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Instruction for Making LaTeX Compuscripts Using $\mathcal{PTP}$TeX

—— LaTeX 2$_\varepsilon$ Version ——

Shin-Ichiro Tomonaga[1,*] and Hideki Yukawa[2,**]

[1] *Physics Department, Tokyo Bunrika University, Tokyo 113-1234, Japan*
[2] *Yukawa Institute for Theoretical Physics, Kyoto University, Kyoto 606-8502, Japan*

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This is a manual for making LaTeX compuscripts for *Progress of Theoretical Physics* using the $\mathcal{PTP}$TeX class file "ptptex.cls." In particular, we explain some useful options, macros and environments that are specially prepared with ptptex.cls. The source file for this manual itself is designed to provide a template that can be used for writing compuscripts.

§1. Introduction

We presently print all articles in *Progress of Theoretical Physics* (PTP) directly from LaTeX 2$_\varepsilon$ manuscripts using ptptex.cls. In this text, we explain how to use ptptex.cls. In $\mathcal{PTP}$TeX, all the usual LaTeX commands can be used, and there are some additional options, macros and environments that are specially prepared. This manual explains the commands specific to $\mathcal{PTP}$TeX from §2 on.

1.1. *Submission*

We started "PTP Online Submission and Review System" on September 1, 2008. All processes, from submission to review, is completely handled on the Web. This system makes it easier to submit papers and faster to review them. Authors can check the progress of review and also see the record of submissions.

For "PTP Online Submission and Review System", please access the following URL:

`http://www2.yukawa.kyoto-u.ac.jp/~ptpwww/index.html`

1.2. *How to obtain the $\mathcal{PTP}$TeX style file*

The $\mathcal{PTP}$TeX class file can be obtained from the following URL:

`http://www2.yukawa.kyoto-u.ac.jp/~ptpwww/ptpcls.html`

Please check this site occasionally to obtain the most recent version, as it is revised from time to time.

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*) A friend of Schwinger, because they both have 'swing' in their names.

**) A friend of Fermi and Bose. E-mail: yukawa@yukawa.kyoto-u.ac.jp

The following files are obtained in the above site:

1. manptp.tex Source file for this manual.
2. template.tex Template for making a $\mathcal{PTP}$TEX compuscript.
3. ptptex.cls Main class file of $\mathcal{PTP}$TEX.
4. ptp-prep.clo Class option file for preprint style output.
5. wrapft.sty Macro for wrapfigure and wraptable environments.
6. wrapfig.sty (Macro called by wrapft.sty)
7. overcite.sty (Macro called by ptptex.cls)

The macros 6 and 7 are style files attached to the standard LATEX systems. We include them here because using different versions together may cause unexpected output.

The $\mathcal{PTP}$TEX class file takes as inputs the style files amsmath.sty and amssymb.sty, which are included in the AMS-LATEX package.*) With these files input, AMS-LATEX commands, such as `\boldsymbol` (and including commands that produce special mathematical symbols) can be used. In the case that these style files are not found, an error message appears and compilation is suspended. Also, in the case that the LATEX 2.09 version of amsmath.sty is input, an error results.**) For the correct versions of these files, the LATEX 2_ε version of the AMS-LATEX package is necessary.

§2. Style and preamble

When creating a compuscript using ptptex.cls, please make use of the **template.tex** file, which is prepared for users' convenience as a separate file. With this, it is easy to make your compuscript in ptptex.cls format. The default style of ptptex.cls is that for Regular Articles in *Progress of Theoretical Physics*.

You can start your LATEX source file with the line

```
\documentclass{ptptex}
```

or

```
\documentclass[seceq]{ptptex}
```

Generally, a LATEX command appearing in square brackets `[ ]` is an "optional argument" and can be omitted. The optional argument `[seceq]` in the second of the above command lines is a declaration to create equation numbers that include section numbers, like (2·15). If this optional command is omitted, then the equation numbers will appear as a single sequence from the beginning to the end of the paper, like (1), (2), ···.

In a usual LATEX `article.cls`, this first line is something like

```
\documentclass[12pt]{article}
```

If such a command line is replaced by one of those given above, then the output automatically becomes of the Article form for *Progress of Theoretical Physics*. Since

*) The amsmath.sty style file, in turn, reads in several other AMS-LATEX files.

**) The error message displayed in this case is ``Package amsfonts Warning: Obsolete command \newsymbol; \DeclareMathSymbol should be used instead ···''.

ptptex.cls is designed to be as compatible with the usual LaTeX `article.cls` as possible, a source file using LaTeX `article.cls` can (probably) also be compiled with ptptex.cls.

In case you wish for the output to be in "preprint" form for private distribution, the file should begin with the line

```
\documentclass[seceq,preprint]{ptptex}
```

If you are writing a Letter article, Supplement article, Addenda or Errata instead of a regular PTP article, please start with the appropriate one of the following:

```
\documentclass[letter]{ptptex}
\documentclass[seceq,supplement]{ptptex}
\documentclass[seceq,addenda]{ptptex}
\documentclass[seceq,errata]{ptptex}
```

The part of the source file from the first `\documentclass` line to the declaration line

```
\begin{document}
```

is called the *preamble*. In the preamble there usually appear definitions of personal macros and style specifications. However, because style specifications are quite unnecessary (and even harmful) in PTPTEX, please do not include them. In PTPTEX, you should enter the appropriate information in the following items (within the brackets) in the preamble. You do not have to enter in "`\recdate{ }`".

```
\markboth{ }{ } : Running head  [in the left { } appears the
                    author's name (or authors'names), and in
                    the right { } appears the paper's title]
 \title{ }      : Title of paper
 \author{ }     : Author's name (or authors' names)
 \inst{ }       : Institution (address)
 \recdate{ }    : Date received
 \abst{ }       : Abstract
```

An example of the above is given in `template.tex`. (Please beware of the fact that the commands appearing from `\inst` to `\abst` are macros particular to ptptex.cls. For this reason, if you compile a file containing these commands using LaTeX `article.cls`, you will get the error message '`! Undefined control sequence`'.)

In the preamble of `template.tex`, the following commands also appear, but each is "commented out" by the symbol `%` appearing in front:

`\notypesetlogo`	:	Prevents appearance of "typeset using PTPTEX.cls" in output file.
`\publishedin{ }`	:	Vol/Year/Page of the paper about which Addenda or Errata is written.
`\preprintnumber[`*width*`]{ }`	:	To include preprint numbers when manuscript is printed. Here [*width*] stipulates the width of the preprint number column.

Use these commands (by deleting the preceding "`%`") when necessary. Their usage is made clear in the `template.tex`.

In general, any packages to be used in compiling the manuscript are called in the preamble using the `\usepackage` command. However, such files as amsbsy.sty (which is necessary for a number of commands, including `\boldsymbol`) are automatically input when `ptptex.cls` is used, and therefore there is no need for them to be called explicitly.

§3. Equations

With the LaTeX 2_ε version of $\mathcal{P}\mathcal{T}$PTEX, the amsmath.sty style file is input automatically, and therefore all of the basic mathematical commands contained in AMS-LaTeX can be used. Here we briefly explain two particularly useful such commands.

3.1. *Mathematical italic bold*

The `\boldsymbol` command is used to make math-bold (mathematical italic bold) fonts. Its use is demonstrated below:

```
\boldsymbol{\alpha kx}
```

3.2. *Subequations*

To number equations in a form like (3·2a), (3·2b), $\cdots$ in an array of equations, you can use the `subequations` environment. Its usage is clear from the following simple example:

Input

```
\begin{subequations}
  \label{eq:1}
  An example of subequations:
  \begin{equation}
    \alpha + 2\beta + \gamma = 2
    \label{eq:1a}
  \end{equation}
  Here is a sentence,
  which can be of any length.
  \begin{eqnarray}
    \gamma &=& \nu (2-\eta) \\
    \delta &=& \mu (1+\rho)
  \end{eqnarray}
\end{subequations}
```

$\Longrightarrow$ gives

Output

An example of subequations:

$$\alpha + 2\beta + \gamma = 2 \qquad (3\cdot1a)$$

Here is a sentence, which can be of any length.

$$\gamma = \nu(2 - \eta) \qquad (3\cdot1b)$$
$$\delta = \mu(1 + \rho) \qquad (3\cdot1c)$$

Here note that the command `\label{eq:1}` just after `\begin{subequations}` defines the label for the entire array, so that `(\ref{eq:1})` gives "(3·1)", while `\label{eq:1a}` refers to the first equation in the array, (3·1a).

§4. References

References are cited using the `\cite` command. All references to be cited at the same point in the paper should be listed in a single series and separated by

commas inside the curly brackets, as `\cite{rf:1,rf:3,rf:4,rf:5}`. (There should be no space after any commas here. Such a space will be interpreted by LaTeX as being part of the reference label.) When three or more consecutive reference numbers appear, as in this example, the numbers are automatically printed in a compressed format, like that at the end of this sentence.[1),3)–5)] In the case that all the references to be cited have consecutively numbered reference numbers, the following type of command can be used: `\cite{rf:3}\tocite{rf:5}`. In this way, only the first and last reference numbers need to be included. The output obtained from this command is that appearing at the end of this sentence.[3)–5)] The `\citen` command can be used to obtain citation numbers: e.g., `Ref.~\citen{rf:3}` gives the output "Ref. 3)".

When you use the `\cite` command at the end of a sentence, it should always appear *after a period, comma, colon or semicolon*, as follows: `...some text.\cite{rf:5}` Then, between such a command and the next sentence (if the paragraph is continued), the command ␣\␣ (where ␣ represents a space) should be included to give an appropriate space between sentences. For instance, typing

```
This is $\cdots$ something.\cite{rf:5} \ Therefore we can $\cdots$
```

the output becomes the following: This is $\cdots$ something.[5)] Therefore we can $\cdots$

The references are included at the end of the file by using the `thebibliography` environment and `\bibitem` command, as usual. For example, the references at the end of this manual are input as follows:

```
\begin{thebibliography}{99}
 \bibitem{rf:1}
    Leslie Lamport, \textit{LaTeX: A Document Preparation System}
    (Addison-Wesley, New York, 1986).
 \bibitem{rf:2}
    S.~Weinberg, Phys.\ Rev.\ Lett.\ \textbf{19} (1967), 1264.
 \bibitem{rf:3}
    M.~Kobayashi and T.~Maskawa, \PTP{49,1973,652}.
 \bibitem{rf:4}
    D.~Gross and F.~Wilczek, \PRL{30,1973,1343}.\\
    H.~D.~Politzer, \PRL{30,1973,1346}.
 \bibitem{rf:5}
    Y.~Nambu, Phys.\ Rev.\ \textbf{117} (1960), 648; \PRL{4,1960,380}.\\
    G.~'t~Hooft, \NPB{33,1971,173}; \NPB{35,1971,167}.
 \bibitem{rf:6}
    E.~Witten, \JL{Adv.\ Theor.\ Math.\ Phys.,2,1998,253},
    hep-th/9802150; hep-th/0112258; arXiv:0710.0631.
 \bibitem{rf:7}
    M.~Harada, Y.~Kikukawa, T.~Kugo and H.~Nakano, \PTP{92,1994,1161}
    [Errata; \textbf{95} (1996), 835].
\end{thebibliography}
```

Please input your bibitems following these examples in the PTP format. In particular, the volume numbers should be in boldface, (*year*) should be followed by a comma, and each item should end with a period. When two or more references by

different authors are cited in a single item, as in `rf:4`, each reference should end with a period, and the next reference should be preceded by a line return, facilitated by the command `\\`. When two or more references by the same author are cited in a single item, as in `rf:5`, each should be separated by a semi-colon without a line return. For the proper format to be used in citing references from "e-print arXiv," see `rf:6` as an example. In the case that a preprint reference of this type corresponds to a paper already published in a journal, whose reference appears before it, the two should be separated by a comma. In the case that such a preprint has not yet been published, if its reference appears after a reference for a paper published by the same author, the two references should be separated by a semi-colon. To make it easier to input bibitems following this PTP format, we prepared the macros `\JL` , `\andvol` , `\PRL` , $\cdots$, which are used in `rf:3` – `rf:7`. When referring to an errata, please follow the example of `rf:7`.

Personal, custom-made macros cannot be used in the bibliography section. And also please do not use BibTEX. This is because in PTP Online (the online version of Progress of Theoretical Physics), we provide a hyperlink function that allows one to link from PTP papers to the online versions of the references listed in their bibliographies. Custom-made macros in the bibliography section and BibTEX may cause errors to arise in this process and make such linking impossible. If you wish to use macros in writing your bibliography, please use only the following macros, which are designed specifically for PTP:

- for general use

`\JL` : general journals	`\andvol` : Vol. (Year), Page

- for individual journal

`\AJ` : Astrophys. J.	`\NC` : Nuovo Cim.
`\ANN` : Ann. of Phys.	`\NPA`, `\NPB` : Nucl. Phys. [A, B]
`\CMP` : Commun. Math. Phys.	`\PLA`, `\PLB` : Phys. Lett. [A, B]
`\IJMP` : Int. J. Mod. Phys.	`\PRA` – `\PRE` : Phys. Rev. [A–E]
`\JHEP` : J. High Energy Phys.	`\PRL` : Phys. Rev. Lett.
`\JMP` : J. Math. Phys.	`\PRP` : Phys. Rep.
`\JP` : J. of Phys.	`\PTP` : Prog. Theor. Phys.
`\JPSJ` : J. Phys. Soc. Jpn.	`\PTPS` : Prog. Theor. Phys. Suppl.

The above macros are defined such that the output of each line on the left below is that given to its right (with those macros not appearing below defined similarly):

```
\PRD{45,1990,34}          ⇒  Phys.\ Rev.\ D \textbf{45} (1990), 34
\JL{Nature,418,2002,123}  ⇒  Nature \textbf{418} (2002), 123
\andvol{123,1995,1020}    ⇒  \textbf{123} (1995), 1020
```

Note that here again, no space should appear after commas separating volume, year and page numbers in the argument.

§5. Figures

5.1. *PostScript (ps/eps) figure files*

Figure files in the form of epsf (encapsulated PostScript files) are best suited for PTPTeX manuscripts. To insert an epsf figure into the text, the file `graphicx.sty`*) must be input. This can be accomplished by including the following line in the preamble of the manuscript source file:

```
\usepackage{graphicx}
```

Then, at the point in the manuscript where you wish for the figure to begin, command lines like the following should be input:

```
\begin{figure}
    \centerline{\includegraphics[width=WIDTH cm,height=HEIGHT cm]
                                {FILENAME.eps}}
\caption{Explanation of the figure.}
\label{fig:1}
\end{figure}
```

Here, `width=WIDTH cm` specifies the horizontal size and `height=HEIGHT cm` the vertical size. If one of these is omitted, the size is automatically set by making the ratio of the height and width of the figure the same as that of the original epsf figure. If both of them are omitted, the size defined in the epsf file is used. However, it is best not to omit both, because in this case an unexpected result can occur for some epsf files.

If you wish to incorporate figures for which there only exist hard copies, the original figures should be mailed to the PTP editorial office separately. (They can be sent with other such correspondence, for example orders for reprints.) In this case, space for the figures in the LaTeX source file should be created using the `\figurebox` command. The following demonstrates how this is done:

```
\begin{figure}
\figurebox{WIDTH}{HEIGHT}
\caption{This is the caption.}
\label{fig:1}
\end{figure}
```

To delete the frame demarking this `figurebox`, the command `\nofigureboxrule` should be added to the preamble. In `template.tex`, this command can be enabled by deleting the `%` appearing before it.

5.2. *Wrapfigure environment*

Narrow figures should be displayed with half text width. (The size used here is 6.6cm, which is actually 4mm smaller than the true half text size, as

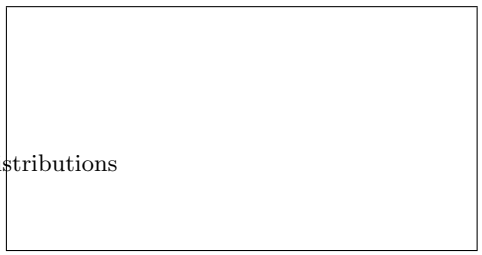


Fig. 1. A figure created using the `wrapfigure` environment.

*) `graphicx.sty` is included in standard LaTeX distributions

it is necessary to include a space.) The `wrapfigure` environment can be used for this purpose. We give an example of the `wrapfigure` in Fig. 1. It should be noted that the `wrapfigure` environment is not a floating environment; that is, the position of the figure in the manuscript corresponds to the place in the source file at which the `\begin{wrapfigure}` command appears, whether there is sufficient space for the figure or not. Please take care, therefore, when this environment is used near the beginning or end of a section, subsection or page. Also, it is best to incorporate figures using `wrapfigure` only when creating the final form of the source file, after no further changes in the text are to be made.

The use of the wrapfigure environment is demonstrated by the following commands, which create Fig. 1 and appear at the beginning of the previous paragraph in the source file of this manuscript:

```
\begin{wrapfigure}{r}{6.6cm}   % r: RIGHT, 6.6cm: WIDTH
  \figurebox{60mm}{3cm}
  \caption{A figure created using the {\ttfamily wrapfigure}
   environment.}
  \label{fig:2}
\end{wrapfigure}
Narrow figures should be displayed with half text width....
```

Also, note that `\centerline{\includegraphics{FILENAME.eps}}` can be used here in place of `\figurebox`.

To use the wrapfigure environment, `wrapft.sty` must be input. This can be done by including the following command in the preamble:

```
\usepackage{wrapft}
```

The basic format of the `wrapfigure` environment is

```
\begin{wrapfigure}[number]{position}{width}
    <figure> etc.
    \caption{ <caption> }
\end{wrapfigure}
```

Here the optional argument `[number]` specifies the number of text lines corresponding to the height of the figure. Since this is almost always calculated automatically with no problem, it is usually best to omit it. It should be explicitly included only when there is a special need to enforce a certain value for this number. (For instance, when a figure is placed at the bottom of a page, the text lines at the beginning of the next page can sometimes become narrow. This can be avoided by explicitly specifying the `[number]`.) The argument `{width}` specifies the width of the space allocated for the figure (and the figure caption). PTP allows only half the text width for this size (7cm), for aesthetic reasons. For this reason, the argument input here must be `{6.6cm}` or `{\halftext}`, which allots the proper space between the figure and the

text. (The quantity `\halftext` is defined to be 0.471 times `\textwidth`. This is 6.6cm for PTP text style.) The argument `{position}` is `{r}`, which positions the figure on the right, or `{l}`, which positions the figure on the left. (In PTP, half-size figures are placed on the right for odd pages and on the left for even pages.)

If you are inserting a full-size figure and wish to specify its position exactly, instead of using the floating positioning of the usual `figure` environment, you can employ the wrapfigure environment and set the position as `{c}` (center). In this case, the command line beginning the figure would be `\begin{wrapfigure}{c}{width}`. With this command line, the figure is treated just as if the `figure` environment were used, except that it is positioned at the point in the manuscript corresponding to the position of this command line in the source file. The item `{width}` specifies the caption width in this case. In the place where "`<figure> etc.`" appears here, an epsf figure can be input (as in the example used to create Fig. 1) or a picture environment can be used, among other options.

To position a figure at the beginning of a paragraph, as in the case of Fig. 1, place the commands for the `wrapfigure` environment before the beginning of the paragraph. If you wish to position a figure within a paragraph, this can be done manually. First, comment out the entire `wrapfigure` environment and compile the source file. Then, preview the manuscript and note the word that appears at the end of the line below which you wish to place the figure. Insert the entire `wrapfigure` environment directly after this word.

If you would like to avoid all such complications, please simply include all the figures with the ordinary `figure` environment. The Editorial Office will make the appropriate changes.

5.3. *Putting figures side by side*

Using either the `figure` or `wrapfigure` environment, it is easy to position two or more figures in immediate succession vertically. To do this, simply repeat the `<figure>` part of the environment, making reference to the each of the figure files to be displayed. To include a separate caption for each such figure, the `\caption` part must also be repeated accordingly.

It is not so simple to place two figures side by side. In fact there are several ways to do this. Below we demonstrate one, in which the `\parbox` command is used:

```
\begin{figure}[htb]
    \parbox{\halftext}{%   %\def\halftext{.471\textwidth}
        \figurebox{6cm}{2cm}
        \caption{The first figure on the left.}}
    \hfill
    \parbox{\halftext}{
        \figurebox{6cm}{2cm}
        \caption{The second figure on the right.}}
\end{figure}
```

This gives the following output:



Fig. 2. The first figure on the left.



Fig. 3. The second figure on the right.

§6. Tables

To make tables in $\mathcal{PTP}$TEX, the standard LATEX `table` environment can be used. Here we give an example of a small table using the `wraptable` environment in Table I. This environment is also supported by the `wrapft.sty` file, discussed above, and the format for this environment is quite similar to that for the `wrapfigure` environment. For tables in PTP the conventions are, as in this example, to put the caption above the table and to use a double line only at the top with the repeated commands `\hline \hline`. Please follow these conventions. Table I was created with the following:

Table I. An example of a small table created with `\begin{wraptable}{r}{\halftext}`.

temperature	energy	specific heat
0.1	0.24	2.46
0.2	0.80	4.62
0.3	1.11	3.27

```
\begin{wraptable}{r}{\halftext}
  \caption{An example of small table created with
      {\ttfamily \BS begin\{wraptable\}\{r\}\{\BS halftext\}}.}
  \label{table:1}
  \begin{center}
    \begin{tabular}{ccc} \hline \hline
     temperature & energy  & specific heat \\ \hline
         0.1     &  0.24   &  2.46  \\
         0.2     &  0.80   &  4.62  \\
         0.3     &  1.11   &  3.27  \\ \hline
    \end{tabular}
  \end{center}
\end{wraptable}
To make tables in \PTPTeX, the standard \LaTeX\ .......
```

The original `tabular` environment is rewritten in $\mathcal{PTP}$TEX so as to make the font used in the table footnote size. If, however, you wish to use the usual text font in a table, please add the line

```
\let\tabularsize\normalsize
```

after the `\begin{wraptable}` command to obtain normal size output. However, care must be taken to make sure that the size change only acts *locally*.

§7. Comments

If you discover any bugs in `ptptex.cls` when using PTPTEX, we would appreciate it if you would inform us. Please send any such correspondence to the following E-mail address:

`ptp@yukawa.kyoto-u.ac.jp`

It would help us if you could make the title of the E-mail something like `ptptex.cls bug`.

Acknowledgements

Acknowledgements in PTPTEX can be written using the LaTeX standard command `\section*{Acknowledgements}`.

Class files and manuals for JJAP and JPSJ were of great help to us in creating the PTPTEX class file and writing this manual. We acknowledge the staff of JJAP and JPSJ for this help. At the end of our class file `ptptex.cls`, we have included the free-ware package files `subeqn.sty` (created by Stephen Gildea) and `overcite.sty` (created by Donald Arseneau). Also, the file `wrapft.sty` is a modified version of the `wrapfig.sty` created by Donald Arseneau. We express our sincere thanks to these authors.

Appendix A
—— How to Make an Appendix ——

Appendices can be made using the standard LaTeX commands as follows:

```
\appendix
\section{How to Make an Appendix}
  ...
\section{Second Appendix}
  ...
```

If you make two or more appendices, the appendix numbers automatically become **A**, **B**, etc. In an appendix, equations become numbered as

$$S_q^z = \frac{1}{L}\sum_{j=1}^{L} S_j^z e^{iqj}. \tag{A·1}$$

Appendix B
—— Notes on Preparing Figures ——

When you make graphics files for figures to be used in PTPTEX, please do so according to the following directions.

- Graphics files should be prepared in EPS (encapsulated PostScript) format. Files should be made using graphics software supporting the EPS format. The types of software we recommend include Adobe Illustrator, xfig, tgif, Mathe-

matica and Maple. We do not accept files made with a "printer driver."

- Fonts used in figures should be common PostScript fonts. Times-Roman, Helvetica, Courier and Symbol fonts can be used.
- Lines (solid, dotted, etc.) in figures must be thick and clear. Because the printer we use for publishing has very fine resolution, lines in original figures that are very pale or fine are reproduced faithfully (i.e. very pale or fine), and for this reason, they may be undetectable. Specifically, be sure that line widths are 1pt or thicker.
- When colored figures are used in a manuscript, they are printed in monochrome (i.e. black and white only). Meanwhile, colored figures in a pdf format of the paper in PTP Online are viewed in full color. Note that papers can be published in color, but in this case there is an additional fee.
- When preparing graphics files by scanning original figures, the scan setting should be "monochrome (2bit)," with a resolution of 1200dpi if the original size is being used. If a scanned figure is being enlarged or reduced, the resolution used should be [magnification ratio] $\times$ 1200dpi. If a figure is to be printed as half the size (in a single dimension) of the original, the scanning resolution $1/2 \times 1200 = 600$dpi can be used.

Appendix

If you wish to make an appendix without a title, like this appendix, simply begin it with the command `\section{}`, leaving the argument empty or blank. Even in this case, the appendix section counter is active, and equation numbers will reflect this, as seen in the following:

$$A = B. \tag{C·1}$$

Making an appendix without a title is not recommended, except when there is only a single appendix.

References

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H. D. Politzer, Phys. Rev. Lett. **30** (1973), 1346.
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G. 't Hooft, Nucl. Phys. B **33** (1971), 173; Nucl. Phys. B **35** (1971), 167.
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