

Intermediate L^AT_EX II

Michael A. Saum

University of Tennessee
Department of Mathematics

Overview

- References and Labels
- Bibliographies and Bib_T_EX
- The **natbib** Package
- Postscript and Encapsulated Postscript
- Figures and .eps files
- The **Xy-Pic** Package
- The **PSTricks** Package
- The *picture* Environment
- NSF Proposal Submission

References and Labels

Use `\label{key_string}` to **tag** equations, figures, tables, chapters, sections, anything that gets numbered automatically within **LATEX** . One can then refer to that item using the `\ref{key_string}` anywhere in your paragraphs and if the numbering changes, so will the references. You will probably have to run **LATEX** two or three times to resolve all of the references.

Refs. and Labels, contd.

```
\begin{equation}\label{emc2}
E = mc^2
\end{equation}
Equation~\ref{emc2} is well known.
```

produces

$$E = mc^2 \tag{1}$$

Equation 1 is well known.

Bibliographies

To use bibliographies, the best way is to create a bibtex file (extension .bib) containing all of the references you will be using in the document. The .bib file is a database of references in an easy to use, modify, and understand format. Part of the bibtex file `ref.bib` is shown on the next slide.

BibTeX file

```
@book{Hu,
  author = "Stephen P. Hubbell",
  year = "2001",
  title = "The Unified Neutral Theory of Biodiversity and Biogeography",
  publisher = "Princeton University Press",
  address = "Princeton, NJ"
}

@article {Lev2003,
  AUTHOR = {Simon A. Levin},
  TITLE = {Complex Adaptive Systems: Exploring the known, the unknown, and the unknowable.},
  JOURNAL = {Bull. Amer. Math. Soc. (N.S.)},
  FJOURNAL = {American Mathematical Society. Bulletin. New Series},
  VOLUME = {40},
  YEAR = {2003},
  NUMBER = {1},
  PAGES = {3--19}
}

@article{Ga1999,
  author = "Sergey Gavrilets",
  title = "Dynamics of Clade Diversification on the Morphological Hypercube",
  journal = "Proc. R. Soc. Lond. B",
  volume = "266",
  pages = "817--824",
  year = "1999"
}

@article{Ga2000a,
  author = "Sergey Gavrilets and Randal Acton and Janko Gravner",
  title = "Dynamics of Speciation and Diversification in a Metapopulation",
  journal = "Evolution",
  volume = "54",
  pages = "1493--1501",
  year = "2000"
}

@article{Ga2000b,
```

Using Bib \TeX

To use Bib \TeX , there are a couple of things you must do.

1. Populate the .bib file with all of your references in the Bib \TeX format.
2. Choose a bibliography style using the `\bibliographystyle{...}` command.
3. At the end of the document, specify the .bib file using `\bibliography{...}` command.
4. You will need to run `latex` on the file, then `bibtex` on the file, then `latex` on the file twice.

Using Bib_{TEX} , contd.

The following slides indicate some of the various styles and usage. Assume that your latex file is named `bibex.tex`, your bibtex file is called `ref.bib` To correctly process your file you would then run:

- `latex bibex`
- `bibtex bibex`
- `latex bibex`
- `latex bibex`
- `dvips bibex -o` (to get the postscript file `bibex.ps`)

plain style

```
\documentclass[10pt]{article}

\begin{document}

\bibliographystyle{plain}

This is plain bibliography style.

You can reference any article like

\begin{itemize}
\item in a book~\cite{Hu}
\item in multiple articles~\cite{Lev2003, Ga2000b}
\item in multiple articles~\cite{Ga1999, Ga2000a}
\item in article~\cite[p. xxx]{Ga2000b} with specifics
\end{itemize}

\bibliography{ref}

\end{document}
```

plain style

This is plain bibliography style. You can reference any article like

- in a book [4]
- in multiple articles [5, 2]
- in multiple articles [1, 3]
- in article [2, p. xxx] with specifics

References

- [1] Sergey Gavrilets. Dynamics of clade diversification on the morphological hypercube. *Proc. R. Soc. Lond. B*, 266:817–824, 1999.
- [2] Sergey Gavrilets. Waiting time to parapatric speciation. *Proc. R. Soc. Lond. B*, 267:2483–2492, 2000.
- [3] Sergey Gavrilets, Randal Acton, and Janko Gravner. Dynamics of speciation and diversification in a metapopulation. *Evolution*, 54:1493–1501, 2000.
- [4] Stephen P. Hubbell. *The Unified Neutral Theory of Biodiversity and Biogeography*. Princeton University Press, Princeton, NJ, 2001.
- [5] Simon A. Levin. Complex adaptive systems: Exploring the known, the unknown, and the unknowable. *Bull. Amer. Math. Soc. (N.S.)*, 40(1):3–19, 2003.

alpha style

```
\documentclass[10pt]{article}

\begin{document}

\bibliographystyle{alpha}

This is alpha bibliography style.
You can reference any article like
\begin{itemize}
\item in a book~\cite{Hu}
\item in multiple articles~\cite{Lev2003, Ga2000b}
\item in multiple articles~\cite{Ga1999, Ga2000a}
\item in article~\cite[p. xxx]{Ga2000b} with specifics
\end{itemize}

\bibliography{ref}

\end{document}
```

alpha style

This is alpha bibliography style. You can reference any article like

- in a book [Hub01]
- in multiple articles [Lev03, Gav00]
- in multiple articles [Gav99, GAG00]
- in article [Gav00, p. xxx] with specifics

References

[GAG00] Sergey Gavrilets, Randal Acton, and Janko Gravner. Dynamics of speciation and diversification in a metapopulation. *Evolution*, 54:1493–1501, 2000.

[Gav99] Sergey Gavrilets. Dynamics of clade diversification on the morphological hypercube. *Proc. R. Soc. Lond. B*, 266:817–824, 1999.

[Gav00] Sergey Gavrilets. Waiting time to parapatric speciation. *Proc. R. Soc. Lond. B*, 267:2483–2492, 2000.

[Hub01] Stephen P. Hubbell. *The Unified Neutral Theory of Biodiversity and Biogeography*. Princeton University Press, Princeton, NJ, 2001.

[Lev03] Simon A. Levin. Complex adaptive systems: Exploring the known, the unknown, and the unknowable. *Bull. Amer. Math. Soc. (N.S.)*, 40(1):3–19, 2003.

apalike style

```
\documentclass[10pt]{article}

\begin{document}

\bibliographystyle{apalike}

This is apalike bibliography style.
You can reference any article like
\begin{itemize}
\item in a book~\cite{Hu}
\item in multiple articles~\cite{Lev2003, Ga2000b}
\item in multiple articles~\cite{Ga1999, Ga2000a}
\item in article~\cite[p. xxx]{Ga2000b} with specifics
\end{itemize}

\bibliography{ref}

\end{document}
```

apalike style

This is apalike bibliography style. You can reference any article like

- in a book [Hubbell, 2001]
- in multiple articles [Levin, 2003, Gavrilets, 2000]
- in multiple articles [Gavrilets, 1999, Gavrilets et al., 2000]
- in article [Gavrilets, 2000, p. xxx] with specifics

References

[Gavrilets, 1999] Gavrilets, S. (1999). Dynamics of clade diversification on the morphological hypercube. *Proc. R. Soc. Lond. B*, 266:817–824.

[Gavrilets, 2000] Gavrilets, S. (2000). Waiting time to parapatric speciation. *Proc. R. Soc. Lond. B*, 267:2483–2492.

[Gavrilets et al., 2000] Gavrilets, S., Acton, R., and Gravner, J. (2000). Dynamics of speciation and diversification in a metapopulation. *Evolution*, 54:1493–1501.

[Hubbell, 2001] Hubbell, S. P. (2001). *The Unified Neutral Theory of Biodiversity and Biogeography*. Princeton University Press, Princeton, NJ.

[Levin, 2003] Levin, S. A. (2003). Complex adaptive systems: Exploring the known, the unknown, and the unknowable. *Bull. Amer. Math. Soc. (N.S.)*, 40(1):3–19.

The **natbib** package

One can use the package **natbib** to obtain more flexibility in citing references. Instead of `\cite` commands, there is a parenthetical citation style using `\citep` and a textual citation style using `\citet`. The following two slides illustrate this usage with `apalike` style of `natbib`.

natbib with apalike style

```
\documentclass[10pt]{article}
\usepackage{natbib}
```

```
\begin{document}
\bibliographystyle{apalike}
```

This is apalike bibliography style using natbib.

You can reference any article like

```
\begin{itemize}
\item in a book~\citep{Hu}
\item in a book~\citet{Hu}
\item in multiple articles~\citep{Lev2003, Ga2000b}
\item in multiple articles~\citet{Ga1999, Ga2000a}
\item in article~\citep[see][p. xxx]{Ga2000b} with specifics
\end{itemize}
```

```
\bibliography{ref}
\end{document}
```

natbib with apalike style

This is apalike bibliography style using natbib. You can reference any article like

- in a book (Hubbell, 2001)
- in a book Hubbell (2001)
- in multiple articles (Levin, 2003; Gavrilets, 2000)
- in multiple articles Gavrilets (1999); Gavrilets et al. (2000)
- in article (see Gavrilets, 2000, p. xxx) with specifics

References

Gavrilets, S. (1999). Dynamics of clade diversification on the morphological hypercube. *Proc. R. Soc. Lond. B*, 266:817–824.

Gavrilets, S. (2000). Waiting time to parapatric speciation. *Proc. R. Soc. Lond. B*, 267:2483–2492.

Gavrilets, S., Acton, R., and Gravner, J. (2000). Dynamics of speciation and diversification in a metapopulation. *Evolution*, 54:1493–1501.

Hubbell, S. P. (2001). *The Unified Neutral Theory of Biodiversity and Biogeography*. Princeton University Press, Princeton, NJ.

Levin, S. A. (2003). Complex adaptive systems: Exploring the known, the unknown, and the unknowable. *Bull. Amer. Math. Soc. (N.S.)*, 40(1):3–19.

natbib, contd.

- The natbib documentation is located at
`/usr/share/texmf/doc/latex/natbib/natbib.dvi`
- Excellent summary notes of natbib are at
`/usr/share/texmf/doc/latex/natbib/natnotes.dvi`
- Excellent reference for Bib_T_EX is Chapter 13 of Goossens, Mittelbach, Samarin. **The L_aT_EX Companion**.
- As always, there exists a lot of references on the WWW.

Postscript files

- A postscript file is an ASCII text file containing commands in a page description programmable language called postscript.
- Postscript is the defacto standard for files to be printed, almost all printers support printing of postscript files.
- A postscript file almost always has the extension `.ps`
- `Ghostscript` is a set of tools which allows one to convert postscript to *pdf* files, which are more portable than postscript, as well as `ghostview`, a postscript file viewer.

Postscript, contd.

- There are two main styles of fonts used in postscript files, Type 1 and Type 3.
- Type 1 postscript fonts are *outline* fonts, i.e., the outline of a character is defined by formulae. These fonts scale nicely.
- Type 3 postscript fonts are *bitmapped* fonts, i.e., each character in the font is a series of dots. These fonts do not scale as nice as Type 1 and one should avoid using these if at all possible.
- One can control what fonts will be used when converting the .dvi file to .ps file (using dvips) by modifying one's .dvipsrc file as described in <http://www.math.utk.edu/TeX/pdfps.html>

Fonts

\LaTeX will use by default the **Computer Modern** font family. These fonts were designed by Donald Knuth (the writer of the \TeX typesetting engine), and look very nice. There are occasions when one will want to use a different font family, such as **Times-Roman**, **Lucida**, etc. There are packages available to do that, but experience has shown that no font family is as comprehensive for text **AND** mathematics as the Computer Modern font family.

Encapsulated Postscript

An encapsulated postscript file (eps) is a postscript file which contains additional information as to how *large* the postscript image is. This information is called bounding box information. When including graphics in \LaTeX , one should always try to ensure that the file being included is in .eps format of some kind. Note that when creating figures in Matlab or Maple, one should try and save the images as .eps, although saving as .ps will do also.

Postscript File Conversion

To convert a .ps file to an .eps file, one has a number of options.

- `ps2epsi` is the preferred way to convert a .ps file to .eps file. It will create an .epsi file (which is basically the same as an .eps file) very nicely.
- `convert` is a program which will convert from almost any graphics format to .eps or .epsf format, which are both encapsulated postscript files.
- `ps2pdf` is a program which converts a .ps file to a .pdf file. To convert *nicely*, see instructions on <http://www.math.utk.edu/TeX/pdfps.html>
- Information on these programs can be obtained by consulting the man pages.

Figures and Graphics

- The figure environment is the preferred way of including graphics images into a L^AT_EX document.
- You should have a `\usepackage{graphicx}` in the normal area before the `\begin{document}` command.
- The **graphicx** package is a very powerful package which can handle most all graphics embedding issues.

Sample Figure

The following code segment would produce the figure on the next page.

```
\begin{center}
\begin{figure}
\includegraphics{test.eps}
\caption{test graphic}
\label{fig:1}
\end{figure}
\end{center}
```

Note that there are many options to the `graphicx` package. The best reference is probably

The L^AT_EX Graphics Companion by Goosens, Rahtz, and Mittelbach.

Sample Figure, contd.

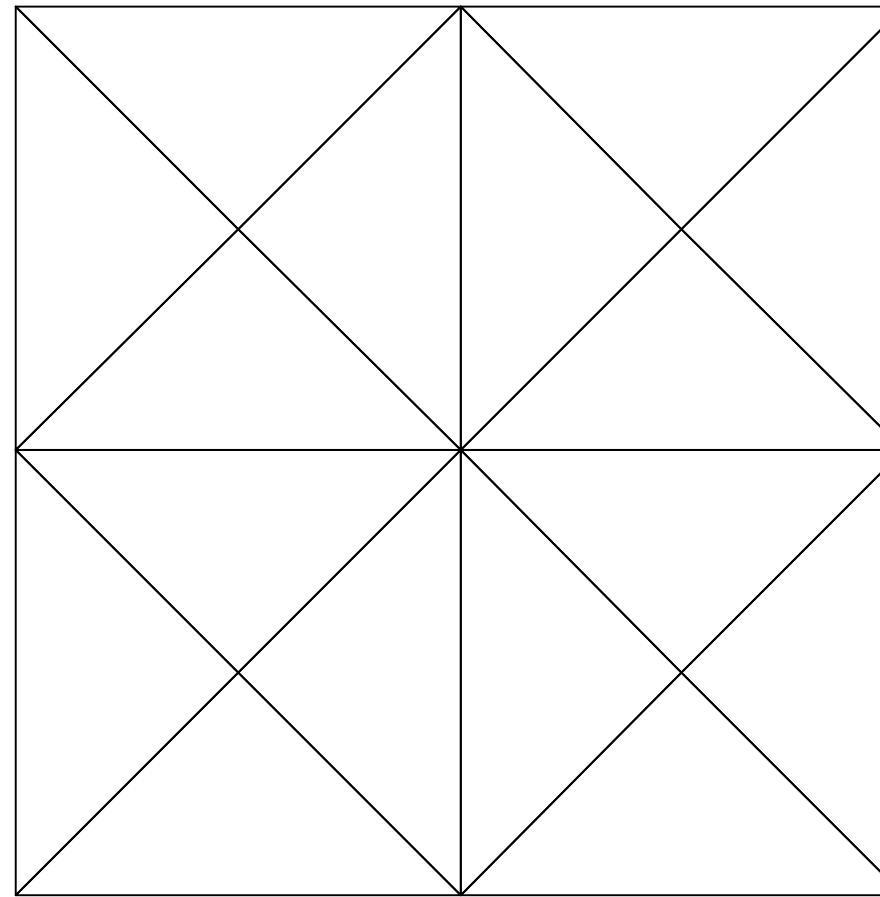


Figure 1: test graphic

Xy-Pic Package

- This package should be used if one has commutative diagrams or other *simple* relationship diagrams to insert into figures.
- This is a powerful package with many options.
- Definition of a diagram is done by specifying objects on a matrix type grid and specifying connections to other grid objects.
- Full documentation with examples is located:

`/usr/share/texmf/doc/generic/xypic/xyguide.ps`

and

`/usr/share/texmf/doc/generic/xypic/xyrefer.ps.`

- The reader is referred to these documents or Chapter 5 of the L^AT_EX Graphics Companion.

PSTricks Package

- PSTricks is a package which consists of core drawing primitives which tie very closely to the postscript page definition language.
- This is a very powerful package with many, many options and uses.
- The use of this package is described fully in Chapter 4 of the L^AT_EX Graphics Companion, as well as other documentation on the WWW.
- There are some interesting examples located at:

<http://www.tug.org/applications/PSTricks/Mathematics/>

The Picture Environment

- The picture environment can be used to overlay L^AT_EX text and mathematics over imported graphics figures.
- The picture environment is usually used nested within the figure environment.
- The picture environment is described well in Chapter 10 of the L^AT_EX Companion.
- Similar tasks can be accomplished with the PStricks package also.

NSF Proposal Submission

- NSF Fastlane allows for a complete electronic submittal and review of grant proposals submitted to NSF and is located at:

<https://www.fastlane.nsf.gov>

- NSF proposals are coordinated through Wanda Wagner who coordinates with the University prior to submittal.

- The submittal guide is located at:

https://www.fastlane.nsf.gov/guides/EB_Proposal_Submission.pdf

- While NSF Fastlane now accepts submittals in almost any format, we have found out from experience what works well for us.

NSF Proposal Tips

- There are specific rules about any submittal which must be followed.
- Submit .pdf documents *distilled* from .ps files containing Type 1 fonts.
- Use the **geometry** package to specify margins exactly.
- Submit the Proposal Description and References as two distinct documents, using L^AT_EX to make sure the citations correspond to the bibliography. Note that there is a trick to doing this correctly, contact me for the details.

NSF Proposal Tips, contd.

- Let Wanda know in ADVANCE if you are going to submit a proposal, and don't wait until the last minute to get everything in order.
- Follow these simple rules, and you will be amazed at how smooth the electronic submittal will go.

Summary

- Some of these packages will not work with each other, and in fact cause \TeX to run out of available resources, such as memory. This is especially true for some of the graphics packages such as Xy-pic and PStricks.
- Both Xy-pic and PStricks have many different options which can be specified when the package is included. The interested user is referred to the documentation for more specifics.
- When including graphics, keeping to the .eps (or .epsi, .epsf) format will make life easier. Avoid including the .jpg, .gif, .pbm, .png formats directly; do the conversion first.

Summary, contd.

- There are other graphics programs which can be used to create, modify, convert grpahics images such as xfig, gimp, etc.
- For bibliographies, using `\nocite{ * }` will list all of the references contained in the .bib file, even if they are not cited in the document.
- Using the package **showkeys** when preparing documents with a lot of citations and references is a good idea, as it will annotate one's document with what key values were used for references and citations. Of course one should comment out the inclusion of the package `showkeys` prior to finalizing your document.