: Run XeLaTeX, then run *biber* to extract and sort the details from the BibTeX file, and then run XeLaTeX again:

```
xelatex myreport
biber myreport
xelatex myreport
```

For PDFLaTeX with *bibtex*: Run PDFLaTeX, then run *bibtex* to extract and sort the details from the BibTeX file, and then run PDFLaTeX again twice (to resolve the references):

```
pdflatex myreport
bibtex myreport
pdflatex myreport
pdflatex myreport
```

In practice, authors tend to retypeset their documents from time to time during writing anyway, so they can keep an eye on the typographic progress of the document. Just clicking the Typeset or Build button after adding a new `\cite` command, and subsequent runs of LaTeX will incrementally incorporate all references without you having to worry about it.

5.4 Indexes and glossaries

Indexes and glossaries are tools for directing or helping the reader. Any book or report sized document should have an index, although they are uncommon in theses. Glossaries are usually only needed where there is a substantial number of technical terms needing formal definition and cross-referencing.

5.4.1 Indexes

LaTeX has an automated indexing facility which uses the standard *makeindex* program for sorting and collation. To use indexing, use

the package makeidx and include the \makeindex command in your Preamble to initialise the index:

```
\usepackage{makeidx}
\makeindex
```

When you want to index something, use the command \index followed by the entry in curly braces, as you want it to appear in the index, in one of the following formats:

Plain entry: Typing \index{beer} will create an entry for 'beer' with the current page number;

Subindex entry: For an entry with a subentry use an exclamation mark to separate them: \index{beer!lite}. You can create another level as well, so you can have subsubentries like \index{beer!lite!American};

Cross-references: 'See' entries are done with the vertical bar (one of the rare times it does *not* get interpreted as a math character): \index{Microbrew|see{beer}};

Font changes: To change the style of an entry, use the @-sign followed by a font change command:

```
\index{beer!Rogue!Chocolate Stout@\textit{Chocolate Stout}}
```

This example indexes *Chocolate Stout* as a third-level entry and italicises it at the same time. Any of the standard \text font-change commands work here: see Table 6.7 on page 146 for details.

You can also change the font of the index number on its own, as for first-usage references, by using the vertical bar in a similar way to the 'see' entries above, but substituting a font-change command name alone (*without* a backslash or curly braces) such as textbf for bold-face text (see the index):

```
\index{beer!Rogue!Chocolate Stout|textbf}
```

Out of sequence: The same method can be used as for font changes, but using the alternate index word instead of the font command name, so `\index{Oregon Brewing Company@Rogue}` will add an entry for 'Rogue' in the 'O' section of the index, as if it was spelled 'Oregon Brewing Company'.

When the document has been processed through LaTeX it will have created a `.idx` file, which you run through the *makeindex* program by clicking the Index button or menu entry in your editor, or by typing the **makeindex** command followed by your document name without the `.tex` filetype.

The program will look for the `.idx` file with the same name as your document, and output a `.ind` file with the sorted index in it. This is what gets used by the command `\printindex` which you put at the end of your document, where you want the index printed. The default index format is two columns with a space between letters of the alphabet. The Unix manual page[6] for the *makeindex* program has details of how to add letter headings to each alphabet group.

5.4.2 Glossaries

Glossaries can be done in a similar manner to indexes, using the command **\makeglossary** in the Preamble and the command **\glossary** in the same way as **\index**. There are some subtle differences in the way glossaries are handled: both the books by Lamport (1994) and by Mittelbach, Goossens, Braams, Carlisle and Rowley (2004) duck the issue, but there is some documentation on `glotex` on CTAN. There is also a gloss package based on BibTeX which uses `\gloss` in the same way as **\cite**.

However, by far the best way is to use the glossaries package (not glossary, which is obsolete, and not gloss). This is a relatively complex package, as glossaries are a relatively complex tool, but there is extensive help in the documentation. It requires the *makeglossaries* script from CTAN (there is also a *makeglossariesgui* Java GUI).

Basically, you need to create a set of definitions, one per item to be glossed, using the `\newglossaryentry` command:

[6] On Unix & GNU/Linux systems (including Apple Macintosh OS X, just type the command **man makeindex**; the page is also available in many reference sites on the web.

```
\newglossaryentry{esis}{name={ESIS},description={The
  \textbf{Element Structure Information Set} of a
  marked-up document, originally defined for SGML
  (replaced for XML using W3C Schemas by the
  Post-Schema-Validation InfoSet, PSVI). See
  \url{http://xml.coverpages.org/WG8-n931a.html}}}
```

This specifies *a*) the label you will use (`esis`); *b*) the name of the item as it will be printed (`ESIS`); and *c*) the textual description to go in the glossary. Probably the bext place to put these is in a separate file like `mygloss.tex`, which you can get LaTeX to read with an `\input{mygloss.tex}` command in your Preamble.

You can then use the `\gls` command in your text to produce the printable name of any entry, using the label to refer to it, eg `\gls{esis}`. It is possible to use or define variant commands to handle references at the start of a sentence (where you need a capital letter if the name is not an acronym), and grammatical alteration like unusual plurals or forms ending in '—ing'.

At the end of your document, where you want the glossary printed, you use the command `\printglossaries`. The glossary need to be processed separately from the main document, using the *makeglossaries* script, exactly the same way as you do for *biber*, *bibtex*, and *makeindex*. The Build function of your editor should do this for you, or use a Makefile or a utility like *latexmk*. As with all these tools, there are many more facilities built into them: read the documentation.

The acronym package can also be used to create a kind of glossary containing a list of acronyms and their expansions, as well as driving the use of expansion on first mention. However, the glossaries package now contains built-in support for acronyms.

5.5 Multiple columns

Use the multicol package: the environment is called `multicols` (note the plural form) and it takes the number of columns as a second argument in curly braces:

```
\usepackage{multicol}
...
\begin{multicols}{3}
...
\end{multicols}
```

LaTeX has built-in support for two-column typesetting via the *twocolumn* option in the standard Document Class Declarations, but it is relatively inflexible in that you cannot change from full-width to double-column and back again on the same page, and the final page does not balance the column heights. However, it does feature special `figure*` and `table*` environments which typeset full-width figures and tables across a double-column setting.

The more extensive solution is the multicol package, which will set up to 10 columns, and allows the number of columns to be changed or reset to one in mid-page, so that full-width graphics can still be used. It also balances the height of the final page so that all columns are the same height — if possible: it's not always achievable — and you can control the width of the gutter by setting the `\columnsep` length to a new dimension.

Multi-column work needs some skill in typographic layout, though: the narrowness of the columns makes typesetting less likely to fit smoothly because it's hard to hyphenate and justify well when there is little space to manœuvre in.