Natural Sciences Citations and References
(Author–Year and Numerical Schemes)

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This paper describes package `natbib` version 6.9a from 1999/04/20.

Abstract

The `natbib` package is a reimplementation of the LaTeX `\cite` command, to work with both author–year and numerical citations. It is compatible with the standard bibliographic style files, such as `plain.bst`, as well as with those for `harvard`, `apalike`, `chicago`, `astron`, `authordate`, and of course `natbib`.

In contrast to the packages listed above, the `natbib` package supports not only the various author–year bibliography styles, but also those for standard numerical citations. In fact, it can also produce numerical citations even with an author–year bibliographic style, something that permits easy switching between the two citation modes. To this end, replacements for the standard LaTeX `.bst` files are also provided.

It is possible to define the citation *style* (type of brackets and punctuation between citations) and even to associate it with the name of the bibliographic style so that it is automatically activated. Citation styles can be defined for local `.bst` files by means of a configuration file `natbib.cfg`.

It is compatible with the packages: `babel`, `index`, `showkeys`, `chapterbib`, `hyperref`, `koma` and with the classes `amsbook` and `amsart`. It can also emulate the sorting and compressing functions of the `cite` package (with which it is otherwise incompatible).

The `natbib` package therefore acts as a single, flexible interface for most of the available bibliographic styles.

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1 Introduction

The first problem of using author–year literature citations with standard LaTeX is that the two forms of citations are not supported. These are:

> textual: ... as shown by Jones et al. (1990) ...
> parenthetical: It has been shown (Jones et al., 1990) that ...

There is only one `\cite` command to do both jobs.

A second problem is that the `thebibliography` environment for listing the references insists on including the *labels* in the list. These labels are normally the numbers, needed for referencing. In the author–year system, they are superfluous and should be left off. Thus, if one were to make up a bibliography with the author–year as label, as

```
\begin{thebibliography}{...}
\bibitem[Jones et al., 1990]{jon90}
Jones, P. K., . . .
\end{thebibliography}
```

then `\cite{jon90}` produces the parenthetical citation [Jones et al., 1990], but there is no way to get the textual citation. Furthermore, the citation text will also be included in the list of references.

The final problem is to find a BibTeX bibliography style that will be suitable.

2 Previous Solutions

> *This section may not be of interest to all users. To find out how to use* `natbib` *without reading about the historical background, go to Section 4.*

Although the author–year citation mode is not supported by *standard* LaTeX, there are a number of contributed packages that try to solve this problem. The various bibliographic styles (`.bst` files) that exist are usually tailored to be used with a particular LaTeX package.

I have found a large number of `.bst` files on file servers that may act as indicators of the various systems available.

2.1 The `natsci.bst` Style

What gave me my first inspiration was Stephen Gildea's `natsci.bst` for use with his `agujgr.sty` file. This showed me that the problem was solvable. However, Gildea's style formats `\bibitem` just as I illustrated above: with an optional label consisting of abbreviated authors and year. Thus only parenthetical citations can be accommodated. The list of references, however, is fixed up in his style files.

2.2 The apalike.bst Style

Oren Patashnik, the originator of BibTeX and the standard `.bst` files, has also worked on an author–year style, called `apalike.bst` with a corresponding `apalike.sty` to support it. Again, only the parenthetical citation is provided. Except for the fact that his style works with version 0.99 of BibTeX, its functionality is identical to that of the `natsci` files.

Patashnik does not like author–year citations. He makes this very clear in his BibTeX manuals and in the header to `apalike.bst`. Nevertheless, one should respect his work in this area, simply because he should be the best expert on matters of BibTeX. Thus `apalike.bst` could be the basis for other styles.

The form of the `thebibliography` entries in this system is

```
\bibitem[Jones et al., 1990]{jon90}...
```

the same as I illustrated earlier. This is the most minimal form that can be given. I name it the `apalike` variant, after Patashnik's `apalike.bst` and `apalike.sty`. However, there could be many independent `.bst` files that follow this line.

The bibliography style files belonging to this group include:

`apalike`, `apalike2`, `cea`, `cell`, `jmb`, `phapalik`, `phppcf`, `phrmp`

2.3 The newapa Style

A major improvement has been achieved with `newapa.bst` and the accompanying `newapa.sty` files by Stephen N. Spencer and Young U. Ryu. Under their system, three separate items of information are included in the `\bibitem` label, to be used as required. These are: the full author list, the abbreviated list, and the year. This is accomplished by means of a `\citeauthoryear` command included in the label, as

```
\bibitem[\protect\citeauthoryear{Jones, Barker,
  and Williams}{Jones et al.}{1990}]{jon90}...
```

Actually, this only illustrates the basic structure of `\citeauthoryear`; the `newapa` files go even further to replace some words and punctuation with commands. For example, the word 'and' above is really `\betweenauthors`, something that must be defined in the `.sty` file. Of course, `\citeauthoryear` is also defined in that file. A number of different `\cite` commands are available to print out the citation with complete author list, with the short list, with or without the date, the textual or parenthetical form.

Thus the `\citeauthoryear` entry in `\bibitem` is very flexible, permitting the style file to generate every citation form that one might want. It is used by a number of other styles, with corresponding `.sty` files. They all appear to have been inspired by `newapa.bst`, although they lack the extra punctuation commands.

Bibliographic style files belonging to the `newapa` group include

`newapa`, `chicago`, `chicagoa`, `jas99`, `named`

Note: the last of these, `named.bst`, uses `\citeauthoryear` in a slightly different manner, with only two arguments: the short list and year.

2.4 The Harvard Family

The same effect is achieved by a different approach in the Harvard family of bibliographic styles. Here a substitute for `\bibitem` is used, as

```
\harvarditem[Jones et al.]{Jones, Baker, and
   Williams}{1990}{jon90}...
```

The accompanying interface package file is called `harvard.sty` and is written by Peter Williams and Thorsten Schnier. It defines `\harvarditem` as well as the citation commands `\cite`, for parenthentical, and `\citeasnoun`, for textual citations. The first citation uses the long author list, following ones the shorter list, if it has been given in the optional argument to `\harvarditem`.

Bibliography styles belonging to the Harvard family are

`agsm`, `dcu`, `kluwer`

This package has been updated for LaTeX 2_ε, with many additions to add flexibility. The result is a powerful interface that should meet most citation needs. (It does not suppress repeated authors, though, as `natbib` does.)

2.5 The Astronomy Style

Apparently realizing the limitations of his `apalike` system, Oren Patashnik went on to develop a 'true' `apa` bibliographic style, making use of the method already employed by an astronomy journal. This is actually very similar to the `newapa` label but with only the short list of authors:

```
\bibitem[\protect\astroncite{Jones et al.}{1990}]{jon90}
   ...
```

It requires the package file `astron.sty` or any other style that defines `\astroncite` appropriately.

Bibliographic styles belonging to the astronomy group are

`apa`, `astron`, `bbs`, `cbe`, `humanbio`, `humannat`, `jtb`

This is as good as the `\citeauthoryear` command, although not as flexible since the full list of authors is missing.

2.6 The `authordate` Style

Finally, I have also found some packages making use of a label command called `\citename` in the form

```
\bibitem[\protect\citename{Jones et al., }1990]{jon90}
    ...
```

This is not a good system since the author list and date are not cleanly separated as individual arguments, and since the punctuation is included in the label text. It is better to keep the punctuation fully removed, as part of the definitions in the `.sty` file, for complete flexibility.

Bibliographic styles belonging to this group are

`authordate1`, `authordate2`, `authordate3`, `authordate4`, `aaai-named`

with accompanying style file `authordate1-4.sty`.

3 The `natbib` System

The form of the `\bibitem` entry that I have used for all my bibliographic styles is only slightly more complicated than the minimal one, but allows a clean separation between authors and date:

```
\bibitem[Jones et al.(1990)]{jon90}...
```

or alternatively

```
\bibitem[Jones et al.(1990)Jones, Baker,
    and Williams]{jon90}...
```

(One weakness of the `natbib` format is that it fails if the author list itself contains parentheses! This may be fixed up if the author list is grouped in curly braces.)

I wanted to name the system something like 'natural sciences bibliography', intending it to be a variant of `natsci.sty`. Since that name was already taken, I resorted to the rather cryptic, and definitely ugly, `natbib`.

The `natbib.sty` package[1] supports not only my own `\bibitem` format, but also all the others described here, plus numerical citation modes. The additional questions of citation style (type of brackets, commas or semi-colons between citations) can be defined once and for all for each `.bst` file and need never be specified explicitly in the source text. The use of `\cite` is the same for all citation styles, meaning that the additional features that might be available in the 'proper' `.sty` file will be missing. (This could be changed later.) The result is a single LaTeX package to handle *all* the bibliographic styles in a uniform manner.

> ***New to version 6.0****: (1995 Sep 29)*
> *In previous versions, each* `.bst` *file was either numerical or author–year only. Applying the wrong mode led to grotesque results, and the mode could not always be selected automatically. With version 6.0, all the author–year bibliographic style files can also be used for* numerical *citations, by simply selecting the mode in one of the ways described in Sections 4.4 and 7. It is not possible to employ author-year citations with pure numerical* `.bst` *files, and never will be.*
>
> *See Section 5 for more information.*

[1] Formerly called a *style file* in the older LaTeX 2.09 terminology.

4 Using this Package

In this paper, I distinguish between the citation *mode* (author–year or numerical) and citation *style* (the type of punctuation used for citations). The citation style is something that is independent of the bibliography style and is not programmed in the `.bst` files.

4.1 Basic Citation Commands

`\citet` `\citep` The `natbib` package has two basic citation commands, `\citet` and `\citep` for *textual* and *parenthetical* citations, respectively. There also exist the starred versions `\citet*` and `\citep*` that print the full author list, and not just the abbreviated one. All of these may take one or two optional arguments to add some text before and after the citation.

`\citet{jon90}`	⇒	Jones et al. (1990)
`\citet[chap.~2]{jon90}`	⇒	Jones et al. (1990, chap. 2)
`\citep{jon90}`	⇒	(Jones et al., 1990)
`\citep[chap.~2]{jon90}`	⇒	(Jones et al., 1990, chap. 2)
`\citep[see][]{jon90}`	⇒	(see Jones et al., 1990)
`\citep[see][chap.~2]{jon90}`	⇒	(see Jones et al., 1990, chap. 2)
`\citet*{jon90}`	⇒	Jones, Baker, and Williams (1990)
`\citep*{jon90}`	⇒	(Jones, Baker, and Williams, 1990)

The starred versions can only list the full authors if the `.bst` file supports this feature; otherwise, the abbreviated list is printed.

In standard LaTeX, the `\cite` command can only take a single optional text for a note after the citation; here, a single optional text is a post-note, while two are the pre- and post-notes. To have only a pre-note, it is necessary to provide an empty post-note text, as shown above.

More complex mixtures of text and citations can be generated with the all-purpose `\citetext` command in Section 4.2.

Multiple citations may be made as usual, by including more than one citation key in the `\cite` command argument. *If adjacent citations have the same author designation but different years, then the author names are not reprinted.*

`\citet{jon90,jam91}`	⇒	Jones et al. (1990); James et al. (1991)
`\citep{jon90,jam91}`	⇒	(Jones et al., 1990; James et al. 1991)
`\citep{jon90,jon91}`	⇒	(Jones et al., 1990, 1991)
`\citep{jon90a,jon90b}`	⇒	(Jones et al., 1990a,b)

These examples are for author–year citation mode. In numerical mode, the results are different.

`\citet{jon90}`	⇒	Jones et al. [21]
`\citet[chap.~2]{jon90}`	⇒	Jones et al. [21, chap. 2]
`\citep{jon90}`	⇒	[21]
`\citep[chap.~2]{jon90}`	⇒	[21, chap. 2]
`\citep[see][]{jon90}`	⇒	[see 21]
`\citep[see][chap.~2]{jon90}`	⇒	[see 21, chap. 2]
`\citep{jon90a,jon90b}`	⇒	[21, 32]

The authors can only be listed if the `.bst` file supports author–year citations. The standard `.bst` files, such as `plain.bst` are numerical only and transfer no author–year information to LaTeX. In this case, `\citet` prints "**(author?)** [21]."

`\cite` In the original versions of `natbib`, the traditional `\cite` command was used for both textual and parenthetical citations. The presence of an empty optional text in square brackets signalled parenthetical. This syntax has been retained for compatibility, but is no longer encouraged.

This means that `\cite` (without notes) is the same as `\citet` in author–year mode, whereas in numerical mode, it is the same as `\citep`. The starred version, as well as the one or two optional notes, may also be used.

It is possible to have multiple citations sorted into the same sequence as they appear in the list of references, regardless of their order as arguments to the `\cite` commands. The option `sort` is required for this feature. See Section 4.10.

Some publishers require that the first citation of any given reference be given with the full author list, but that all subsequent ones with the abbreviated list. Include the option `longnamesfirst` to enable this for `natbib`. See Section 4.11.

4.2 Extended Citation Commands

`\citealt` `\citealp` `\citetext` As an alternative form of citation, `\citealt` is the same as `\citet` but *without any parentheses.* Similarly, `\citealp` is `\citep` with the parentheses turned off. Multiple references, notes, and the starred variants also exist.

`\citealt{jon90}`	⇒	Jones et al. 1990
`\citealt*{jon90}`	⇒	Jones, Baker, and Williams 1990
`\citealp{jon90}`	⇒	Jones et al., 1990
`\citealp*{jon90}`	⇒	Jones, Baker, and Williams, 1990
`\citealp{jon90,jam91}`	⇒	Jones et al., 1990; James et al., 1991
`\citealp[pg.~32]{jon90}`	⇒	Jones et al., 1990, pg. 32
`\citetext{priv.\ comm.}`	⇒	(priv. comm.)

The `\citetext` command (new to version 6.8) allows arbitrary text to be placed in the current citation parentheses. This may be used in combination with `\citealp`. For example,

```
\citetext{see \citealp{jon90},
  or even better \citealp{jam91}}
```

to produce (see Jones et al., 1990, or even better James et al., 1991).

\citeauthor \citeyear \citeyearpar \citefullauthor

In author–year schemes, it is sometimes desirable to be able to refer to the authors without the year, or vice versa. This is provided with the extra commands

`\citeauthor{jon90}`	⇒	Jones et al.
`\citeauthor*{jon90}`	⇒	Jones, Baker, and Williams
`\citeyear{jon90}`	⇒	1990
`\citeyearpar{jon90}`	⇒	(1990)

There also exists a command `\citefullauthor` which is equivalent to `\citeauthor*` (the starred version was added at version 6.6).

If the full author information is missing, then `\citeauthor*` is the same as `\citeauthor`, printing only the abbreviated list. This also applies to the starred versions of `\citet` and `\citep`.

If the author or year information is missing (as is the case with the standard LaTeX `.bst` files), these commands issue a warning.

Note: as of version 6.0, these commands may also be used with numerical citations, provided an author–year `.bst` file is being employed.

Note: as of version 6.6, all `\cite..` commands have the same syntax, allowing multiple citations and up to two notes (there is, however, no starred `\citeyear` variant). It does not really make much sense to add notes to `\citeyear` and `\citeauthor`, especially with multiple citations; however, this can be done, there will be no error message, but the results are sometimes strange. For example, in numerical mode, the notes are fully ignored, while in author–year mode, only the post-note is accepted. Multiple citations in `\citet` are also not recommended (nor are they in my opinion meaningful), but if they are used with notes, the pre-note will appear before each year, and the post-note only after the last year. These are admittedly bugs, but the effort to remove them is not justified by the questionable usefulness of these features.

In summary, notes are only intended for `\citep` but they may also be used with `\citet` in author–year mode, with single citations. In any other situation, the results are unpredictable.

4.3 Citation Aliasing

\defcitealias \citetalias \citepalias

Sometimes one wants to refer to a reference with a special designation, rather than by the authors, i.e. as Paper I, Paper II. Such aliases can be defined and used, textual and/or parenthetical with:

`\defcitealias{jon90}{Paper~I}`	⇒	
`\citetalias{jon90}`	⇒	Paper I
`\citepalias{jon90}`	⇒	(Paper I)

These citation commands function much like `\citet` and `\citep`: they may take multiple keys in the argument, may contain notes, and are marked as hyperlinks.

A warning is issued if the alias is used before it is defined, or if an alias is redefined for a given citation. No warning is issued if an alias is defined for a citation key that does not exist; the warning comes when it is used!

4.4 Selecting Citation Punctuation

`\bibpunct` The above examples have been printed with the default citation style. It is possible to change this, as well as to select numerical or author–year mode, by means of the `\bibpunct` command, which takes one optional and 6 mandatory arguments. The mandatory ones are:

1. the opening bracket symbol, default = (
2. the closing bracket symbol, default =)
3. the punctuation between multiple citations, default = ;
4. the letter 'n' for numerical style, or 's' for numerical superscript style, any other letter for author–year, default = author–year; note, it is not necessary to specify which author–year interface is being used, for all will be recognized;
5. the punctuation that comes between the author names and the year (parenthetical case only), default = ,
6. the punctuation that comes between years or numbers when common author lists are suppressed (default = ,); if both authors and years are common, the citation is printed as '1994a,b', but if a space is wanted between the extra letters, then include the space in the argument, as `{,~}`.

   For numerical mode, `\citet{jon90,jon91}` produces 'Jones et al. [21, 22]' with this punctuation between the numbers. A space is automatically included for numbers, but not for superscripts.

The optional argument is the character preceding a post-note, default is a comma plus space. In redefining this character, one must include a space if one is wanted.

The `\bibpunct` command must be issued in the preamble, that is, before `\begin{document}`. (**Note:** in versions 5.4 or earlier, this declaration had to be given after the preamble!)

Example 1, `\bibpunct{[}{]}{,}{a}{}{;}` changes the output of

```
\citep{jon90,jon91,jam92}
```

into [Jones et al. 1990; 1991, James et al. 1992].

Example 2, `\bibpunct[; ]{(}{)}{,}{a}{}{;}` changes the output of

```
\citep[and references therein]{jon90}
```

into (Jones et al. 1990; and references therein).

`\bibstyle@xxx` Usually the citation style is determined by the journal for which one is writing, and is as much a part of the bibliography style as everything else. The `natbib` package allows punctuation definitions to be directly coupled to the `\bibliographystyle` command that must always be present when BibTeX is used. It is this command that selects the `.bst` file; by adding such a coupling to `natbib` for every `.bst` file that one might want to use, it is not necessary to add `\bibpunct` explicitly in the document itself, unless of course one wishes to override the preset values.

Such a coupling is achieved by defining a command `\bibstyle@`*bst*, where *bst* stands for the name of the `.bst` file. For example, the American Geophysical Union (AGU) demands in its publications that citations be made with square brackets and separated by semi-colons. I have an `agu.bst` file to accomplish most of the formatting, but such punctuations are not included in it. Instead, `natbib` has the definition

```
\newcommand{\bibstyle@agu}{\bibpunct{[}{]}{;}{a}{,}{,~}}
```

These style defining commands may contain more than just `\bibpunct`. Some numerical citation scheme require even more changes. For example, the journal *Nature* not only uses superscripted numbers for citations, it also prints the numbers in the list of references without the normal square brackets. To accommodate this, `natbib` contains the style definition

```
\newcommand{\bibstyle@nature}%
    {\bibpunct{}{}{,}{s}{}{\textsuperscript{,}}%
     \gdef\NAT@biblabelnum##1{##1.}}
```

The redefined `\NAT@biblabelnum` command specifies how the reference numbers are to be formatted in the list of references itself. The redefinition must be made with `\gdef`, not `\def` or `\renewcommand`.

The selected punctuation style and other redefinitions will not be in effect on the first LaTeX run, for they are stored to the auxiliary file for the subsequent run.

The user may add more such definitions of his own, to accommodate those journals and `.bst` files that he has. He may either add them to his local copy of `natbib.sty`, or better put them into a file named `natbib.cfg`. This file will be read in if it exists, adding any local configurations. Thus such configurations can survive future updates of the package. (This is for LaTeX 2_ε only.)

Note: with version 6.0, any explicit call to `\bibpunct` has priority over the predefined citation styles.

`\citestyle` A preprogrammed citation style is normally invoked by the command `\bibliographystyle`, as described above. However, it may be that one wants to apply a certain citation style to another bibliography style. This may be done with `\citestyle`, given *before* `\begin{document}`. For example, to use the `plainnat` bibliography style (for the list of references) with the *Nature* style of citations (superscripts),

```
\documentclass{article}
\usepackage{natbib}
. . . . .
\citestyle{nature}
\begin{document}
\bibliographystyle{plainnat}
. . . . .
```

Note: for versions 5.5 and later, all changes to the citation style, including punctuation, must be made before `\begin{document}`, which freezes the citation style.

4.5 Priority of Style Commands

The citation style (punctuation and mode) can be selected by means of the `\bibpunct`, `\citestyle`, and predefined `\bibstyle@`*bst* commands. They can also be selected by LaTeX 2_ε options (Section 7). What happens if there are several conflicting selections?

The lowest priority is assigned to the predefined `\bibstyle@`*bst* commands, since they are implicit and not obvious to the user. The LaTeX 2_ε options have the next priority. Finally, any selection by `\bibpunct` and/or `\citestyle` overrides those of the other methods.

4.6 Other Formatting Options

`\bibsection` The list of references normally appears as a `\section*` or `\chapter*`, depending on the main class. If one wants to redesign one's own heading, say as a numbered section with `\section`, then `\bibsection` may be redefined by the user accordingly.

`\bibpreamble` A preamble appearing after the `\bibsection` heading may be inserted before the actual list of references by defining `\bibpreamble`. This will appear in the normal text font unless it contains font declarations. The `\bibfont` applies to the list of references, not to this preamble.

`\bibfont` The list of references is normally printed in the same font size and style as the main body. However, it is possible to define `\bibfont` to be font commands that are in effect within the `thebibliography` environment after any preamble.

`\bibhang` The list of references for author–year styles uses a hanging indentation format: the first line of each reference is flush left, the following lines are set with an indentation from the left margin. This indentation is 1 em by default but may be changed by redefining (with `\setlength`) the length parameter `\bibhang`.

`\bibsep` The vertical spacing between references in the list, whether author–year or numerical, is controlled by the length `\bibsep`. If this is set to 0 pt, there is no extra line spacing between references. The default spacing depends on the font size selected in `\documentclass`, and is almost a full blank line. Change this by redefining `\bibsep` with `\setlength` command.

4.7 Automatic Indexing of Citations

(New to version 6.0; applies to LaTeX 2_ε only)

`\citeindextrue` `\citeindexfalse` If one wishes to have the citations entered in the `.idx` indexing file, it is only necessary to issue `\citeindextrue` at any point in the document. All following `\cite` commands, of all variations, then insert the corresponding entry to that file. With `\citeindexfalse`, these entries will no longer be made.

The `\bibitem` commands in the `thebibliography` environment will also make index entries. If this is not desired, then issue `\citeindexfalse` before `\bibliography` or `\begin{thebibliography}`.

Of course, `\makeindex` must also be issued in the preamble to activate indexing, as usual. Otherwise, no indexing is done at all.

Make sure that the document has been processed at least twice after the last BibTeX run before running the `makeindex` program.

`\NAT@idxtxt` The form of the index entries is set by the internal `\NAT@idxtxt`, which can be redefined by hackers if wanted (in the `natbib.cfg` file please). By default, it prints the short author list plus date in the current parenthesis style.

The `natbib` package can also be used with the `index` package of David M. Jones. The order in which the packages are loaded is not important.

`\citeindextype` In that package, multiple index lists may be made by means of a `\newindex` command. For example, it may be desirable to put all the citation indexing into a separate list. First that list must be initiated with, e.g.,

```
\newindex{cite}{ctx}{cnd}{List of Citations}
```

and then the automatic citation indexing associated with this list with the `natbib` command

```
\renewcommand{\citeindextype}{cite}
```

See the documentation for `index.sty` for details.

4.8 HyperTeX Compatibility

As of version 6.4, `natbib` is compatible with the `hyperref` package of Sebastian Rahtz, for use with LaTeX → HTML conversions, pdfTeX, `pdfmark`. The compatibility is of a mutual nature: both packages contain coding that interact with that of the other. Thus the version of `hyperref` must be more recent than 1996 Oct 8, and preferably later than 1998 July 7.

There is a special option `nonamebreak` that can be used with the `hyperref` package; it keeps all the author names in a citation on one line, something that avoids certain problems with pdfTeX. This is otherwise not recommended, since many overfull lines result.

4.9 Multiple Bibliographies in One Document

As of version 6.4, `natbib` is compatible with the `chapterbib` package of Donald Arseneau and Niel Kempson,[2] which makes it possible to have several bibliographies in one document. The usual application is to have bibliographies in each chapter of a book, especially if they have been written by different authors.

The `chapterbib` package works in a very natural way for the author; only the editor who puts all the chapters together into one book has to do some extra work.

The package makes use of the `\include` command, and it is in fact every `\include`d file that has its own bibliography. For large books, it makes very good sense to take advantage of this feature in any case.

To review the use of `\include`, recall that the main file

```
\documentclass{...}
```

[2] I have used version 1.5 from 1995/10/09; cannot guarantee earlier versions.

```
\includeonly{ch2}
\begin{document}
  \include{ch1}
  \include{ch2}
  \include{ch3}
\end{document}
```

will process only the file `ch2.tex` as though the files `ch1.tex` and `ch3.tex` were also present. That is, all counters, especially the page and section numbers, as well as cross-referencing definitions, will function as if the whole document were processed. The trick is that each `\include`d file has it own `.aux` file containing these definitions, and they are all read in every time, even if the corresponding `.tex` file is not. The `.aux` files also contain the citation information for BibTeX, something that the `chapterbib` package exploits.

If `\usepackage{chapterbib}` has been given, the keys in each `\cite` and `\bibitem` command are associated with the current `\include`d file and are distinguished from the identical key in a different file. Each of these files must contain its own `\bibliography` and `\bibliographystyle` commands. One processes BibTeX on each file separately before processing it under LaTeX (at least twice).

4.9.1 Special Considerations for `natbib` and `chapterbib`

The order in which the `chapterbib` and `natbib` packages are loaded is unimportant.

The `chapterbib` package provides an option `sectionbib` that puts the bibliography in a `\section*` instead of `\chapter*`, something that makes sense if there is a bibliography in each chapter. This option will not work when `natbib` is also loaded; instead, add the option to `natbib`. (The `sectionbib` option can always be given, but it only has meaning for the `book` and `report` classes, or for classes derived from them.)

Every `\include`d file (with citations) must contain its own `\bibliography` command where the bibliography is to appear. The database files listed as arguments to this command can be different in each file, of course. However, what is not so obvious, is that each file must also contain a `\bibliographystyle` command, *preferably with the same style argument.* If different bibliography styles are specified for different files, then the preprogrammed citation style (punctuation and citation mode) will be that of the first bibliography style given. The preprogrammed citation styles can only be changed in the preamble (see Section 4.5), something that guarantees a uniform style for the entire document.[3]

4.10 Sorting and Compressing Numerical Citations

Another package by Donald Arseneau, `cite.sty`, reimplements the entire (numerical) citation system such that one can control the punctuation and citation

[3]It would be relatively easy to allow changes in style anywhere in the document, but this strikes me as bad policy. However, it is provided for with the `docstrip` option `nopreonly`.

format, all of which is done by `natbib` as well. However, it also can sort and compress numerical citations, something that is required by some journals.

What this means is that when multiple citations are given with a single `\cite` command, the normal order of the numbers is in the sequence given. This is usually a wild list of numbers, such as [4,2,8,3]. With the `cite` package, this list becomes [2–4,8].

It is impossible to make the `cite` and `natbib` packages compatible, since both reimplement `\cite` from scratch. Instead, I have taken over some of the coding from `cite.sty`, modifying it for `natbib`. This coding is activated by including one of the options `sort` or `sort&compress` in the `\usepackage` command.

For author–year citations, the option `sort` orders the citations in a single `\citep` or `\citet` command into the sequence in which they appear in the list of references. This is normally alphabetical first, year second. This should avoid citations of the type: "James et al. (1994b,a)". For author–year mode, the `sort&compress` option is identical to `sort`.

4.11 Long Author List on First Citation

A feature that has often been requested by otherwise happy users of `natbib` is one that is found in the `harvard` package as standard: with the first citation of any reference, the full author list is printed, and afterwards only the abbreviated list. One can control this with `\citet*` for the first citation, and `\citet` or `\citep` thereafter. However, the automatic feature is very desired.

This can be activated (version 6.7 and later) with the option `longnamesfirst`.

`\shortcites` Some references have so many authors that you want to suppress the automatic long list only for them. In this case, issue

`\shortcites{`*key-list*`}`

before the first citations, and those included in *key-list* will have a short list on their first citation.

Full author lists can still be forced at any time with the starred variants.

5 Numerical Citations with Author–Year Styles

(New to version 6.0)

In earlier versions, each `.bst` file could be used either for numerical or author–year citation mode, without any possibility of switching. Obviously numerical `.bst` files can never be used for author–year citations (the information is missing in the auxiliary file) but there is no reason why the converse should not work.

I have been frequently asked if I could implement this feature, and I at first replied that it would be quite easy. That was a mistake. The numerical information was missing in the auxiliary files, so the `\cite` commands could never access it.

5.1 New Coding for 6.0

I have now recoded `natbib` so that the separation of author and year information comes before the information is written to the auxiliary file, and furthermore, a sequential number is also written. This permits numerical citations with *any* of the author–year bibliographic style files.

The recoding has made fewer internal changes than I expected. Any users who have local redefinitions of my internals should be aware that of the citation commands, only `\NAT@citexnum` has been altered. Otherwise the changes are in the parsing commands `\NAT@parse` and `\NAT@parse@date`. Of the external commands, `\bibitem` is completely redefined, and `\citeauthor`, `\citeyear`, and `\citefullauthor` are different.

Version 5.5 actually made far more internal changes: all internal commands were renamed to conform to recommended LaTeX coding practices.

5.2 Selecting Numerical Mode

By default, `natbib` is in author–year mode. This can be changed by

1. selecting a numerical bibliography style with predefined citation style, defined either in the package or in the local configuration file;
2. giving options `numbers` or `super` to the `\usepackage` command;
3. issuing `\bibpunct` with the 4th mandatory argument set to `n` or `s`;
4. issuing `\citestyle` with the name of a predefined numerical bibliography style.

The methods are listed in order of increasing priority.

The `natbib` package will automatically switch to numerical mode if any one of the `\bibitem` entries fails to conform to the possible author–year formats. There is no way to override this, since such an entry would cause trouble in the author–year mode.

There are certain special 'numerical' styles, like that of the standard `alpha.bst`, which include a non-numerical label in place of the number, in the form

```
\bibitem[ABC95]{able95}
```

As far as `natbib` is concerned, this label does not conform to the author–year possibilities and is therefore considered to be numerical. The citation mode switches to numerical, and `\cite{able95}` prints [ABC95].

5.3 New Bibliography Styles

I provide three new `.bst` files to replace the standard LaTeX numerical ones:

```
plainnat.bst     abbrvnat.bst     unsrtnat.bst
```

These produce reference lists in the same style as the corresponding standard `.bst` file, but can only be used with `natbib`. The advantage is that they can be used in both numerical and author–year mode.

In fact, `unsrtnat.bst` is rather silly for author–year citations: the references are listed in the order they were cited, which makes it difficult to find them. It is only included in case an author wishes to switch from `plainnat` (author–year) to the unsorted numerical mode, retaining the `\citeauthor` and `\citeyear` commands in his paper.

It is not possible to produce a modified version of `alpha.bst` since it would conflict with the `\bibitem` format of `natbib`.

The sample bibliography style file `natbib.bst` will no longer be distributed. It merely represented a demonstration of the `\bibitem` syntax for `natbib`, a function that is now taken over by `plainnat.bst` and friends.

6 Local Configuration

For LaTeX 2_ε, it is possible to add a local configuration file `natbib.cfg`, which is read in, if it exists, at the end of the package. It may thus contain coding to supecede that in the package, although its main purpose is to allow the user to add his own `\bibstyle@`*bst* definitions to couple citation punctuation with local bibliography styles.

7 Options with LaTeX 2_ε

One of the new features of LaTeX 2_ε is *options* for the packages, in the same way as main styles (now called *classes*) can take options. This package is now installed with

```
\documentclass[..]{...}
\usepackage[options]{natbib}
```

The options available provide another means of specifying the punctuation for citations:

`round` (default) for round parentheses;

`square` for square brackets;

`curly` for curly braces;

`angle` for angle brackets;

`colon` (default) to separate multiple citations with colons;

`comma` to use commas as separaters;

`authoryear` (default) for author–year citations;

`numbers` for numerical citations;

`super` for superscripted numerical citations, as in *Nature*;

`sort` orders multiple citations into the sequence in which they appear in the list of references;

`sort&compress` as `sort` but in addition multiple numerical citations are compressed if possible (as 3–6, 15);

`longnamesfirst` makes the first citation of any reference the equivalent of the starred variant (full author list) and subsequent citations normal (abbreviated list);

`sectionbib` redefines `\thebibliography` to issue `\section*` instead of `\chapter*`; valid only for classes with a `\chapter` command; to be used with the `chapterbib` package;

`nonamebreak` keeps all the authors' names in a citation on one line; causes overfull hboxes but helps with some `hyperref` problems.

If any of the formatting options are selected, the predefined citation styles in the commands `\bibstyle@`*bst* will be no longer be effective. If either `\bibpunct` or `\citestyle` is given in the preamble, the above punctuation options will no longer hold.

8 As Module to Journal-Specific Styles

Although `natbib` is meant to be an all-purpose bibliographic style *package*, it may also be incorporated as a module to other packages for specific journals. In this case, many of the general features may be left off. This is allowed for with `docstrip` options that not only leave off certain codelines, but also include extra ones. So far, options exist for

`subpack` produces a basic version with author–year only, fixed citation punctuation, no `\bibpunct` nor `\citestyle` nor predefined styles;

`subpack,egs` for journals of the *European Geophysical Society*, in particular *Nonlinear Processes in Geophysics*;

`subpack,agu` for *American Geophysical Union* journals.

The `subpack` option must always be used with `package`.

Previous options `jgr` and `grl` have become obsolete due to revisions in these journals; they have been replaced by the more general `agu` option.

9 Reference Sheet

A summarization of the main points on using `natbib` can be obtained by LaTeXing the file `natnotes.tex`, which is extracted from the main source file `natbib.dtx` with the `docstrip` option `notes`. This is intended to act as a handy reference sheet.

This file should be extracted automatically by the supplied installation file, `natbib.ins`.

10 Options with `docstrip`

The source `.dtx` file is meant to be processed with `docstrip`, for which a number of options are available:

`all` includes all of the other interfaces;

`apalike` allows interpretation of minimal `apalike` form of `\bibitem`;

`newapa` allows `\citeauthoryear` to be in the optional argument of `\bibitem` along with the punctuation commands of `newapa.sty`;

`chicago` is the same as `newapa`;

`harvard` includes interpretation of `\harvarditem`;

`astron` allows `\astroncite` to appear in the optional argument of `\bibitem`;

`authordate` adds the syntax of the `\citename` command.

This package file is intended to act as a module for other class files written for specific journals, in which case the flexible `\bibstyle@`*bst* commands are not wanted. Punctuation and other style features are to be rigidly fixed. These journal options are

`agu` for journals of the *American Geophysical Union*;

`egs` for journals of the *European Geophysical Society*, in particular *Nonlinear Processes in Geophysics*.

The remaining options are:

`package` to produce a `.sty` package file with most comments removed;

`209` (together with `package`) for a style option file that will run under the older LaTeX 2.09;

`subpack` (together with `package`) for coding that is to be included inside a larger package; even more comments are removed, as well as LaTeX 2_ε option handling and identification; produces a basic `natbib` package for author–year only, fixed citation style (punctuation);

`notes` extracts a summary of usage to be used as a reference sheet; the resulting file is to be LaTeXed;

`nopreonly` allows `\citestyle` and `\bibpunct` to be called anywhere in the text; this is considered possibly useful with the `chapterbib` package where different chapters might have different bibliography and citation styles; is only provided in case I change my mind about this feature, but for now I refuse to implement it;

`driver` to produce a driver `.drv` file that will print out the documentation under LaTeX 2_ε. The documentation cannot be printed under LaTeX 2.09.

The source file `natbib.dtx` is itself a driver file and can be processed directly by LaTeX 2_ε.