

# **LATEX Class for the Association for Computing Machinery<sup>\*</sup>**

Boris Veytsman<sup>†</sup>

2022/10/18, v1.87

## **Abstract**

This package provides a class for typesetting publications of the Association for Computing Machinery.

## **Contents**

<b>1</b>	<b>Introduction</b>	<b>3</b>
<b>2</b>	<b>User's guide</b>	<b>3</b>
2.1	Installation . . . . .	3
2.2	Invocation and options . . . . .	6
2.3	Top matter . . . . .	7
2.4	Top matter of ACM Engage materials . . . . .	19
2.5	ACM cover page . . . . .	19
2.6	Internationalization . . . . .	20
2.7	Algorithms . . . . .	21
2.8	Figures and tables . . . . .	21
2.9	Descriptions of images . . . . .	23
2.10	Theorems . . . . .	23
2.11	Online-only and offline-only material . . . . .	23
2.12	Note about anonymous mode . . . . .	24
2.13	Acknowledgments . . . . .	24
2.14	Bibliography . . . . .	25
2.14.1	Processing using Bib <small>T<small>E</small>X</small> . . . . .	25
2.14.2	Processing using Bib <small>ET<small>E</small>X</small> . . . . .	28
2.15	Colors . . . . .	29
2.16	Other notable packages and typographic remarks . . . . .	29
2.17	Counting words . . . . .	30
2.18	Creative Commons licenses for ACM publications . . . . .	30
2.19	Disabled or forbidden commands . . . . .	31
2.20	Notes for wizards . . . . .	31
2.21	Currently supported publications . . . . .	32
2.22	A note about sigchi-a format . . . . .	33

---

<sup>\*</sup>©2016–2022, Association for Computing Machinery

<sup>†</sup>[borisv@lk.net](mailto:borisv@lk.net), [boris@varphi.com](mailto:boris@varphi.com)

<b>3 Implementation</b>	<b>35</b>
3.1 Identification . . . . .	35
3.2 Preload hook . . . . .	35
3.3 Options . . . . .	35
3.4 Setting switches . . . . .	39
3.5 Loading the base class and package . . . . .	40
3.6 Citations . . . . .	41
3.7 Internationalization . . . . .	43
3.8 Sectioning . . . . .	45
3.9 Hyperxmp and hyperref . . . . .	48
3.10 Other packages . . . . .	50
3.11 Paper size and paragraphing . . . . .	50
3.12 Fonts . . . . .	53
3.13 Image descriptions . . . . .	55
3.14 Floats . . . . .	56
3.15 Lists . . . . .	58
3.16 Top-matter data . . . . .	59
3.17 Concepts system . . . . .	75
3.18 Copyright system . . . . .	75
3.19 Maketitle hook . . . . .	81
3.20 ACM Engage top matter . . . . .	82
3.21 Typesetting top matter . . . . .	82
3.22 Headers and Footers . . . . .	99
3.23 Sectioning . . . . .	105
3.24 TOC lists . . . . .	108
3.25 Theorems . . . . .	108
3.26 Balancing columns . . . . .	111
3.27 Acknowledgments . . . . .	112
3.28 Conditional typesetting . . . . .	113
3.29 Additional bibliography commands . . . . .	113
3.30 Index . . . . .	113
3.31 End of Class . . . . .	114

## 1 Introduction

The Association for Computing Machinery<sup>1</sup> is the world’s largest educational and scientific computing society, which delivers resources that advance computing as a science and a profession. It was one of the early adopters of  $\text{\TeX}$  for its typesetting.

It provided several different classes for a number of journals and conference proceedings. Unfortunately during the years since these classes were written, the code was patched many times, and supporting different versions of the classes became difficult.

This package provides the uniform interface for all ACM publications. It is intended to replace all the different classes and packages and provide an up-to-date  $\text{\LaTeX}$  package.

This package uses only free  $\text{\TeX}$  packages and fonts included in  $\text{\TeX}Live$ , Mik $\text{\TeX}$  and other popular  $\text{\TeX}$  distributions. It is intended to be published in these distributions itself, which minimizes users’ efforts in the installation and support of this package.

I am grateful to Michael D. Adams, Leif Andersen, Lawrence Christopher Angrave, Dirk Beyer, Andrew Black, Joachim Breitner, Yegor Bugayenko, Benjamin Byholm, John Collins, Roberto Di Cosmo, Nils Anders Danielsson, Michael Ekstrand, Matthew Fluet, Paolo G. Giarrusso, Ben Greenman, Enrico Gregorio, Jamie Davis, Ulrike Fischer, Jason Hemann, Peter Kemp, Luis Leiva, Ben Liblit, Rholais Lii, LianTze Lim, Kuldeep S. Meel, Kai Mindermann, Frank Mittelbach, Serguei Mokhov, Ross Moore, John Owens, Joel Nider, Scott Pakin, Tobias Pape, Henning Pohl, Philip Quinn, Mathias Rav, Andreas Reichinger, Matteo Riondato, Craig Rodkin, Bernard Rous, Feras Saad, Kerry A. Seitz, Jr., David Shamma, Gabriel Scherer, Kartik Singhal, Christoph Sommer, Stephen Spencer, Shin Hwei Tan, Daniel Thomas, Shari Trewin, Zack Weinberg, John Wickerson and many others for their invaluable help.

The development version of the package is available at <https://github.com/borisveytsman/acmart>.

## 2 User’s guide

This class uses many commands and customizaton options, so it might appear intimidating for a casual user. Do not panic! Many of these commands and options can be safely left with their default values or the values recommended by your conference or journal editors. If you have problems or questions, do not hesitate to ask me directly or the community at <https://github.com/borisveytsman/acmart>, <https://tex.stackexchange.com> or the closest  $\text{\TeX}$  Users Group. The world-wide  $\text{\TeX}$  Users Group is at <https://tug.org/>; please consider joining us if you use  $\text{\TeX}$  regularly.

### 2.1 Installation

Most probably, you already have this package installed in your favorite  $\text{\TeX}$  distribution; if not, you may want to upgrade. You may need to upgrade it anyway since this package uses a number of relatively recent packages, especially the ones related to fonts.

The latest released version of this package can be found on CTAN: <https://www.ctan.org/pkg/acmart>. The development version can be found on GitHub: <https://github.com/borisveytsman/acmart>. At this address you can file a bug report—or even contribute your own enhancement by making a pull request.

---

<sup>1</sup><http://www.acm.org/>

Please note that the version on Github is a development (or experimental) version: please download it for testing new features. The production version is the one on CTAN and ACM sites.

Most users should not attempt to install this package themselves but should rather rely on their  $\text{\TeX}$  distributions to provide it. If you decide to install the package yourself, follow the standard rules:

1. Run `latex acmart.ins`. This will produce the file `acmart.cls`
2. Put the files `acmart.cls` and `ACM-Reference-Format.bst` in places where  $\text{\LaTeX}$  can find them (see [1] or the documentation for your  $\text{\TeX}$  system).
3. Update the database of file names. Again, see [1] or the documentation for your  $\text{\TeX}$  system for the system-specific details.
4. The file `acmart.pdf` provides the documentation for the package. (This is probably the file you are reading now.)

As an alternative to items 2 and 3 you can just put the files in the working directory where your `.tex` file is.

This class uses a number of other packages. They are included in all major  $\text{\TeX}$  distributions ( $\text{\TeX} \text{Live}$ , Mac $\text{\TeX}$ , Mik $\text{\TeX}$ ) of 2015 and later, so you probably have them installed. Just in case here is the list of these packages:

- *amscls*, <http://www.ctan.org/pkg/amscls>
- *amsfonts*, <http://www.ctan.org/pkg/amsfonts>
- *amsmath*, <http://www.ctan.org/pkg/amsmath>
- *binhex*, <http://www.ctan.org/pkg/binhex>
- *balance*, <http://www.ctan.org/pkg/balance>
- *booktabs*, <http://www.ctan.org/pkg/booktabs>
- *caption*, <http://www.ctan.org/pkg/caption>
- *comment*, <http://www.ctan.org/pkg/comment>
- *cm-super*, <http://www.ctan.org/pkg/cm-super>
- *cmap*, <http://www.ctan.org/pkg/cmap>
- *doclicense*, <http://www.ctan.org/pkg/doclicense>
- *draftwatermark*, <http://www.ctan.org/pkg/draftwatermark>
- *environ*, <http://www.ctan.org/pkg/environ>
- *etoolbox*, <http://www.ctan.org/pkg/etoolbox>
- *fancyhdr*, <http://www.ctan.org/pkg/fancyhdr>
- *float*, <http://www.ctan.org/pkg/float>
- *fontaxes*, <http://www.ctan.org/pkg/fontaxes>

- *geometry*, <http://www.ctan.org/pkg/geometry>
- *graphics*, <http://www.ctan.org/pkg/graphics>
- *hyperref*, <http://www.ctan.org/pkg/hyperref>
- *hyperxmp*, <http://www.ctan.org/pkg/hyperxmp>
- *iftex*, <http://www.ctan.org/pkg/iftex>
- *inconsolata*, <http://www.ctan.org/pkg/inconsolata>
- *libertine*, <http://www.ctan.org/pkg/libertine>
- *manyfoot*, <http://www.ctan.org/pkg/manyfoot>
- *microtype*, <http://www.ctan.org/pkg/microtype>
- *mmap*, <http://www.ctan.org/pkg/mmap>
- *ms*, <http://www.ctan.org/pkg/ms>
- *mweights*, <http://www.ctan.org/pkg/mweights>
- *natbib*, <http://www.ctan.org/pkg/natbib>
- *nccfoots*, <http://www.ctan.org/pkg/nccfoots>
- *newtx*, <http://www.ctan.org/pkg/newtx>
- *oberdiek*, <http://www.ctan.org/pkg/oberdiek>
- *pdftex-def*, <http://www.ctan.org/pkg/pdftex-def>
- *refcount*, <http://www.ctan.org/pkg/refcount>
- *setspace*, <http://www.ctan.org/pkg/setspace>
- *textcase*, <http://www.ctan.org/pkg/textcase>
- *totpages*, <http://www.ctan.org/pkg/totpages>
- *trimspaces*, <http://www.ctan.org/pkg/trimspaces>
- *upquote*, <http://www.ctan.org/pkg/upquote>
- *url*, <http://www.ctan.org/pkg/url>
- *xcolor*, <http://www.ctan.org/pkg/xcolor>
- *xkeyval*, <http://www.ctan.org/pkg/xkeyval>
- *xstring*, <http://www.ctan.org/pkg/xstring>

## 2.2 Invocation and options

To use this class, put in the preamble of your document

```
\documentclass[<options>]{acmart}
```

There are several options corresponding to the type of the document and its general appearance. They are described below. Generally speaking, the options have key=value forms, for example,

```
\documentclass[format=acmsmall, screen=true, review=false]{acmart}
```

The option `format` describes the format of the output. There are several possible values for this option, for example,

```
\documentclass[format=acmtog]{acmart}
```

Actually the words `format=` can be omitted, e.g.,

```
\documentclass[acmtog, review=false]{acmart}
```

The possible formats are listed in Table 1. Note that formats starting with `acm` are intended for journals, transactions, and course materials, while formats starting with `sig` are intended for proceedings published as books.

Note that sometimes conference proceedings are published as a special issue (or issues) of an ACM journal. In this case, you should use the journal format for a conference paper. Please contact your conference committee if in doubt.

Starting in 2020, ACM retired formats `sigchi` and `sigchi-a`. SIGCHI conferences now use `sigconf` format for their publications. If a file uses `sigchi` format, a warning is issued, and the format is automatically switched to `sigconf`. Format `sigchi-a` can be used for non-ACM documents only (see Section 2.22). The format `acmcnp` is used for ACM cover pages discussed in Section 2.5.

There are several Boolean options that can take `true` or `false` values. They are listed in Table 2. The words `=true` can be omitted when setting a Boolean option, so instead of `screen=true` one can write just `screen`, for example,

```
\documentclass[acmsmall, screen, review]{acmart}
```

The option `review` is useful when combined with the `manuscript` format option. It provides a version suitable for reviewers and copy editors.

Two samples in the `samples` directory, `manuscript` and `acmsmall-submission`, show manuscripts formatted for submission to ACM.

The default for the option `screen` depends on the publication. At present it is `false` for all publications *but* PACM, since PACM is now electronic-only. Thus PACM titles (see Table 5) set this option to `true`. In the future this option may involve additional features suitable for on-screen versions of articles.

The option `natbib` is used when the corresponding Bib<sup>T</sup>E<sub>X</sub> style is based on `natbib`. In most cases you do not need to set it. See Section 2.14.

The option `anonymous` is used for anonymous review processes and causes all author information to be obscured.

Table 1: The possible values for the `format` option

Value	Meaning
<code>manuscript</code>	A manuscript. This is the default.
<code>acmsmall</code>	Small single-column format. Used for ACMJCSS, CIE, CSUR, DLT, FAC, GAMES, JACM, JATS, JDIQ, JDS, JEA, JERIC, JETC, JRC, PACM-CGIT, PACMHCI, PACMPL, TAAS, TACCESS, TACO, TALG, TALLIP (formerly TALIP), TCPS, TDS, TEAC, TECS, TELO, THRI, TIIS, TIOT, TISSEC, TIST, TKDD, TMIS, TOCE, TOCHI, TOCL, TOCS, TOCT, TODAES, TODS, TOIS, TOIT, TOMACS, TOMM (formerly TOMCCAP), TOMPECS, TOMS, TOPC, TOPLAS, TOPS, TORS TOS, TOSEM, TOSN, TQC, TRETS, TSAS, TSC, TSLP and TWEB, including special issues.
<code>acmlarge</code>	Large single-column format. Used for DTRAP, HEALTH, IMWUT, JOCH, POMACS and TAP, including special issues.
<code>acmtog</code>	Large double-column format. Used for TOG, including annual conference Technical Papers.
<code>sigconf</code>	Proceedings format for most ACM conferences (with the exception of SIGPLAN) and all ICPS volumes.
<code>sigplan</code>	Proceedings format for SIGPLAN conferences.
<code>acmengage</code>	ACM EngageCSEdu Course materials.
<code>acmcpc</code>	ACM cover page.

The option `timestamp` is used to include a time stamp in the footer of each page. When preparing a document, this can help avoid confusing different revisions. The footer also includes the page range of the document. This helps detect missing pages in hard copies.

The option `authordraft` is intended for author's drafts that are not intended for distribution. It typesets a copyright block to give the author an idea of its size and the overall size of the paper but overprints it with the phrase "Unpublished working draft. Not for distribution.", which is also used as a watermark. This option sets `timestamp` and `review` to `true`, but these can be overridden by setting these options to `false` after setting `authordraft` to `true`.

The option `balance` determines whether the last page in the two column mode has balanced columns. By default it is `true`; however, it may lead to problems for some documents. Set it to `false` if you encounter compilation errors. Note that for one page documents `\balance` command might cause problems. An alternative is the (experimental) option `pbalance`, which uses the new package `pbalance` for this end.

The option `urlbreakonhyphens` determines whether URLs can be split between lines after hyphens. By default it is `true`. Set it to `false` to disallow these breaks.

The option `language` is used to define the languages for the multi-language papers. It is discussed in Section 2.6.

### 2.3 Top matter

A number of commands set up *top matter* or (in computer science jargon) *metadata* for an article. They establish the publication name, article title, authors, DOI and other data. Some of these commands, like `\title` and `\author`, should be put by the authors.

Table 2: Boolean options

Option	Default	Meaning
review	false	A review version: lines are numbered and hyperlinks are colored
screen	see text	A screen version: hyperlinks are colored
natbib	true	Whether to use the <code>natbib</code> package (see Section 2.14)
anonymous	false	Whether to make author(s) anonymous
authorversion	false	Whether to generate a special version for the authors' personal use or posting (see Section 2.3)
nonacm	false	Use the class typesetting options for a non-ACM document, which will not include the conference/journal header and footers. Currently such documents allow only a Creative Commons license.
timestamp	false	Whether to put a time stamp in the footer of each page
authordraft	false	Whether author's-draft mode is enabled
acmthm	true	Whether to define theorem-like environments, see Section 2.10
balance	true	Whether to balance the last page in two column mode
pbalance	false	Whether to balance the last page in two column mode using pbalance package
urlbreakonhyphens	true	Whether to break urls on hyphens

Others, like \acmVolume and \acmDOI—by the editors. Below we describe these commands and mention who should issue them. These macros should be used *before* the \maketitle command. Note that in previous versions of ACM classes some of these commands should be used before \maketitle, and some after it. Now they all must be used before \maketitle.

This class internally loads the amsart class, so many top-matter commands are inherited from amsart [2].

\acmJournal The macro \acmJournal{<shortName>} sets the name of the journal or transaction for journals and transactions. The argument is the short name of the publication *in uppercase*, for example,

```
\acmJournal{TOMS}
```

The currently recognized journals are listed in Table 5. Note that conference proceedings published in *book* form do not set this macro.

\acmConference The macro \acmConference[<short name>]{<name>}{<date>}{<venue>} is used for conference proceedings published in the book form. The arguments are the following:

**short name:** the abbreviated name of the conference (optional).

**name:** the name of the conference.

**date:** the date(s) of the conference.

**venue:** the place of the conference.

Examples:

```
\acmConference[TD'15]{Technical Data Conference}{November  
12--16}{Dallas, TX, USA}  
\acmConference{SA'15 Art Papers}{November 02--06, 2015}{Kobe, Japan}
```

\acmBooktitle By default we assume that conference proceedings are published in the book named *Proceedings of CONFERENCE*, where CONFERENCE is the name of the conference inferred from the command \acmConference above. However, sometimes the book title is different. The command \acmBooktitle can be used to set this title, for example,

```
\acmBooktitle{Companion to the first International Conference on the  
Art, Science and Engineering of Programming (Programming '17)}
```

An ACM paper should have either \acmJournal or \acmConference command. If it has both (or more) commands, the last one takes precedence. Note that if you have the command \acmConference in a journal format like acmsmall, the class will use conference format for bibstrip and reference citation formatting. In the samples directory there is a file sample-acmsmall-conf.tex with the example of this usage.

An ACM Engage material should *not* use \acmJournal or \acmConference command. It may use \acmBooktitle to override the default *ACM EngageCSEdu*. It should use \acmYear to set the date of the material.

\editor In most cases, conference proceedings are edited. You can use the command \editor{<editor>} to set the editor of the volume. This command can be repeated, for example,

```
\editor{Jennifer B. Sartor}
\editor{Theo D'Hondt}
\editor{Wolfgang De Meuter}
```

**\title** The command `\title`, as in the `amsart` class, has two arguments: one optional, and one mandatory:

```
\title[<ShortTitle>]{<FullTitle>}
```

The mandatory argument is the full title of the article. The optional argument, if present, defines the shorter version of the title for running heads. If the optional argument is absent, the full title is used instead.

It is expected that this command is inserted by the author of the manuscript.

**\subtitle** Besides title, ACM classes allow a subtitle, set with the `\subtitle{<subtitle>}` macro.

The commands for specifying authors are highly structured. The reason is they serve double duty: the authors' information is typeset in the manuscript *and* is used by the metadata extraction tools for indexing and cataloguing. Therefore it is very important to follow the guidelines exactly.

**\author** The basic commands are `\author`, `\orcid` (for the researchers registered with ORCID, <http://www.orcid.org/>), `\affiliation` and `\email`. In the simplest case, you `\affiliation` enter them in this order:

```
\email
  \author{...}
  \orcid{...}
  \affiliation{...}
  \email{...}
```

Do *not* use the L<sup>A</sup>T<sub>E</sub>X `\and` macro or commas, or `\backslash` between the authors! Each author deserves his or her own `\author` command. An attempt to list several authors or their e-mails in one command leads to a warning or an error. This is not a bug, but the expected behavior.

Note that some formats do not typeset e-mails or ORCID identifiers. Do not worry: the metadata tools will get them.

Sometimes an author has several affiliations. In this case, the `\affiliation` command should be repeated:

```
\author{...}
\orcid{...}
\affiliation{...}
\affiliation{...}
\email{...}
```

Similarly you can repeat the `\email` command.

You may have several authors with the same affiliation, different affiliations, or overlapping affiliations (author  $A_1$  is affiliated with institutions  $I_1$  and  $I_2$ , while author  $A_2$  is affiliated with  $I_2$  only, author  $A_3$  is affiliated with  $I_1$  and  $I_3$ , etc.). The recommended solution is to put the `\affiliation` commands after each author, possibly repeating them:

```
\author{...}
\orcid{...}
```

```
\affiliation{...}
\affiliation{...}
\email{...}
\author{...}
\orcid{...}
\affiliation{...}
\email{...}
\author{...}
\orcid{...}
\affiliation{...}
\affiliation{...}
\email{...}
```

In some cases, when several authors share the same affiliation, you can try to save space using the format

```
\author{...}
\email{...}
\author{...}
\email{...}
\affiliation{...}
```

However, this format is not generally recommended.

**\additionalaffiliation** In some cases, too many affiliations can take too much space. The command `\additionalaffiliation{<affiliation>}` creates a footnote after an author's name with the words "Also with {<affiliation>}". You should use this command only as a last resort. An example of usage is:

```
\author{G. Tobin}
\author{Ben Trovato}
\additionalaffiliation{%
    \institution{The Th{\o}rv{\aa}ld Group}
    \streetaddress{1 Th{\o}rv{\aa}ld Circle}
    \city{Hekla}
    \country{Iceland}}
\affiliation{%
    \institution{Institute for Clarity in Documentation}
    \streetaddress{P.O. Box 1212}
    \city{Dublin}
    \state{Ohio}
    \postcode{43017-6221}}
```

Here Trovato and Tobin share their affiliation with the Institute for Clarity in Documentation, but only Ben Trovato is affiliated with The Th{\o}rv{\aa}ld Group.

**\position** The `\affiliation` and `\additionalaffiliation` commands are further structured `\institution` to interact with the metadata extraction tools. Inside these commands you should use the `\department`, `\position`, `\institution`, `\department`, `\city`, `\streetaddress`, `\state`, `\postcode`, `\streetaddress` and `\country` macros to indicate the corresponding parts of the affiliation. Note that in `\city` some cases (for example, journals) these parts are not printed in the resulting copy, but `\state` they *are* necessary since they are used by the XML metadata extraction programs. Do not put commas or `\backslash` between the elements of `\affiliation`. They will be provided `\country` automatically.

The fields \institution, \city and \country are mandatory. If they are not provided, an error or a warning is issued. Currently the absence of \country produces an error; ACM may change this in the future.

An example of the author block:

```
\author{A. U. Thor}
\orcid{1234-4564-1234-4565}
\affiliation{%
    \institution{University of New South Wales}
    \department{School of Biomedical Engineering}
    \streetaddress{Samuels Building (F25), Kensington Campus}
    \city{Sidney}
    \state{NSW}
    \postcode{2052}
    \country{Australia}}
\email{author@nsw.au.edu}
\author{A. N. Other}
\affiliation{%
    \institution{University of New South Wales}
    \city{Sidney}
    \state{NSW}
    \country{Australia}}
\author{C. O. Respondent}
\orcid{1234-4565-4564-1234}
\affiliation{%
    \institution{University of Pennsylvania}
    \city{Philadelphia}
    \state{PA}
    \country{USA}}
\affiliation{%
    \institution{University of New South Wales}
    \city{Sidney}
    \state{NSW}
    \country{Australia}}
```

Note that the old ACM conference formats did not allow more than six authors and required some effort from authors to achieve alignment. The new format is much better in this.

Sometimes an author works in several departments within the same institution. There could be two situations: the departments are independent, or one department is within another. In the first case, just repeat the command \department several times. To handle the second case the command has an optional numerical parameter. The departments with higher numbers are higher in the organizational chart. Compare

```
\affiliation{%
    \department[0]{Department of Lunar Studies} % 0 is the default
    \department[1]{John Doe Institute} % higher than 0
    \institution{University of San Serriffe}
    \country{San Serriffe}}
```

and

```
\affiliation{%
```

```
\department{Department of Lunar Studies} % Not in the John Doe Institute!
\department{John Doe Institute}
\institution{University of San Serriffe}
\country{San Serriffe}
```

The command `\affiliation` formats its output according to American conventions. This might be wrong for some cases. Consider, for example, a German address. In Germany, the postcode is put before the city and is not separated by a comma. We can handle this order using

```
\affiliation{%
  \institution{Fluginstitut}
  \streetaddress{Sonnenallee 17}
  \postcode{123456}
  \city{Helm}
  \country{Germany}}
```

However, the comma after the postcode is unfortunate: the address will be typeset (in some formats) as

```
Fluginstitut
Sonnenallee 17
123456, Helm, Germany
```

To overcome this problem, the command `\affiliation` has an optional parameter `obeypunctuation`, which can be `false` (the default) or `true`. If this parameter is `true`, `\affiliation` obeys the author's command. Thus

```
\affiliation[obeypunctuation=true]{%
  \institution{Fluginstitut} \\
  \streetaddress{Sonnenallee 17} \\
  \postcode{123456}
  \city{Helm}, \\
  \country{Germany}}
```

will be typeset as

```
Fluginstitut
Sonnenallee 17
123456 Helm, Germany
```

Note that you should *not* use this option for journals.

It is expected that these commands are inserted by the author of the manuscript.

`\thanks` Like `amsart` (and unlike standard L<sup>A</sup>T<sub>E</sub>X), we allow `\thanks` only *outside* of the commands `\title` and `\author`. This command is obsolete and should *not* be used in most cases. Do not list your acknowledgments or grant sponsors here. Put this information in the `acks` environment (see Section 2.13).

`\authorsaddresses` In some formats, addresses are printed as a footnote on the first page. By default L<sup>A</sup>T<sub>E</sub>X typesets them itself using the information you give it. However, you can override its choice using the command `\authorsaddresses{<contact addresses>}`, for example,

```
\authorsaddresses{%
Authors' addresses: G.~Zhou, Computer Science Department, College of
William and Mary, 104 Jameson Rd, Williamsburg, PA 23185, US;
V.~B'eranger, Inria Paris-Rocquencourt, Rocquencourt, France;
A.~Patel, Rajiv Gandhi University, Rono-Hills, Doimukh, Arunachal
Pradesh, India; H.~Chan, Tsinghua University, 30 Shuangqing Rd,
Haidian Qu, Beijing Shi, China; T.~Yan, Eaton Innovation Center,
Prague, Czech Republic; T.~He, C.~Huang, J.~A.~Stankovic University
of Virginia, School of Engineering Charlottesville, VA 22903, USA;
T. F. Abdelzaher, (Current address) NASA Ames Research Center,
Moffett Field, California 94035.}
```

You can *suppress* printing authors' addresses by setting them to an empty string: \authorsaddresses{}. Please note that authors' addresses are mandatory for journal articles.

\titlenote While the command \thanks generates a note without a footnote mark, sometimes \subtitlenote the authors might need notes more tightly connected to the title, subtitle or author. The \authornote commands \titlenote, \subtitlenote and \authornote that follow the corresponding commands (\title, \subtitle and \author) generate such notes. For example,

```
\title{This is a title}
\titlenote{This is a titlenote}
\author{A. U. Thor}
\authornote{This is an authornote}
```

Please never use a \footnote inside an \author or \title command since this confuses the metadata extraction software. (Actually these commands now produce errors.)

\authornotemark Sometimes one may need to have the same footnote connected to several authors. The command \authornotemark[<number>] adds just the footnote mark, for example,

```
\author{A. U. Thor}
\authornote{Both authors contributed equally to the paper}
...
\author{A. N. Other}
\authornotemark[1]
```

The correct numbering of these marks is the responsibility of the user.

\acmVolume The macros \acmVolume, \acmNumber, \acmArticle, \acmYear and \acmMonth are \acmNumber inserted by the editor and set the journal volume, issue, article number, year and month \acmArticle corrspondingly. The arguments of all these commands, including \acmMonth, is numerical. For example,

```
\acmMonth
\acmVolume{9}
\acmNumber{4}
\acmArticle{39}
\acmYear{2010}
\acmMonth{3}
```

Note that \acmArticle is used not only for journals but also for some conference proceedings.

\acmArticleSeq The articles in the same issue of a journal have a *sequence number*. It is used to

vertically position the black blob on the first page of some formats. By default it is the same as the article number, but the command `\acmArticleSeq{n}` can be used to change it:

```
\acmArticle{39} % The sequence number will be 39 by default  
\acmArticleSeq{5} % We redefine it to 5
```

Setting this number to zero suppresses the blob.

`\acmSubmissionID` If your paper got a Submission ID from the Conference Management System, put it here:

```
\acmSubmissionID{123-A56-BU3}
```

`\acmPrice` The macro `\acmPrice{price}` sets the price for the article, for example,

```
\acmPrice{25.00}
```

Note that you do not need to put the dollar sign here, just the amount. By default the price is \$15.00, unless the copyright is set to usgov, rightsretained, iW3c2w3, or iW3c2w3g, when it is suppressed. Note that to override the defaults you need to set the price *after* the `\setcopyright` command. Also, the command `\acmPrice{}` suppresses the printing of the price.

`\acmISBN` Book-like volumes have ISBN numbers attached to them. The macro `\acmISBN{ISBN}` sets it. Normally it is set by the typesetter, for example,

```
\acmISBN{978-1-4503-3916-2}
```

Setting it to the empty string, as `\acmISBN{}`, suppresses printing the ISBN.

`\acmDOI` The macro `\acmDOI{DOI}` sets the DOI of the article, for example,

```
\acmDOI{10.1145/9999997.9999999}
```

It is normally set by the typesetter. Setting it to the empty string, as `\acmDOI{}`, suppresses the DOI.

`\acmBadgeR` Some conference articles get special distinctions, for example, the artifact evaluation  
`\acmBadgeL` for PPoP 2016 (see <http://ctuning.org/ae/ppopp2016.html>). These articles display special badges supplied by the conference organizers. This class provides commands to add these badges: `\acmBadgeR[url]{graphics}` and `\acmBadgeL[url]{graphics}`. The first command puts the badge to the right of the title, and the second one—to the left. The arguments have the following meaning: `[url]`, if provided, sets the link to the badge authority in the screen version, while `{graphics}` sets the graphics file with the badge image. The file must be a cropped square, which is scaled to a standard size in the output. For example, if the badge image is `ae-logo.pdf`, the command is

```
\acmBadgeR[http://ctuning.org/ae/ppopp2016.html]{ae-logo}
```

`\startPage` The macro `\startPage{page}` sets the first page of the article in a journal or book.  
It is used by the typesetter.

`\terms` The command `\keywords{keyword, keyword, ...}` sets keywords for the article.  
`\keywords`

They must be separated by commas, for example,

```
\keywords{wireless sensor networks, media access control,  
multi-channel, radio interference, time synchronization}
```

**CCSXML (*env*)** ACM publications are classified according to the ACM Computing Classification Scheme (CCS). CCS codes are used both in the typeset version of the publications *and* in the metadata in various databases. Therefore you need to provide both TeX commands and XML metadata with the paper.

The tool at <http://dl.acm.org/ccs.cfm> can be used to generate CCS codes. After you select the topics, click on “Generate CCS codes” to get results like the following:

```
\begin{CCSXML}  
<ccs2012>  
  <concept>  
    <concept_id>10010520.10010553.10010562</concept_id>  
    <concept_desc>Computer systems organization~Embedded systems</concept_desc>  
    <concept_significance>500</concept_significance>  
  </concept>  
  <concept>  
    <concept_id>10010520.10010575.10010755</concept_id>  
    <concept_desc>Computer systems organization~Redundancy</concept_desc>  
    <concept_significance>300</concept_significance>  
  </concept>  
  <concept>  
    <concept_id>10010520.10010553.10010554</concept_id>  
    <concept_desc>Computer systems organization~Robotics</concept_desc>  
    <concept_significance>100</concept_significance>  
  </concept>  
  <concept>  
    <concept_id>10003033.10003083.10003095</concept_id>  
    <concept_desc>Networks~Network reliability</concept_desc>  
    <concept_significance>100</concept_significance>  
  </concept>  
</ccs2012>  
\end{CCSXML}  
  
\ccsdesc[500]{Computer systems organization~Embedded systems}  
\ccsdesc[300]{Computer systems organization~Redundancy}  
\ccsdesc{Computer systems organization~Robotics}  
\ccsdesc[100]{Networks~Network reliability}
```

You just need to copy this code and paste it in your paper anywhere before `\maketitle`.

CCS Concepts and user-defined keywords are required for all articles over two pages in length, and are optional for one- and two-page articles (or abstracts).

**\setcopyright** There are several possibilities for the copyright of the papers published by the ACM: the authors may transfer the rights to the ACM, license them to the ACM, some or all authors might be employees of the US or Canadian governments, etc. Accordingly the command `\setcopyright{...}` is introduced. Its argument is the copyright status of the paper, for example, `\setcopyright{acmcopyright}`. The possible values for this command are listed in Table 3. This command must be placed in the preamble, before

Table 3: Parameters for the `\setcopyright` command

Parameter	Meaning
<code>none</code>	The copyright and permission information is not typeset. (This is the option for some ACM conferences.)
<code>acmcopyright</code>	The authors transfer the copyright to the ACM (the “traditional” choice).
<code>acmlicensed</code>	The authors retain the copyright but license the publication rights to ACM.
<code>rightsretained</code>	The authors retain the copyright and publication rights to themselves or somebody else.
<code>usgov</code>	All the authors are employees of the US government.
<code>usgovmixed</code>	Some authors are employees of the US government.
<code>cagov</code>	All the authors are employees of the Canadian government.
<code>cagovmixed</code>	Some authors are employees of the Canadian government.
<code>licensedusgovmixed</code>	Some authors are employees of the US government, and the publication rights are licensed to ACM.
<code>licensedcagov</code>	All the authors are employees of the Canadian government, and the publication rights are licensed to ACM.
<code>licensedcagovmixed</code>	Some authors are employees of the Canadian government, and the publication rights are licensed to ACM.
<code>othergov</code>	Authors are employees of a government other than the US or Canada.
<code>licensedothergov</code>	Authors are employees of a government other than the US or Canada, and the publication rights are licensed to ACM.
<code>iw3c2w3</code>	Special statement for conferences organized by IW3C2.
<code>iw3c2w3g</code>	Special statement for conferences organized by IW3C2, when some authors are approved Google employees.
<code>cc</code>	Creative Commons license. If this key is set, <code>doclicense</code> images are used to typeset the license. See also <code>\setccctype</code> command. Note that at present this license can be used only for <code>acmengage</code> format or for <code>nonacm</code> publications.

`\begin{document}`. Additional information about ACM copyright rules is discussed in Section ??.

`\setccctype` If Creative Commons license is used, the package by default chooses CC-BY 4.0 Attribution 4.0 International license. You can override this choice by the command `\setccctype[<version>]{<type>}`, where [<version>] can be either 3.0 or 4.0 (4.0 by default), and {<type>} can be one of zero, by, by-sa, by-nd, by-nc, by-nc-sa, by-nc-nd (see <https://creativecommons.org/licenses/> for the explanation). This command should be used in the preamble only.

Material published under Creative Commons license should include the corresponding icon. A modern TeX distribution includes these icons in the package `doclicense`. In case your distribution does not have them, ACM provides a file `ccicons.zip` with these icons. Just unzip it in the same directory where your document is.

The ACM submission software should generate the right command for you to paste into your file.

`\copyrightyear` Each copyright statement must have the year of copyright. By default it is the same

as `\acmYear`, but you can override this using the macro `\copyrightyear`, e.g.,

```
\acmYear{2016}  
\copyrightyear{2015}
```

There is a special case for a personal copy that the authors may be allowed to generate for their use or a posting on a personal site (check the instructions for the specific journal or conference for the details). The document option `authorversion=true` produces a special form of the copyright statement for this case. Note that you still need the `\setcopyright` command and (optionally) `\copyrightyear` command to tell TeX about the copyright owner and year. Also, you should be aware that due to the different sizes of the permission blocks for the printed version and authors' version, the page breaks might be different between them.

`abstract (env)` The environment `abstract` must *precede* the `\maketitle` command. Again, this is different from the standard L<sup>A</sup>T<sub>E</sub>X. Putting `abstract` after `\maketitle` will trigger an error.

`teaserfigure (env)` A special kind of figure is used for many two-column conference proceedings. This figure is placed just after the authors but before the main text. The environment `teaserfigure` is used for these figures. This environment must be used *before* `\maketitle`, for example,

```
\begin{teaserfigure}  
  \includegraphics[width=\textwidth]{sampleteaser}  
  \caption{This is a teaser}  
  \label{fig:teaser}  
\end{teaserfigure}
```

`\settopmatter` Some information in the top matter is printed for certain journals or proceedings and suppressed for others. You can override these defaults using the command `\settopmatter{\{settings\}}`. The settings and their meanings are listed in Table 4. For example,

```
\settopmatter{printacmref=false, printccs=true, printfolios=true}
```

The parameter `authorsperrow` requires some explanation. In conference proceedings authors' information is typeset in boxes, several boxes per row (see `sample-sigconf.pdf`, `sample-sigplan.pdf`, etc.). The number of boxes per row is determined automatically. If you want to override this, you can do it using this parameter, for example,

```
\settopmatter{authorsperrow=4}
```

However, in most cases you should *not* do this and should use the default settings. Setting `authorsperrow` to 0 will revert it to the default settings.

The parameter `printacmref` specifies whether to print the ACM bibliographic entry (default), or not. Note that this entry is required for all articles over one page in length, and is optional for one-page articles (abstracts).

`\received` The command `\received[\{stage\}]\{\{date\}\}` sets the history of the publication. The `[\{stage\}]` argument is optional; the default is Received for the first date and revised for the subsequent ones. For example,

Table 4: Settings for the \settopmatter command

Parameter	Values	Meaning
printccs	true/false	Whether to print CCS categories
printacmref	true/false	Whether to print the ACM bibliographic entry
printfolios	true/false	Whether to print page numbers (folios)
authorsperrow	numeric	Number of authors per row for the title page in conference proceedings formats

```
\received{20 February 2007}
\received[revised]{12 March 2009}
\received[accepted]{5 June 2009}
```

- \maketitle     The macro \maketitle must be the last command in the top-matter group. That is it must follow the commands defined in this section.
- \shortauthors     After the command \maketitle, the macro \shortauthors stores the names of the authors for the running head. You can redefine it if the list of author's name is too long, e.g.,
- ```
\maketitle
\renewcommand{\shortauthors}{Zhou et al.}
```

## 2.4 Top matter of ACM Engage materials

ACM Engage materials resemble conference proceedings, but have some special features. First, as a rule, they are released under a Creative Commons license. By default CC-BY is used. However, if you want to use another variant of CC license, use \setcctype command, for example, \setcctype{by-nc}. Second, abstract is called *synopsis*. Third, there are special top matter items used for the materials, such as *Course*, *Resource Type*, *Programming Language*, *CS Topics*.

- \setengagemetadata     These items are set with the command \setengagemetadata{*name*}{{*value*}}, for example,

```
\setengagemetadata{Course}{CS1}
\setengagemetadata{Programming Language}{Python}
\setengagemetadata{Knowledge Unit}{Programming Concepts}
\setengagemetadata{CS Topics}{Functions, Data Types, Expressions,
Mathematical Reasoning}
```

Note that the type of Creative Commons license, if such license is used, is automatically added to the metadata.

## 2.5 ACM cover page

ACM cover pages are forms of extended abstracts that are added to journals at the late stage. Authors prepare them as separate .tex files using acmcp format. At present only JDS uses them, but in the future this may change.

There are several top matter commands specific for this format.

\acmArticleType There are five article types accepted by JDS: *Research* (the default), *Review*, *Discussion*, *Invited*, and *Position*. The command \acmArticleType{\textit{type}} sets the article type, for example

```
\acmArticleType{Review}
```

\acmCodeLink The commands \acmCodeDataLink{\textit{link}} and \acmDataLink{\textit{link}} set the links \acmDataLink to the data and code accompanying the paper, for example,

```
\acmCodeLink{https://github.com/repository/code}
\acmDataLink{https://datadryad.org/stash/dataset/doi:DOI}
```

You may repeat these commands if you have several repositories.

ACM cover page should have the following obligatory sections:

- Problem statement,
- Methods,
- Results,
- Significance.

Sometimes the addresses extracted from the authors' data are too long to fit on the page. In this case the command \authorsaddresses can be used to override them, for example,

```
\authorsaddresses{Corresponding author: Ben Trovato,
\href{mailto:trovato@corporation.com}{trovato@corporation.com};
Institute for Clarity in Documentation, P.O. Box 1212, Dublin,
Ohio, USA, 43017-6221}
```

## 2.6 Internationalization

ACM accepts publications in languages other than English, as well as papers in English with translations of titles, subtitles, keywords and abstracts into other languages. Papers in languages other than English usually have titles, subtitles (if applicable), keywords and abstracts in English. Note that CCS concepts are always typeset in English.

To submit these papers you need to set the option language in the \documentclass command. This option can be repeated, for example,

```
\documentclass[sigconf, language=french, language=english]{acmart}
```

The last language in the list is the main language of the paper, i.e. the one for the main title, abstract, body, etc. The other languages are *secondary*, and used for translated titles, keywords, abstracts. Thus the paper above is written in English, and has a secondary abstract and a secondary title in French. On the other hand, a paper in French with secondary titles and abstracts in English and German should use, for example

```
\documentclass[sigconf,
language=german,
language=english,
language=french]{acmart}
```

This key can use any language defined in *babel* package [3] (currently the package is tested with English, French, German and Spanish languages; other languages may require a translation of \keywordsname macro). Actually *acmart* loads *babel* internally, so you can use the facilities provided by this package.

If this key is set, you have access to several additional top matter commands.

\translatedtitle The commands \translatedtitle{\langle language \rangle}title, \translatedsubtitle{\langle language \rangle}subtitle \translatedsubtitle and \translatedkeywordslanguagekeywords are used to set title, subtitle and keywords words in the secondary language. For example, a paper in English with French title and abstract may set

```
\title{A note on computational complexity}
\translatedtitle{french}{Remarque sur la complexit\'e de calcul}
```

while a paper in French should set

```
\title{Remarque sur la complexit\'e de calcul}
\translatedtitle{english}{A note on computational complexity}
```

translatedabstract (*env.*) Similarly, translatedabstract environment has a mandatory language argument, for example,

```
\begin{translatedabstract}{english}
This is the English version of the abstract
\end{translatedabstract}
```

You can repeat these commands if a paper has more than one secondary language.

Use the standard commands (\title, \subtitle, \keywords, abstract) for the main language of the paper.

## 2.7 Algorithms

There are now several good packages for typesetting algorithms [4, 5, 6], and the authors are free to choose their favorite one.

## 2.8 Figures and tables

The new ACM styles use the standard L<sup>A</sup>T<sub>E</sub>X interface for figures and tables. There are some important items to be aware of, however.

1. The captions for figures must be entered *after* the figure bodies and for tables *before* the table bodies.
2. The ACM uses the standard types for figures and tables and adds several new ones. In total there are the following types:

**figure, table:** a standard figure or table taking a full text width in one-column formats and one column width in two-column formats.

**figure\*, table\*** in two-column formats, a special figure or table taking a full text width.

**teaserfigure:** a special figure before \maketitle.

3. Accordingly, when scaling images, one should use the following sizes:

- (a) For `teaserfigure`, `figure` in one-column mode or `figure*` in two-column mode, use `\textwidth`. In one-column mode, you can also use `\columnwidth`, which coincides with `\textwidth` in this case.
- (b) For `figure` in two-column mode, use `\columnwidth`.

It is strongly recommended to use the package `booktabs` [7] and follow its main principles of typography with respect to tables:

1. Never, ever use vertical rules.
2. Never use double rules.

It is also a good idea not to overuse horizontal rules.

For table *footnotes* you have several options described in the TeX FAQ [1]. The simplest one is to use a `\minipage` environment:

```
\begin{table}
\caption{Simulation Configuration}
\label{tab:conf}
\begin{minipage}{\columnwidth}
\begin{center}
\begin{tabular}{ll}
\toprule
TERRAIN\footnote{This is a table footnote. This is a
table footnote. This is a table footnote.} &
(200\,m$\times$200\,m) Square\\
Node Number & 289\\
Node Placement & Uniform\\
Application & Many-to-Many/Gossip CBR Streams\\
Payload Size & 32 bytes\\
Routing Layer & GF\\
MAC Layer & CSMA/MMSN\\
Radio Layer & RADIO-ACNOISE\\
Radio Bandwidth & 250Kbps\\
Radio Range & 20m--45m\\
\bottomrule
\end{tabular}
\end{center}
\bigskip
\footnotesize\emph{Source:} This is a table
sourcenote. This is a table sourcenote. This is a table
sourcenote.

\emph{Note:} This is a table footnote.
\end{minipage}
\end{table}
```

Tables and figures are by default centered. However, in some cases (for example, when you use several subimages per figure) you may need to override this. A good way to do so is to put the contents into a `\minipage` of the width `\columnwidth`.

## 2.9 Descriptions of images

\Description Some readers of ACM publications might be visually challenged. These readers might use a voice-over software to read aloud the papers. It is important to provide them a description of each image used in the paper.

The command `\Description[<short description>]{<long description>}` should be placed inside every `figure`, `teaserfigure` or `marginfigure` environment to provide a description of the image(s) used in the figure. Unlike `\caption`, which is used alongside the image, `\Description` is intended to be used instead of the image, for example,

```
\begin{figure}
  \centering
  \includegraphics{voltage}
  \Description{A bell-like histogram centered at $0.5\text{~V}$ with most measurements between $0.2\text{~V}$ and $0.8\text{~V}$}
  \caption{Histogram of the measurements of voltage}
  \label{fig:voltage}
\end{figure}
```

At present the lack of descriptions generates a warning at compilation.

## 2.10 Theorems

The ACM classes define two theorem styles and several pre-defined theorem environments:

**acmplain:** this is the style used for `theorem`, `conjecture`, `proposition`, `lemma` and `corollary`, and

**acmdefinition:** this is the style used for `example` and `definition`.

These environments are defined by default. In the unusual circumstance that a user does not wish to have these environments defined, the option `acmthm=false` in the preamble will suppress them.

Sometimes authors want to define new theorem-like constructs that use theorem counters. These constructs must be defined either after `\begin{document}`, or delayed using `\AtEndPreamble` macro, for example,

```
\AtEndPreamble{%
  \theoremstyle{acmdefinition}
  \newtheorem{remark}[theorem]{Remark}}
```

## 2.11 Online-only and offline-only material

`printonly` (*env*) Some supplementary material in ACM publications is put online but not in the printed version.

`screenonly` (*env*) The text inside the environment `screenonly` will be typeset only when the option `screen` (see Section 2.2) is set to `true`. Conversely, the text inside the environment `printonly` is typeset only when this option is set to `false`. For example,

```
\section{Supplementary materials}

\begin{printonly}
```

```

Supplementary materials are available in the online version of this paper.
\end{printonly}

\begin{screenonly}
(The actual supplementary materials.)
\end{screenonly}

```

We use the `comment` package for typesetting this code, so `\begin{...}` and `\end{...}` should start on a line of their own with no leading or trailing spaces.

## 2.12 Note about anonymous mode

`anonsuppress (env)` When the option `anonymous` is selected, TeX suppresses author information (including the number of authors) for a blind review. However, sometimes the information identifying the authors may be present in the body of the paper. For example,

```

\begin{anonsuppress}
This is the continuation of the previous work by the author
\cite{prev1, prev2}.
\end{anonsuppress}

```

As for the `printonly` and `screenonly` environments, `\begin{anonsuppress}` and `\end{anonsuppress}` should start on a line of their own with no leading or trailing spaces.

`\anon` To suppress short snippets of information, use the command `\anon[\langle substitute\rangle]{\langle suppressed-text\rangle}`. By default `[\langle substitute\rangle]` is the word ANONYMOUS. Examples:

```

This work was performed at \anon{NSA}.
This work was performed at \anon[No Such Agency]{NSA}.

```

## 2.13 Acknowledgments

The traditional “Acknowledgments” section is conventionally used to thank persons and granting agencies for their help and support. However, there are several important considerations about this section.

First, in anonymous mode this section must be omitted: it gives too much information to reviewers. Second, data about grants is extracted and stored separately by the postprocessing software. ACM classes provide facilities for both these tasks.

`acks (env)` The environment `acks` starts an unnumbered section “Acknowledgments” unless the anonymous mode is chosen. Put all thanks inside this environment.

As for the `printonly` and `screenonly` environments, `\begin{acks}` and `\end{acks}` should start on a line of their own with no leading or trailing spaces.

`\grantsponsor` All financial support *must* be listed using the commands `\grantsponsor` and `\grantnum`. These commands tell the postprocessing software about the granting organization and grant. The format of these commands is the following:

```

\grantsponsor{\langle sponsorID\rangle}{\langle name\rangle}{\langle url\rangle}
\grantnum[\langle url\rangle]{\langle sponsorID\rangle}{\langle number\rangle}.

```

Here  $\{\langle sponsorID \rangle\}$  is the unique ID used to match grants to sponsors,  $\{\langle name \rangle\}$  is the name of the sponsor,  $\{\langle url \rangle\}$  is its URL, and  $\{\langle number \rangle\}$  is the grant number. The  $\{\langle sponsorID \rangle\}$  of the `\grantnum` command must correspond to the  $\{\langle sponsorID \rangle\}$  of a `\grantsponsor` command. Some awards have their own web pages, which you can include using the optional argument of the `\grantnum` command.

At present  $\{\langle sponsorID \rangle\}$  is chosen by the authors and can be an arbitrary key in the same way the label of a `\cite` is arbitrarily chosen. There might be a change to this policy if the ACM decides to create a global database of sponsoring organizations.

Example:

```
\begin{acks}
The authors would like to thank Dr. Yuhua Li for providing the
matlab code of the \textit{BEPS} method.

The authors would also like to thank the anonymous referees for
their valuable comments and helpful suggestions. This work is
supported by the \grantsponsor{GS501100001809}{National Natural
Science Foundation of
China}{\url{https://doi.org/10.13039/501100001809}} under Grant
No.:~\grantnum{GS501100001809}{61273304}
and~\grantnum[\url{http://www.nnsf.cn/youngscientists}]{GS501100001809}{Young
Scientists' Support Program}.
\end{acks}
```

## 2.14 Bibliography

The ACM lets you use either Bib $\text{\TeX}$  or Bib $\text{\LaTeX}$  to process your references: they require slightly different setup of your  $\text{\TeX}$  file, as detailed in the following subsections.

### 2.14.1 Processing using Bib $\text{\TeX}$

This uses the `natbib` package for formatting references and the Bib $\text{\TeX}$  style file `ACM-Reference-Format.bst` for Bib $\text{\TeX}$  processing. You can disable loading of `natbib` using the option `natbib=false` in `\documentclass`. However, it is not recommended, as well as the use of Bib $\text{\TeX}$  styles other than `ACM-Reference-Format.bst`, and may delay the processing of the manuscript.

`\citetstyle` If you use `natbib`, you can select one of two predefined citation styles using the command `\citetstyle`: the author-year format `acmauthoryear` or the numeric format `acmnumeric`. For example,

```
\citetstyle{acmauthoryear}
```

Note that numeric citations are the default mode for most formats.

`\setcitetstyle` You can further customize `natbib` using the `\setcitetstyle` command, for example,

```
\setcitetstyle{numbers,sort&compress}
```

One of the more common versions is

```
\setcitetstyle{nosort}
```

It is useful if you do not like the way `natbib` sorts citation lists.

If you use `natbib`, then commands like `\citet` and `\citeauthor` are automatically supported. The command `\shortcite` is the same as `\cite` in numerical mode and cites the year in author-date mode.

Note that before version 1.48 the command `\citeyear` put the year in parentheses. In version 1.48 and later it produces just the year; the command `\citeyearpar` can be used to emulate its old behavior.

There are several customized BibTeX entry types and fields in the ACM style file `ACM-Reference-Format.bst` that you may want to be aware of.

The style supports the fields `doi` and `url`, for example,

```
doi = "10.1145/1188913.1188915",
url = "http://ccrma.stanford.edu/~jos/bayes/bayes.pdf",
```

Normally the printing of URL is suppressed if DOI is present. However, there is a special field `distinctURL`. If it is present and is not zero, URL is printed even if DOI is present.

The style supports the arXiv-recommended fields `eprint` and (optionally) `primaryclass`, for example,

```
eprint = "960935712",
primaryclass = "cs",
```

See the examples at <https://arxiv.org/help/hypertex/bibstyles>.

There are several special entry types. Types `online` and `game` are used for Web pages and games, for example,

```
@online{Thornburg01,
  author = "Harry Thornburg",
  year = "2001",
  title = "Introduction to Bayesian Statistics",
  url = "http://ccrma.stanford.edu/~jos/bayes/bayes.html",
  month = mar,
  lastaccessed = "March 2, 2005",
}
```

Entry types `artifactsoftware`, `artifactdataset` (with synonyms `software` and `dataset`) can be used to cite software artifacts and datasets, for example,

```
@ArtifactSoftware{R,
  title = {R: A Language and Environment for Statistical Computing},
  author = {{R Core Team}},
  organization = {R Foundation for Statistical Computing},
  address = {Vienna, Austria},
  year = {2019},
  url = {https://www.R-project.org/},
}
@ArtifactDataset{UMassCitations,
  author = {Sam Anzaroot and Andrew McCallum},
  title = {{UMass} Citation Field Extraction Dataset},
  year = 2013,
  url = {http://www.iesl.cs.umass.edu/data/data-umasscitationfield},
```

```

    lastaccessed = {May 27, 2019}
}

```

For these entry types you can use the `lastaccessed` field to add the access date for the URL.

There are two ways to enter video or audio sources in the bibliography corresponding to two different possibilities. For standalone sources available online, you can use an `online` entry and set its `howpublished` field. For example,

```

@online{Obama08,
    author = "Barack Obama",
    year = "2008",
    title = "A more perfect union",
    howpublished = "Video",
    day = "5",
    url = "http://video.google.com/videoplay?docid=6528042696351994555",
    month = mar,
    lastaccessed = "March 21, 2008",
}

```

For sources available as attachments to conference proceedings and similar documents, you can use the usual `inproceedings` entry type and set its `howpublished` field:

```

@Inproceedings{Novak03,
    author = "Dave Novak",
    title = "Solder man",
    booktitle = "ACM SIGGRAPH 2003 Video Review on Animation theater Program",
    year = "2003",
    publisher = "ACM Press",
    address = "New York, NY",
    pages = "4",
    month = "March 21, 2008",
    doi = "10.9999/woot07-S422",
    howpublished = "Video",
}

```

Sometimes you need to cite a complete issue of a journal. The `periodical` entry type is intended for this:

```

@periodical{JCohen96,
    key = "Cohen",
    editor = "Jacques Cohen",
    title = "Special issue: Digital Libraries",
    journal = "Communications of the {ACM}",
    volume = "39",
    number = "11",
    month = nov,
    year = "1996",
}

```

If you do not know the year of publication, the style will add “[n. d.]” (for “no date”) to the entry.

If you do not know the author (this is often the case for online entries), use the key field to add a key for sorting and citations, for example,

```
@online{TUGInstmem,
key = {TUG},
year = 2017,
title = "Institutional members of the {\TeX} Users Group",
url = "http://www.tug.org/instmem.html",
lastaccessed = "May 27, 2017",
}
```

A note about sorting. The current ACM bibliography styles always sort the entries according to authors names and publication year. There is a controversy about sorting names with “von” or “van” part: should Ludwig van Beethoven be sorted under “V” or under “B”? The American practice is to use “van” in sorting, i.e. to file van Beethoven under “V”. However, some authorities recommend to sort Dutch persons according to their last names (see e.g. [https://www.ifla.org/files/assets/cataloguing/pubs/names-of-persons\\_1996.pdf](https://www.ifla.org/files/assets/cataloguing/pubs/names-of-persons_1996.pdf)). While I do not want to take a part in this dispute, I would like to point to the old “noopsort” trick by Oren Patashnik. Add to the .bib file the line

```
@PREAMBLE{"\providecommand{\noopsort}[1]{}"}
```

and then encode the author as

```
author = {Ludwig \noopsort{Beethoven} van Beethoven},
```

This will make the author to be sorted as “Beethoven” rather than “van Beethoven”.

The current bst style defines a number of macros for common journal names. In particular, all journals listed in Table 5 are includes, so you can use strings like journal = taccess for *ACM Transactions on Accessible Computing*.

### 2.14.2 Processing using Bib<sup>L</sup>T<sub>E</sub>X

You will find in this package two sets of style files for Bib<sup>L</sup>T<sub>E</sub>X, acmnumeric and acmauthoryear, that mimic the behaviour of the ACM-Reference-Format.bst Bib<sub>T</sub><sup>E</sup>X style. They provide you access to all the power of Bib<sup>L</sup>T<sub>E</sub>X and already include support for advanced citation of software artefact from the biblatex-software package, also separately available on CTAN. Look at the biblatex-software documentation to learn more about what it offers.

There are a few key differences in how the <sup>L</sup>T<sub>E</sub>X sources are set up when using Bib<sup>L</sup>T<sub>E</sub>X instead of Bib<sub>T</sub><sup>E</sup>X, that we summarize briefly here (please refer to the official Bib<sup>L</sup>T<sub>E</sub>X documentation for more details).

In the preamble of your document you need to load the Bib<sup>L</sup>T<sub>E</sub>X package and select the appropriate bibliography style, as follows

```
\RequirePackage[
  datamodel=acmdatamodel,
  style=acmnumeric, % use style=acmauthoryear for publications that require it
]{biblatex}
```

Also in the preamble, you need to declare the bibliography sources files using the `\addbibresource` directive (one `\addbibresource` command per source file), e.g.:

```
\addbibresource{software.bib}  
\addbibresource{sample-base.bib}
```

At the end of the document, where you want the bibliography to appear, you need to place the command `\printbibliography`.

Look at the `sample-*-biblatex.tex` files that can be found in the `samples` directory after running `make` for templates showcasing these Bib<sup>L</sup>TEX styles.

## 2.15 Colors

While printed ACM publications are usually black and white, screen mode allows the use of colors. The ACM classes pre-define several colors according to [8]: ACMBrown, ACMYellow, ACMOrange, ACMRed, ACMLightBlue, ACMGreen, ACMPurple and ACMDarkBlue. You can use them in color assignments.

The ACM provides the following recommendation on color use.

The most accessible approach would be to ensure that your article is still readable when printed in greyscale. The most notable reasons for this are:

1. The most common type of inherited Color Vision Deficiency (CVD) is red-green (in which similar-brightness colors that differ only in their amounts of red or green are often confused), and it affects up to 8% of males and 0.5% of females of Northern European descent.
2. The most common type of acquired Color Vision Deficiency (CVD) is blue-yellow (including mild cases for many older adults).
3. Most printing is in black and white.
4. Situational impairments (e.g., bright sunlight shining on a mobile screen) tend to reduce the entire color gamut, reducing color discriminability.

**Note:** It is *not* safe to encode information using only variations in color (i.e., only differences in hue and/or saturation) as there is bound to be someone affected!

To ensure that you are using the most accessible colors, the ACM recommends that you choose sets of colors to help ensure suitable variations in when printed in greyscale by using either of the following tools:

1. ColourBrewer: <http://colorbrewer2.org/>
2. ACE: The Accessible Colour Evaluator: <http://daprlab.com/ace/> for designing WCAG 2.0 compliant palettes.

## 2.16 Other notable packages and typographic remarks

Several other packages are recommended for specialized tasks.

The package `subcaption` [9] is recommended for complex figures with several subplots or subfigures that require separate subcaptioning. The packages `nomenc1` [10] and `glossaries` [11] can be used for the automatic creation of the lists of symbols and concepts used.

By default `acmart` prevents all widows and orphans (i.e., lonely lines at the beginning or end of the page) and hyphenation at the end of the page. This is done by the rather strict settings

```
\widowpenalty=10000
\clubpenalty=10000
\brokepenalty=10000
```

However, this may lead to frustrating results when the authors must obey a page limit. Setting these penalties to smaller values may help if you absolutely need to.

Another problem might be the too strict line breaking rules. Again, a strategically placed `\sloppy` command or putting the problematic paragraph inside `sloppypar` environment might help—but beware, the results might be, well, sloppy.

Note that the uppercasing in section titles is done using the `textcase` package [12], so the command `\NoCaseChange` inside the title may help to prevent extraneous uppercasing.

## 2.17 Counting words

Some ACM conferences use word count limits for papers. The calculation of word number for a paper with math, tables and figures is not a trivial task. Currently the authoritative word count is done by translating the PDF to text and using `wc -w` on the output. Authors can use the package `texcount` (used by Overleaf) to get an estimate of the word count. To facilitate this one adds to the beginning of the package metacomments

```
%TC:macro \cite [option:text,text]
%TC:macro \citet [option:text,text]
%TC:macro \citet [option:text,text]
%TC:envir table 0 1
%TC:envir table* 0 1
%TC:envir tabular [ignore] word
%TC:envir displaymath 0 word
%TC:envir math 0 word
%TC:envir comment 0 0
```

and uses `\begin{math}... \end{math}` instead of dollar signs for math. Note that the count is in any case approximate, and the final decision of editors is based on PDF count.

The script `texcount` provides a report of word count in the document.

## 2.18 Creative Commons licenses for ACM publications

At present ACM does not allow the authors to typeset Creative Commons license for most ACM publications. These licenses can be used under an agreement with the ACM publishing office. In this case they are inserted by ACM itself.

The exceptions are ACM Engage format, which allows Creative Commons license, and conferences organized and copyrighted by IW3C2. In these cases the authors should use correspondingly `\setcopyright{cc}`, `\setcopyright{iw3c2w3}`, or `\setcopyright{iw3c2w3g}` (the latter should be used by Google employees).

Yet another case is the typesetting of non-ACM materials, when the option `nonacm` is used. This case is somewhat opposite, because for this case *only* Creative Common licenses are supported.

The command `\setcopyright{cc}` produces an error unless the format is `acmengage` or `nonacm` option is selected. On the other hand, if the option `nonacm` is selected, any argument of `\setcopyright` other than `cc` is treated as none.

## 2.19 Disabled or forbidden commands

The goal of `acmart` package is to provide a uniform look and feel for ACM publications. Accordingly, a number of commands is forbidden or disabled in `acmart`.

You may *not* put several authors or several e-mails into a `\author` or `\email` command. This may lead to errors or warning.

You cannot change `\baselinestretch` in your document: this produces an error.

You should not abuse the command `\vspace`: this command may disturb the typesetting of ACM papers.

You should not load `amssymb` package since the package `acmart` defines the corresponding symbols itself.

## 2.20 Notes for wizards

Sometimes you need to change the behavior of `acmart`. The usual way to do this is to redefine commands in the preamble. However, these definitions are executed *after* `acmart` is loaded and certain decisions are made. This presents a number of problems.

For example, one may want to use the `titletoc` package with `acmart`. This package should be loaded before `hyperref`. However, since `acmart` loads `hyperref` itself, the line `\usepackage{titletoc}` in the preamble will lead to grief (see <http://tex.stackexchange.com/questions/35265/using-titletoc-with-acm-acmart-style>).

Another example is passing options to a package. Suppose you want to use the `dvipsnames` option of the `xcolor` package. Normally you cannot do this because `acmart` loads this package itself without options.

The file `acmart-preload-hook.tex` can be used to solve these problems. If this file exists, it will be processed before any other package. You can use this file to load packages or pass options to them. For example, if you put in this file

```
\let\LoadClassOrig\LoadClass
\renewcommand\LoadClass[2][]{\LoadClassOrig[#1]{#2}%
\usepackage{titletoc}}
```

then `titletoc` will be loaded before `hyperref`. If you put in this file

```
\PassOptionsToPackage{dvipsnames}{xcolor}
```

you will pass `dvipsnames` to `xcolor`.

**Important note.** This hook makes it too easy to create a manuscript that is not acceptable by the ACM. It is even easier to create a file that cannot be compiled. So please do not use it *unless you know what you are doing*. And if you use it, *do not ask for support*. If you decide to use this hook, you are on your own.

`\AtBeginMaketitle` Another hook is `\AtBeginMaketitle`. The commands in this hook are executed before `\maketitle`, for example,

```
\AtBeginMaketitle{\acmPrice{125.00}}
```

## 2.21 Currently supported publications

Table 5: ACM publications and arguments of the \acmJournal command

| Abbreviation | Publication                                                                |
|--------------|----------------------------------------------------------------------------|
| ACMJCSS      | ACM Journal on Computing and Sustainable Societies                         |
| CIE          | ACM Computers in Entertainment                                             |
| CSUR         | ACM Computing Surveys                                                      |
| DLT          | Distributed Ledger Technologies: Research and Practice                     |
| DGOV         | Digital Government: Research and Practice                                  |
| DTRAP        | Digital Threats: Research and Practice                                     |
| FAC          | Formal Aspects of Computing                                                |
| GAMES        | ACM Games: Research and Practice                                           |
| HEALTH       | ACM Transactions on Computing for Healthcare                               |
| IMWUT        | PACM on Interactive, Mobile, Wearable and Ubiquitous Technologies          |
| JACM         | Journal of the ACM                                                         |
| JATS         | ACM Journal on Autonomous Transportation Systems                           |
| JDIQ         | ACM Journal of Data and Information Quality                                |
| JDS          | ACM/IMS Journal of Data Science                                            |
| JEA          | ACM Journal of Experimental Algorithms                                     |
| JERIC        | ACM Journal of Educational Resources in Computing                          |
| JETC         | ACM Journal on Emerging Technologies in Computing Systems                  |
| JOCCH        | ACM Journal on Computing and Cultural Heritage                             |
| JRC          | ACM Journal on Responsible Computing                                       |
| PACMCGIT     | Proceedings of the ACM on Computer Graphics and Interactive Techniques     |
| PACMHCI      | PACM on Human-Computer Interaction                                         |
| PACMPL       | PACM on Programming Languages                                              |
| POMACS       | PACM on Measurement and Analysis of Computing Systems                      |
| TAAS         | ACM Transactions on Autonomous and Adaptive Systems                        |
| TACCESS      | ACM Transactions on Accessible Computing                                   |
| TACO         | ACM Transactions on Architecture and Code Optimization                     |
| TALG         | ACM Transactions on Algorithms                                             |
| TALLIP       | ACM Transactions on Asian and Low-Resource Language Information Processing |
| TAP          | ACM Transactions on Applied Perception                                     |
| TCPS         | ACM Transactions on Cyber-Physical Systems                                 |
| TDS          | ACM/IMS Transactions on Data Science                                       |
| TEAC         | ACM Transactions on Economics and Computation                              |
| TECS         | ACM Transactions on Embedded Computing Systems                             |
| TELO         | ACM Transactions on Evolutionary Learning                                  |
| THRI         | ACM Transactions on Human-Robot Interaction                                |
| TIIS         | ACM Transactions on Interactive Intelligent Systems                        |
| TIOT         | ACM Transactions on Internet of Things                                     |
| TISSEC       | ACM Transactions on Information and System Security                        |
| TIST         | ACM Transactions on Intelligent Systems and Technology                     |
| TKDD         | ACM Transactions on Knowledge Discovery from Data                          |
| TMIS         | ACM Transactions on Management Information Systems                         |

Table 5: ACM publications and arguments of the \acmJournal command (continued)

| Abbreviation | Publication                                                                  |
|--------------|------------------------------------------------------------------------------|
| TOCE         | ACM Transactions on Computing Education                                      |
| TOCHI        | ACM Transactions on Computer-Human Interaction                               |
| TOCL         | ACM Transactions on Computational Logic                                      |
| TOCS         | ACM Transactions on Computer Systems                                         |
| TOCT         | ACM Transactions on Computation Theory                                       |
| TODAES       | ACM Transactions on Design Automation of Electronic Systems                  |
| TODS         | ACM Transactions on Database Systems                                         |
| TOG          | ACM Transactions on Graphics                                                 |
| TOIS         | ACM Transactions on Information Systems                                      |
| TOIT         | ACM Transactions on Internet Technology                                      |
| TOMACS       | ACM Transactions on Modeling and Computer Simulation                         |
| TOMM         | ACM Transactions on Multimedia Computing, Communications and Applications    |
| TOMPECS      | ACM Transactions on Modeling and Performance Evaluation of Computing Systems |
| TOMS         | ACM Transactions on Mathematical Software                                    |
| TOPC         | ACM Transactions on Parallel Computing                                       |
| TOPLAS       | ACM Transactions on Programming Languages and Systems                        |
| TOPS         | ACM Transactions on Privacy and Security                                     |
| TORS         | ACM Transactions on Recommender Systems                                      |
| TOS          | ACM Transactions on Storage                                                  |
| TOSEM        | ACM Transactions on Software Engineering and Methodology                     |
| TOSN         | ACM Transactions on Sensor Networks                                          |
| TQC          | ACM Transactions on Quantum Computing                                        |
| TRETS        | ACM Transactions on Reconfigurable Technology and Systems                    |
| TSAS         | ACM Transactions on Spatial Algorithms and Systems                           |
| TSC          | ACM Transactions on Social Computing                                         |
| TSLP         | ACM Transactions on Speech and Language Processing                           |
| TWEB         | ACM Transactions on the Web                                                  |

Besides the publications listed in Table 5, there is a special “publication” type FACMP, a forthcoming ACM publication, reserved for new journals which are not assigned an ISSN yet.

## 2.22 A note about sigchi-a format

Starting in Spring 2020 ACM retired SIGCHI Extended Abstract format (sigchi-a). ACM will not, under any circumstances, accept documents in this format for publication and will not offer technical support to the authors who use this template.

You may use this format in the nonacm mode only, as in

```
\documentclass[sigchi-a, nonacm]{acmart}
```

`sidebar (env)` This format has large margin uses for special figures and tables. This package provides three environments for this with optional captions:  
`marginfigure (env)`  
`margintable (env)`

**sidebar:** textual information in the margin,

**marginfigure:** a figure in the margin,

**margintable:** a table in the margin.

The environments `figure` and `table` produce figures and tables with the width of the text column. The environments `figure*` and `table*` produce “wide” figures and tables, which take a large part of the margin.

The horizontal sizes of figures are:

1. `figure`: `\columnwidth`,
2. `marginfigure`: `\marginparwidth`,
3. `figure*`: `\fulltextwidth`.

## 3 Implementation

### 3.1 Identification

We start with a declaration of who we are. Most .dtx files put driver code in a separate .drv driver file. We roll this code into the main file and use the pseudo-guard <gobble> for it.

```
1 <class>\NeedsTeXFormat{LaTeX2e}
2 <*gobble>
3 \ProvidesFile{acmart.dtx}
4 </gobble>
5 <class>\ProvidesClass{acmart}
6 [2022/10/18 v1.87 Typesetting articles for the Association for Computing Machinery]
```

And the driver code:

```
7 <*gobble>
8 \documentclass[ltxdoc]
9 \usepackage{array,booktabs,amsmath,graphicx,fancyvrb,tabularx, longtable}
10 \usepackage[tt=false, type1=true]{libertine}
11 \usepackage[varqu]{zi4}
12 \usepackage[libertine]{newtxmath}
13 \usepackage[tableposition=top]{caption}
14 \usepackage{hypdoc}
15 \PageIndex
16 \CodelineIndex
17 \RecordChanges
18 \EnableCrossrefs
19 \begin{document}
20   \DocInput{acmart.dtx}
21 \end{document}
22 </gobble>
23 <*class>
24 \def\@classname{acmart}
```

### 3.2 Preload hook

We preload acmart-preload-hook:

```
25 \InputIfFileExists{acmart-preload-hook.tex}{%
26   \ClassWarning{@classname}{%
27     I am loading acmart-preload-hook.tex. You are fully responsible
28     for any problems from now on.}}{}
```

### 3.3 Options

We need xkeyval since some of our options may have values:

```
29 \RequirePackage{xkeyval}
```

We use xstring to check whether user input is valid

```
30 \RequirePackage{xstring}
```

We need iftex to check the engine

```
31 \RequirePackage{iftex}
```

```
format The possible formats
```

```
32 \define@choicekey*+{acmart.cls}{format}[\ACM@format\ACM@format@nr]{%
33   manuscript, acmsmall, acmlarge, acmtog, sigconf, siggraph,
34   sigplan, sigchi, sigchi-a, acmengage, acmcpc}[manuscript]{}{%
35   \ClassError{@classname}{The option format must be manuscript,
36   acmsmall, acmlarge, acmtog, sigconf, siggraph,
37   sigplan, sigchi or sigchi-a}}
38 \def\@DeclareACMFormat#1{\DeclareOptionX{#1}{\setkeys{acmart.cls}{format=#1}}}
39 \@DeclareACMFormat{manuscript}
40 \@DeclareACMFormat{acmsmall}
41 \@DeclareACMFormat{acmlarge}
42 \@DeclareACMFormat{acmtog}
43 \@DeclareACMFormat{sigconf}
44 \@DeclareACMFormat{siggraph}
45 \@DeclareACMFormat{sigplan}
46 \@DeclareACMFormat{sigchi}
47 \@DeclareACMFormat{sigchi-a}
48 \@DeclareACMFormat{acmengage}
49 \@DeclareACMFormat{acmcpc}
50 \ExecuteOptionsX{format}
```

```
\if@ACM@screen Whether we use screen mode
```

```
51 \define@boolkey+{acmart.cls}[@ACM@]{screen}[true]{%
52   \if@ACM@screen
53     \PackageInfo{@classname}{Using screen mode}%
54   \else
55     \PackageInfo{@classname}{Not using screen mode}%
56   \fi}{\PackageError{@classname}{The option screen can be either true or
57   false}}
58 \ExecuteOptionsX{screen=false}
```

```
\if@ACM@urlbreakonhyphens
```

```
59 \define@boolkey+{acmart.cls}[@ACM@]{urlbreakonhyphens}[true]{%
60   \if@ACM@urlbreakonhyphens
61     \PackageInfo{@classname}{Using breaking urls on hyphens}%
62   \else
63     \PackageInfo{@classname}{Not breaking urls on hyphens}%
64   \fi}{\PackageError{@classname}{The option urlbreakonhyphens can be either true or
65   false}}
66 \ExecuteOptionsX{urlbreakonhyphens=true}
```

```
\if@ACM@acmthm Whether we define theorem-like environments.
```

```
67 \define@boolkey+{acmart.cls}[@ACM@]{acmthm}[true]{%
68   \if@ACM@acmthm
69     \PackageInfo{@classname}{Requiring acmthm}%
70   \else
71     \PackageInfo{@classname}{Suppressing acmthm}%
72   \fi}{\PackageError{@classname}{The option acmthm can be either true or
73   false}}
74 \ExecuteOptionsX{acmthm=true}
```

```
\if@ACM@review Whether we use review mode
```

```
75 \define@boolkey+{acmart.cls}[@ACM@]{review}[true]{%
```

```

76  \if@ACM@review
77    \PackageInfo{@classname}{Using review mode}%
78    \AtBeginDocument{@ACM@printfoliotrue}%
79  \else
80    \PackageInfo{@classname}{Not using review mode}%
81  \fi{\PackageError{@classname}{The option review can be either true or
82    false}}%
83 \ExecuteOptionsX{review=false}

\if@ACM@authorversion Whether we use author's-version mode
84 \define@boolkey+{acmart.cls}[@ACM@]{authorversion}[true]{%
85   \if@ACM@authorversion
86     \PackageInfo{@classname}{Using authorversion mode}%
87   \else
88     \PackageInfo{@classname}{Not using authorversion mode}%
89  \fi{\PackageError{@classname}{The option authorversion can be either true or
90    false}}%
91 \ExecuteOptionsX{authorversion=false}

\if@ACM@nonacm Special option for non-ACM publications using the ACM typesetting options.
92 \define@boolkey+{acmart.cls}[@ACM@]{nonacm}[true]{%
93   \if@ACM@nonacm
94     \PackageInfo{@classname}{Using nonacm mode}%
95     \AtBeginDocument{@ACM@printacmreffalse}%
96     % in 'nonacm' mode we disable the "ACM Reference Format"
97     % printing by default, but this can be re-enabled by the
98     % user using \settopmatter{printacmref=true}
99   \else
100     \PackageInfo{@classname}{Not using nonacm mode}%
101  \fi{\PackageError{@classname}{The option nonacm can be either true or
102    false}}%
103 \ExecuteOptionsX{nonacm=false}

\if@ACM@balance Whether to balance the last page
104 \define@boolkey+{acmart.cls}[@ACM@]{balance}[true]{}{%
105   \PackageError{@classname}{The option balance can be either true or
106    false}}%
107 \ExecuteOptionsX{balance}

\if@ACM@pbalance Whether to balance the last page
108 \define@boolkey+{acmart.cls}[@ACM@]{pbalance}[true]{}{%
109   \PackageError{@classname}{The option pbalance can be either true or
110    false}}%
111 \ExecuteOptionsX{pbalance=false}

\if@ACM@natbib@override This macro is no longer used.

\if@ACM@natbib Whether we use natbib mode
112 \define@boolkey+{acmart.cls}[@ACM@]{natbib}[true]{%
113   \if@ACM@natbib
114     \PackageInfo{@classname}{Explicitly selecting natbib mode}%
115   \else
116     \PackageInfo{@classname}{Explicitly deselecting natbib mode}%
117  \fi{\PackageError{@classname}{The option natbib can be either true or

```

```

118     false}}
119 \ExecuteOptionsX{natbib=true}

\if@ACM@anonymous Whether we use anonymous mode
120 \define@boolkey+{acmart.cls}[@ACM@]{anonymous}[true]{%
121   \if@ACM@anonymous
122     \PackageInfo{@classname}{Using anonymous mode}%
123   \else
124     \PackageInfo{@classname}{Not using anonymous mode}%
125   \fi}{\PackageError{@classname}{The option anonymous can be either true or
126   false}}
127 \ExecuteOptionsX{anonymous=false}

\if@ACM@timestamp Whether we use timestamp mode
128 \define@boolkey+{acmart.cls}[@ACM@]{timestamp}[true]{%
129   \if@ACM@timestamp
130     \PackageInfo{@classname}{Using timestamp mode}%
131   \else
132     \PackageInfo{@classname}{Not using timestamp mode}%
133   \fi}{\PackageError{@classname}{The option timestamp can be either true or
134   false}}
135 \ExecuteOptionsX{timestamp=false}

\if@ACM@authordraft Whether we use author-draft mode
136 \define@boolkey+{acmart.cls}[@ACM@]{authordraft}[true]{%
137   \if@ACM@authordraft
138     \PackageInfo{@classname}{Using authordraft mode}%
139     \@ACM@timestamptrue
140     \@ACM@reviewtrue
141   \else
142     \PackageInfo{@classname}{Not using authordraft mode}%
143   \fi}{\PackageError{@classname}{The option authordraft can be either true or
144   false}}
145 \ExecuteOptionsX{authordraft=false}

\ACM@fontsize The font size to pass to the base class
146 % \changes{v1.87}{2022/08/27}{Added fontsize 8pt}
147 \def\ACM@fontsize{}
148 \DeclareOptionX{8pt}{\edef\ACM@fontsize{\CurrentOption}}
149 \DeclareOptionX{9pt}{\edef\ACM@fontsize{\CurrentOption}}
150 \DeclareOptionX{10pt}{\edef\ACM@fontsize{\CurrentOption}}
151 \DeclareOptionX{11pt}{\edef\ACM@fontsize{\CurrentOption}}
152 \DeclareOptionX{12pt}{\edef\ACM@fontsize{\CurrentOption}}

\ACM@languages The languages of the document
153 \def\ACM@languages{}
154 \DeclareOptionX{language}{%
155   \ifx\ACM@languages\empty
156   \gdef\ACM@languages{english}\fi
157   \g@addto@macro\ACM@languages{, #1}}
158 \DeclareOptionX{draft}{\PassOptionsToClass{\CurrentOption}{amsart}}
159 \DeclareOptionX{*}{\PassOptionsToClass{\CurrentOption}{amsart}}
160 \ProcessOptionsX
161 \ClassInfo{@classname}{Using format \ACM@format, number \ACM@format@nr}

```

### 3.4 Setting switches

```
\if@ACM@manuscript Whether we use manuscript mode
162 \newif\if@ACM@manuscript

\if@ACM@journal There are two kinds of publications: journals and books
163 \newif\if@ACM@journal

\if@ACM@journal@bibstrip Sometimes ACM wants a journal-like publication to have conference information in the
bibstrip and vice versa, so we have an additional switch.
164 \newif\if@ACM@journal@bibstrip

\if@ACM@sigchiamode The formatting of SIGCHI extended abstracts is quite unusual. We have a special switch
for them.
165 \newif\if@ACM@sigchiamode

\if@ACM@engage ACM Engage course materials have special formatting
166 \newif\if@ACM@engage
167 \@ACM@engagefalse

\if@ACM@acmcpc ACM cover page formatting
168 \newif\if@ACM@acmcpc
169 \@ACM@acmcpcfse

      Setting up switches
170 \ifnum\ACM@format@nr=5\relax % siggraph
171 \ClassWarning{@classname}{%
172   The format siggraph is now obsolete.\MessageBreak
173   I am switching to sigconf.}
174   \setkeys{acmart.cls}{format=sigconf}
175 \fi
176 \ifnum\ACM@format@nr=7\relax % sigchi
177 \ClassWarning{@classname}{%
178   The format sigchi is now obsolete.\MessageBreak
179   I am switching to sigconf.}
180   \setkeys{acmart.cls}{format=sigconf}
181 \fi
182 \ifnum\ACM@format@nr=8\relax % sigchi
183 \ClassWarning{@classname}{%
184   ACM SIGCHI has retired the SIGCHI-A template\MessageBreak
185   effective immediately. ACM is keeping this template\MessageBreak
186   option available to authors who are working on legacy\MessageBreak
187   documents only. ACM will not, under any circumstances,\MessageBreak
188   accept documents in this format for publication and\MessageBreak
189   will not offer technical support to the authors who use\MessageBreak
190   this template.\MessageBreak
191   ACM SIGCHI is directing Conference leaders and\MessageBreak
192   authors to publish their articles using the SIGCONF\MessageBreak
193   template call.}
194 \fi
195 \ifnum\ACM@format@nr=0\relax
196   \@ACM@manuscripttrue
197 \else
```

```

198   \@ACM@manuscriptfalse
199 \fi
200 \@ACM@sigchiamodefalse
201 \ifcase\ACM@format@nr
202 \relax % manuscript
203 \@ACM@journaltrue
204 \or % acmsmall
205 \@ACM@journaltrue
206 \or % acmlarge
207 \@ACM@journaltrue
208 \or % acmtog
209 \@ACM@journaltrue
210 \or % sigconf
211 \@ACM@journalfalse
212 \or % siggraph
213 \@ACM@journalfalse
214 \or % sigplan
215 \@ACM@journalfalse
216 \or % sigchi
217 \@ACM@journalfalse
218 \or % sigchi-a
219 \@ACM@journalfalse
220 \@ACM@sigchiamodetrue
221 \or % acmengage
222 \@ACM@journalfalse
223 \@ACM@engagetrue
224 \or % acmcp
225 \@ACM@journaltrue
226 \@ACM@acmcptrue
227 \AtBeginDocument{\@ACM@printacmreffalse}%
228 \fi
229 \if@ACM@journal
230 \@ACM@journal@bibstriptrue
231 \else
232 \@ACM@journal@bibstripfalse
233 \fi

```

### 3.5 Loading the base class and package

At this point we either have \ACM@fontsize or use defaults

```

234 \ifx\ACM@fontsize\empty
235 \ifcase\ACM@format@nr
236 \relax % manuscript
237 \def\ACM@fontsize{9pt}%
238 \or % acmsmall
239 \def\ACM@fontsize{10pt}%
240 \or % acmlarge
241 \def\ACM@fontsize{10pt}%
242 \or % acmtog
243 \def\ACM@fontsize{9pt}%
244 \or % sigconf
245 \def\ACM@fontsize{9pt}%
246 \or % siggraph
247 \def\ACM@fontsize{9pt}%

```

```

248 \or % sigplan
249   \def\ACM@fontsize{10pt}%
250 \or % sigchi
251   \def\ACM@fontsize{9pt}%
252 \or % sigchi-a
253   \def\ACM@fontsize{10pt}%
254 \or % acmengage
255   \def\ACM@fontsize{10pt}%
256 \or % acmcnp
257   \def\ACM@fontsize{9pt}%
258 \fi
259 \fi
260 \ClassInfo{@classname}{Using fontsize \ACM@fontsize}
261 \LoadClass[\ACM@fontsize, reqno]{amsart}
262 \RequirePackage{microtype}

```

We need etoolbox for delayed code

```
263 \RequirePackage{etoolbox}
```

Booktabs is now the default

```
264 \RequirePackage{booktabs}
```

We need totpages to calculate the number of pages and refcount to use that number

```
265 \RequirePackage{refcount}
```

```
266 \RequirePackage{totpages}
```

The \collect@body macro in amsmath is defined using \def. We load environ to access the \long version of this command

```
267 \RequirePackage{environ}
```

We use setspace for double spacing

```
268 \if@ACM@manuscript
```

```
269 \RequirePackage{setspace}
```

```
270 \onehalfspacing
```

```
271 \fi
```

We need textcase for better upcasing

```
272 \RequirePackage{textcase}
```

```
273 \if@ACM@acmcnp
```

```
274 \RequirePackage{framed}
```

```
275 \fi
```

### 3.6 Citations

We patch \setcitestyle to allow, for example, \setcitestyle{sort} and \setcitestyle{nosort}. We patch \citestyle to warn about undefined citation styles.

```
276 \if@ACM@natbib
```

```
277 \RequirePackage{natbib}
```

```
278 \renewcommand{\bibsection}{%
```

```
279   \section*{\refname}%

```

```
280   \phantomsection\addcontentsline{toc}{section}{\refname}%

```

```
281 }
```

```
282 \renewcommand{\bibfont}{\bibliofont}
```

```
283 \renewcommand\setcitestyle[1]{
```

```

284  \@for\@tempa:=#1\do
285  {\def\@tempb{round}\ifx\@tempa\@tempb
286    \renewcommand\NAT@open{\{} \renewcommand\NAT@close{\}}\fi
287  \def\@tempb{square}\ifx\@tempa\@tempb
288    \renewcommand\NAT@open{[]}\renewcommand\NAT@close{[]}\fi
289  \def\@tempb{angle}\ifx\@tempa\@tempb
290    \renewcommand\NAT@open{$<$}\renewcommand\NAT@close{$>$}\fi
291  \def\@tempb{curly}\ifx\@tempa\@tempb
292    \renewcommand\NAT@open{\{\}} \renewcommand\NAT@close{\}}\fi
293  \def\@tempb{semicolon}\ifx\@tempa\@tempb
294    \renewcommand\NAT@sep{;}\fi
295  \def\@tempb{colon}\ifx\@tempa\@tempb
296    \renewcommand\NAT@sep{;}\fi
297  \def\@tempb{comma}\ifx\@tempa\@tempb
298    \renewcommand\NAT@sep{,}\fi
299  \def\@tempb{authoryear}\ifx\@tempa\@tempb
300    \NAT@numbersfalse\fi
301  \def\@tempb{numbers}\ifx\@tempa\@tempb
302    \NAT@numberstrue\NAT@superfalse\fi
303  \def\@tempb{super}\ifx\@tempa\@tempb
304    \NAT@numberstrue\NAT@supertrue\fi
305  \def\@tempb{nobibstyle}\ifx\@tempa\@tempb
306    \let\bibstyle=\@gobble\fi
307  \def\@tempb{bibstyle}\ifx\@tempa\@tempb
308    \let\bibstyle=\@citestyle\fi
309  \def\@tempb{sort}\ifx\@tempa\@tempb
310    \def\NAT@sort{\@ne}\fi
311  \def\@tempb{nosort}\ifx\@tempa\@tempb
312    \def\NAT@sort{\z@\fi
313  \def\@tempb{compress}\ifx\@tempa\@tempb
314    \def\NAT@cmprs{\@ne}\fi
315  \def\@tempb{nocompress}\ifx\@tempa\@tempb
316    \def\NAT@cmprs{\z@\fi
317  \def\@tempb{sort&compress}\ifx\@tempa\@tempb
318    \def\NAT@sort{\@ne}\def\NAT@cmprs{\@ne}\fi
319  \def\@tempb{mcite}\ifx\@tempa\@tempb
320    \let\NAT@merge=\@ne\fi
321  \def\@tempb{merge}\ifx\@tempa\@tempb
322    \@ifnum{\NAT@merge<\tw@}{\let\NAT@merge\tw@}\{}\fi
323  \def\@tempb{elide}\ifx\@tempa\@tempb
324    \@ifnum{\NAT@merge<\thr@}{\let\NAT@merge\thr@}\{}\fi
325  \def\@tempb{longnamesfirst}\ifx\@tempa\@tempb
326    \NAT@longnamestrue\fi
327  \def\@tempb{nonamebreak}\ifx\@tempa\@tempb
328    \def\NAT@nmfmt#1{\mbox{\NAT@up#1}}\fi
329  \expandafter\NAT@find@eq\@tempa=\relax\@nil
330  \if\@tempc\relax\else
331    \expandafter\NAT@rem@eq\@tempc
332  \def\@tempb{open}\ifx\@tempa\@tempb
333    \xdef\NAT@open{\@tempc}\fi
334  \def\@tempb{close}\ifx\@tempa\@tempb
335    \xdef\NAT@close{\@tempc}\fi
336  \def\@tempb{aysep}\ifx\@tempa\@tempb
337    \xdef\NAT@aysep{\@tempc}\fi

```

```

338     \def\@tempb{yysep}\ifx\@tempa\@tempb
339         \xdef\NAT@yrsep{\@tempc}\fi
340     \def\@tempb{notesep}\ifx\@tempa\@tempb
341         \xdef\NAT@cmt{\@tempc}\fi
342     \def\@tempb{citesep}\ifx\@tempa\@tempb
343         \xdef\NAT@sep{\@tempc}\fi
344     \fi
345 }
346 \NAT@@setcites
347 }
348 \renewcommand\citestyle[1]{%
349     \ifcsname bibstyle@\#1\endcsname%
350         \csname bibstyle@\#1\endcsname\let\bibstyle\@gobble%
351     \else%
352         \@latex@error{Undefined '#1' citestyle}%
353     \fi
354 }
355 \fi

```

\bibstyle@acmauthoryear The default author-year format:

```

356 \newcommand{\bibstyle@acmauthoryear}{%
357     \setcitestyle{%
358         authoryear,%
359         open={[],close={}},citesep={;},%
360         aysep={},yysep={,},%
361         notesep={, }}}

```

\bibstyle@acmnumeric The default numeric format:

```

362 \newcommand{\bibstyle@acmnumeric}{%
363     \setcitestyle{%
364         numbers,sort&compress,%
365         open={[],close={}},citesep={,},%
366         notesep={, }})

```

The default is numeric:

```

367 \if@ACM@natbib
368 \citestyle{acmnumeric}
369 \fi

```

### 3.7 Internationalization

```

370 \if@ACM@journal
371     \renewcommand\keywordsname{Additional Key Words and Phrases}%
372 \else
373     \renewcommand\keywordsname{Keywords}%
374 \fi
375 \if@ACM@engage
376     \renewcommand\abstractname{Synopsis}%
377 \fi
378 \ifx\ACM@languages\empty
379 \else
380     \RequirePackage[\ACM@languages]{babel}%
381     \addto\captionsenglish{%
382         \if@ACM@journal

```

```

383     \renewcommand\keywordsname{Additional Key Words and Phrases}%
384     \else
385         \renewcommand\keywordsname{Keywords}%
386     \fi
387     \renewcommand\acksname{Acknowledgements}%
388     \if@ACM@engage
389         \renewcommand\abstractname{Synopsis}%
390     \fi
391 }
392 \addto\captionsfrench{%
393     \if@ACM@journal
394         \renewcommand\keywordsname{Mots Clés et Phrases Supplémentaires}%
395     \else
396         \renewcommand\keywordsname{Mots clés}%
397     \fi
398     \renewcommand\acksname{Remerciements}%
399 }
400 \addto\captionsgerman{%
401     \if@ACM@journal
402         \renewcommand\keywordsname{Zusätzliche Schlagwörter und Phrasen}%
403     \else
404         \renewcommand\keywordsname{Schlagwörter}%
405     \fi
406     \renewcommand\acksname{Danksagungen}%
407 }
408 \addto\captionsspanish{%
409     \if@ACM@journal
410         \renewcommand\keywordsname{Palabras y Frases Claves Adicionales}%
411     \else
412         \renewcommand\keywordsname{Palabras claves}%
413     \fi
414     \renewcommand\acksname{Expresiones de gratitud}%
415 }
416 \fi

```

\ACM@lang@check Some commands should not be used if the document is monlingual

```

417 \newcommand\ACM@lang@check[1]{%
418     \ifx\ACM@languages\@empty\relax
419         \ClassError{\@classname}{%
420             Command \string#1 \MessageBreak is used in monlingual document}{%
421             You used a command (\string#1) \MessageBreak
422             that does not have a meaning \MessageBreak
423             unless are languages are defined. \MessageBreak
424             Please choose the languages in \string\documentclass
425             \MessageBreak
426             (e.g. \string\documentclass[languages={french, english}]{acmart}),%
427             \MessageBreak
428             or delete the command.}%
429     \fi}

```

\@translatedtitle

```

430 \def\@translatedtitle{}

```

\translatedtitle The title of the paper in a different language

```

431 \newcommand{\translatedtitle}[2]{\ACM@lang@check{\translatedtitle}%
432 \g@addto@macro{\@translatedtitle{\par\foreignlanguage{#1}{#2}}}

\@translatedsubtitle
433 \def\@translatedsubtitle{}

\translatedsubtitle The subtitle of the paper in a different language
434 \newcommand{\translatedsubtitle}[2]{\ACM@lang@check{\translatedsubtitle}%
435 \g@addto@macro{\@translatedsubtitle{\par\foreignlanguage{#1}{#2}}}

\@translatedkeywords
436 \def\@translatedkeywords{}

\translatedkeywords Add keywords to the paper in the language specified
437 \newcommand{\translatedkeywords}[2]{\ACM@lang@check{\translatedkeywords}%
438 \g@addto@macro{\@mktranslatedkeywords{#1}{#2}}}

\@translatedabstracts The container for translated abstracts.
439 \def\@translatedabstracts{}

translatedabstract We save translated abstracts into \@translatedabstracts
440 \newenvironment{translatedabstract}[1]{\Collect@Body
441   \@savetranslatedabstract\@mktranslatedabstract{#1}}{ }

@savetranslatedabstract And saving the abstract
442 \long\def\@savetranslatedabstract#1{\if@ACM@maketitle@typeset
443   \ClassError{\@classname}{Abstract must be defined before maketitle
444     command. Please move it!}\fi
445   \ACM@lang@check{translatedabstract}%
446   \g@addto@macro{\@translatedabstracts{\bgroup#1\egroup}}}

```

### 3.8 Sectioning

\@startsection Before we call hyperref, we redefine \startsection commands to their L<sup>A</sup>T<sub>E</sub>X defaults since the amsart ones are too AMS-specific. We need to do this early since we want hyperref to have a chance to redefine them again:

```

447 \def\@startsection#1#2#3#4#5#6{%
448   \if@noskipsec \leavevmode \fi
449   \par
450   \@tempskipa #4\relax
451   \@afterindenttrue
452   \ifdim \@tempskipa <\z@
453     \@tempskipa -\@tempskipa \@afterindentfalse
454   \fi
455   \if@nobreak
456     \everypar{}%
457   \else
458     \addpenalty\@secpenalty\addvspace\@tempskipa
459   \fi
460   \@ifstar
461     {\@ssect{#3}{#4}{#5}{#6}}%
462     {\@dblarg{\@sect{#1}{#2}{#3}{#4}{#5}{#6}}}}

```

```

463 \def\@sect#1#2#3#4#5#6[#7]#8{%
464   \edef\@toclevel{\ifnum#2=\@m 0\else\number#2\fi}%
465   \ifnum #2>\c@secnumdepth
466     \let\@svsec\empty
467   \else
468     \refstepcounter{#1}%
469     \protected@edef\@svsec{\@seccntformat{#1}\relax}%
470   \fi
471   \@tempskipa #5\relax
472   \ifdim \@tempskipa>\z@
473     \begingroup
474       #6{%
475         \hangfrom{\hskip #3\relax\@svsec}%
476         \interlinepenalty \zM #8\Z@par}%
477     \endgroup
478     \csname #1mark\endcsname{#7}%
479   \ifnum #2>\c@secnumdepth \else
480     \tochangmeasure{\csname the#1\endcsname}%
481   \fi
482   \addcontentsline{toc}{#1}{%
483     \ifnum #2>\c@secnumdepth \else
484       \protect\numberline{\csname the#1\endcsname}%
485     \fi
486     #7}%
487   \else
488     \def\@svsechd{%
489       #6{\hskip #3\relax
490       \@svsec #8}%
491       \csname #1mark\endcsname{#7}%
492     \ifnum #2>\c@secnumdepth \else
493       \tochangmeasure{\csname the#1\endcsname\space}%
494     \fi
495     \addcontentsline{toc}{#1}{%
496       \ifnum #2>\c@secnumdepth \else
497         \protect\numberline{\csname the#1\endcsname}%
498       \fi
499       #7}}%
500   \fi
501   \xsect{#5}}
502 \def\@xsect#1{%
503   \@tempskipa #1\relax
504   \ifdim \@tempskipa>\z@
505     \par \nobreak
506     \vskip \@tempskipa
507     \@afterheading
508   \else
509     \nobreakfalse
510     \global\@noskipsectrue
511     \everypar{%
512       \if@noskipsec
513         \global\@noskipsecfalse
514         {\setbox\z@\lastbox}%
515         \clubpenalty\zM
516       \begingroup \@svsechd \endgroup

```

```

517      \unskip
518      \@tempskipa #1\relax
519      \hskip -\@tempskipa
520      \else
521          \clubpenalty \clubpenalty
522          \everypar{}%
523      \fi}%
524  \fi
525  \ignorespaces}
526 \def@\secnntformat#1{\csname the#1\endcsname\quad}
527 \def@\ssect#1#2#3#4#5{%
528   \@tempskipa #3\relax
529   \ifdim \@tempskipa>\z@
530     \begingroup
531       #4{%
532         \hangfrom{\hskip #1}%
533         \interlinepenalty \OM #5\@par}%
534     \endgroup
535   \else
536     \def@\svsechd{#4{\hskip #1\relax #5}}%
537   \fi
538   \xsect{#3}}

```

\@startsection The amsart package redefines \startsection. Here we redefine it again to make the table of contents work.

```

539 \def@\starttoc#1#2{\begingroup\makeatletter
540   \setTrue{#1}%
541   \par\removeLastskip\vskip\z@skip
542   \startsection{section}\OM\z@\{.linespacing\@plus\linespacing}%
543   {.5\linespacing}{\centering\contentsnamefont}{#2}%
544   \input{\jobname.#1}%
545   \if@filesw
546     \xp\newwrite\csname tf@#1\endcsname
547     \immediate\xp\openout\csname tf@#1\endcsname \jobname.#1\relax
548   \fi
549   \global\@nobreakfalse \endgroup
550   \addvspace{32\p@\@plus14\p@}%
551 }

```

\l@section Section spacing is more generous than for amsart

```
552 \def\l@section{\@tocline{1}{0pt}{1pc}{2pc}{}}
```

\l@subsection The spacing in amsart is too large

```
553 \def\l@subsection{\@tocline{2}{0pt}{1pc}{3pc}{}}
```

\l@subsubsection The spacing in amsart is too large

```
554 \def\l@subsubsection{\@tocline{3}{0pt}{1pc}{5pc}{}}
```

We need to define footnote-related stuff before the call to hyperref (Ross Moore)

\@makefntext We do not use indentation for footnotes

```
555 \def\@makefntext{\noindent\@makefnmark}
```

```
\@footnotetext In sigchi-a mode our footnotes are in the margin!
```

```
556 \if@ACM@sigchiamode
557 \long\def\@footnotetext#1{\marginpar{%
558   \reset@font\small
559   \interlinepenalty\interfootnotelinepenalty
560   \protected@edef\@currentlabel{%
561     \csname p@footnote\endcsname\@thefnmark
562   }%
563   \color@begingroup
564   \color@begingroup
565   \rule{z@{\footnotesep}\ignorespaces#1\@finalstrut\strutbox}%
566   \color@endgroup}%
567 \fi
```

```
\@mpfootnotetext We want the footnotes in minipages centered:
```

```
568 \long\def\@mpfootnotetext#1{%
569   \global\setbox\@mpfootins\vbox{%
570     \unvbox\@mpfootins
571     \reset@font\footnotesize
572     \hsize\columnwidth
573     \parboxrestore
574     \protected@edef\@currentlabel
575       {\csname p@mpfootnote\endcsname\@thefnmark}%
576     \color@begingroup\centering
577     \color@begingroup\centering
578     \rule{z@{\footnotesep}\ignorespaces#1\@finalstrut\strutbox}%
579     \color@endgroup}}
```

```
\@makefnmark AMS classes use a buggy definition of \makefnmark. We revert to the standard one.
```

```
580 \def\@makefnmark{\hbox{\@textsuperscript{\normalfont\@thefnmark}}}
```

### 3.9 Hyperxmp and hyperref

Adding hyperxmp

```
581 \RequirePackage{hyperxmp}
      And now, hyperref
582 \let\@footnotemark@nolink\@footnotemark
583 \let\@footnotetext@nolink\@footnotetext
584 \RequirePackage[bookmarksnumbered,unicode]{hyperref}
585 \pdfstringdefDisableCommands{%
586   \def\addtocounter#1#2{}%
587   \def\unskip{}%
588   \def\textbullet{- }%
589   \def\textrightarrow{ -> }%
590   \def\footnotemark{}%
591 }
592 \urlstyle{rm}
593 \ifcase\ACM@format@nr
594   \relax % manuscript
595 \or % acmsmall
596 \or % acmlarge
597 \or % acmtog
598 \or % sigconf
```

```

599 \or % siggraph
600 \or % sigplan
601   \urlstyle{sf}
602 \or % sigchi
603 \or % sigchi-a
604   \urlstyle{sf}
605 \or % acmengage
606 \or % acmcpc
607 \fi
608 \AtEndPreamble{%
609   \if@ACM@urlbreakonhyphens
610     \def\do@url@hyp{\do\-\}%
611   \fi
612   \if@ACM@screen
613     \hypersetup{colorlinks,
614       linkcolor=ACMPurple,
615       citecolor=ACMPurple,
616       urlcolor=ACMDarkBlue,
617       filecolor=ACMDarkBlue}
618   \else
619     \hypersetup{hidelinks}
620   \fi
621   \hypersetup{pdflang={en},
622     pdfdisplaydoctitle}}
Bibliography mangling.
623 \if@ACM@natbib
624   \let\citeN\cite
625   \let\cite\citet
626   \let\citeANP\citeauthor
627   \let\citeNN\citeyearpar
628   \let\citeyearNP\citeyear
629   \let\citeNP\citealt
630   \DeclareRobustCommand\citeA
631     {\begingroup\NAT@swafalse
632       \let\NAT@ctype@\ne\NAT@partrue\NAT@fullfalse\NAT@open\NAT@citetp}%
633   \providecommand\newblock{}%
634 \else
635   \AtBeginDocument{%
636     \let\shortcite\cite%
637     \providecommand\citename[1]{#1}}
638 \fi
639 \newcommand\shortcite[2][]{%
640   \ifNAT@numbers\cite[#1]{#2}\else\citeyearpar[#1]{#2}\fi}

```

\bibliographystyle The amsart package redefines \bibliographystyle since it prefers the AMS bibliography style. We turn it back to the L<sup>A</sup>T<sub>E</sub>X definition:

```

641 \def\bibliographystyle#1{%
642   \ifx\@begindocumenthook\@undefined\else
643     \expandafter\AtBeginDocument
644   \fi
645   {\if@filesw
646     \immediate\write\auxout{\string\bibstyle{#1}}%
647   \fi}}

```

### 3.10 Other packages

Graphics and color.

```
648 \RequirePackage{graphicx}
649 \RequirePackage[prologue]{xcolor}

We define ACM colors according to [8]:
650 \definecolor[named]{ACMBlue}{cmyk}{1,0.1,0,0.1}
651 \definecolor[named]{ACMYellow}{cmyk}{0,0.16,1,0}
652 \definecolor[named]{ACMOOrange}{cmyk}{0,0.42,1,0.01}
653 \definecolor[named]{ACMRed}{cmyk}{0,0.90,0.86,0}
654 \definecolor[named]{ACMLightBlue}{cmyk}{0.49,0.01,0,0}
655 \definecolor[named]{ACMGreen}{cmyk}{0.20,0,1,0.19}
656 \definecolor[named]{ACMPurple}{cmyk}{0.55,1,0,0.15}
657 \definecolor[named]{ACMDarkBlue}{cmyk}{1,0.58,0,0.21}
```

Author-draft mode or sigchi-a mode

```
658 \if@ACM@authordraft
659   \RequirePackage{draftwatermark}
660   \SetWatermarkFontSize{0.5in}
661   \SetWatermarkColor[gray]{.9}
662   \SetWatermarkText{\parbox{12em}{\centering
663     Unpublished working draft.\\
664     Not for distribution.}}
665 \else
666   \if@ACM@sigchiamode
667     \if@ACM@nonacm\else
668       \RequirePackage{draftwatermark}
669       \SetWatermarkFontSize{0.5in}
670       \SetWatermarkColor[gray]{.9}
671       \SetWatermarkText{\parbox{12em}{\centering
672         Legacy document. \
673         Not for publication in an ACM venue}}
674     \fi
675   \fi
676 \fi
```

### 3.11 Paper size and paragraphing

We use geometry for dimensions. Note that the present margins do not depend on the font size option—we might need to change this. See <https://github.com/borisveytsman/acmart/issues/5#issuecomment-272881329>.

```
677 \RequirePackage{geometry}
678 \ifcase\ACM@format@nr
679 \relax % manuscript
680   \geometry{letterpaper,head=13pt,
681   marginparwidth=6pc,heightrounded}%
682 \or % acmsmall
683   \geometry{twoside=true,
684   includeheadfoot, head=13pt, foot=2pc,
685   paperwidth=6.75in, paperheight=10in,
686   top=58pt, bottom=44pt, inner=46pt, outer=46pt,
687   marginparwidth=2pc,heightrounded
688 }%
```

```

689 \or % acmlarge
690   \geometry{twoside=true, head=13pt, foot=2pc,
691     paperwidth=8.5in, paperheight=11in,
692     includeheadfoot,
693     top=78pt, bottom=114pt, inner=81pt, outer=81pt,
694     marginparwidth=4pc, heightrounded
695   }%
696 \or % acmtog
697   \geometry{twoside=true, head=13pt, foot=2pc,
698     paperwidth=8.5in, paperheight=11in,
699     includeheadfoot, columnsep=24pt,
700     top=52pt, bottom=75pt, inner=52pt, outer=52pt,
701     marginparwidth=2pc, heightrounded
702   }%
703 \or % sigconf
704   \geometry{twoside=true, head=13pt,
705     paperwidth=8.5in, paperheight=11in,
706     includeheadfoot, columnsep=2pc,
707     top=57pt, bottom=73pt, inner=54pt, outer=54pt,
708     marginparwidth=2pc, heightrounded
709   }%
710 \or % siggraph
711   \geometry{twoside=true, head=13pt,
712     paperwidth=8.5in, paperheight=11in,
713     includeheadfoot, columnsep=2pc,
714     top=57pt, bottom=73pt, inner=54pt, outer=54pt,
715     marginparwidth=2pc, heightrounded
716   }%
717 \or % sigplan
718   \geometry{twoside=true, head=13pt,
719     paperwidth=8.5in, paperheight=11in,
720     includeheadfoot=false, columnsep=2pc,
721     top=1in, bottom=1in, inner=0.75in, outer=0.75in,
722     marginparwidth=2pc, heightrounded
723   }%
724 \or % sigchi
725   \geometry{twoside=true, head=13pt,
726     paperwidth=8.5in, paperheight=11in,
727     includeheadfoot, columnsep=2pc,
728     top=66pt, bottom=73pt, inner=54pt, outer=54pt,
729     marginparwidth=2pc, heightrounded
730   }%
731 \or % sigchi-a
732   \geometry{twoside=false, head=13pt,
733     paperwidth=11in, paperheight=8.5in,
734     includeheadfoot, marginparsep=72pt,
735     marginparwidth=170pt, columnsep=20pt,
736     top=72pt, bottom=72pt, left=314pt, right=72pt
737   }%
738   \@mparswitchfalse
739   \reversemarginpar
740 \or % acmengage
741   \geometry{twoside=true, head=13pt,
742     paperwidth=8.5in, paperheight=11in,

```

```

743     includeheadfoot, columnsep=2pc,
744     top=57pt, bottom=73pt, inner=54pt, outer=54pt,
745     marginparwidth=2pc,heightrounded
746   }%
747 \or % acmcpc
748   \geometry{twoside=true,
749     includeheadfoot, head=13pt, foot=2pc,
750     paperwidth=6.75in, paperheight=10in,
751     top=58pt, bottom=44pt, inner=46pt, outer=46pt,
752     marginparwidth=2pc,heightrounded
753   }%
754 \fi

```

\parindent Paragraphing

```

\parskip 755 \setlength{\parindent}{10\p@}
756 \setlength{\parskip}{\z@}
757 \ifcase\ACM@format@nr
758   \relax % manuscript
759 \or % acmsmall
760 \or % acmlarge
761 \or % acmtog
762   \setlength{\parindent}{9\p@}%
763 \or % sigconf
764 \or % siggraph
765 \or % sigplan
766 \or % sigchi
767 \or % sigchi-a
768 \or % acmengage
769 \or % acmcpc
770 \fi

```

\normalparindent The amsart package defines the \normalparindent length and initializes it to 12pt (the value of \parindent in amsart). It is later used to set the \listparindent length in the quotation environment and the \parindent length in the \@footnotetext command. We set \normalparindent to the value of \parindent as selected by acmart for consistent paragraph indents.

```
771 \setlength{\normalparindent}{\parindent}
```

Footnotes require some consideration. We have several layers of footnotes: front-matter footnotes, “regular” footnotes and the special insert for the bibstrip. In the old ACM classes, the bibstrip was a \@float. The problem with floats is that they tend to, well, float—and we want the guarantee they stay.

We use manyfoot for layered footnotes instead.

copyrightpermissionfootnoterule This is the footnote rule that separates the bibstrip from the rest of the paper. It is a full width rule.

```

772 \def\copyrightpermissionfootnoterule{\kern-3\p@
773   \hrule \@width \columnwidth \kern 2.6\p@}

774 \RequirePackage{manyfoot}
775 \SelectFootnoteRule[2]{copyrightpermission}
776 \DeclareNewFootnote{authorsaddresses}
777 \SelectFootnoteRule[2]{copyrightpermission}
778 \DeclareNewFootnote{copyrightpermission}

```

```
\footnoterule Tschichold's rules:
```

```
779 \def\footnoterule{\kern-3\p@  
780   \hrule \@width 4pc \kern 2.6\p@}
```

```
\endminipage We do not use footnote rules in minipages
```

```
781 \def\endminipage{%
```

```
782   \par  
783   \unskip  
784   \ifvoid\@mpfootins\else  
785     \vskip\skip\@mpfootins  
786     \normalcolor  
787     \unvbox\@mpfootins  
788   \fi  
789   \atminipagefalse  
790   \color@endgroup  
791   \egroup  
792   \expandafter\@iiiparbox\@mpargs{\unvbox\@tempboxa}}
```

```
\@textbottom Add some stretch according to David Carlisle's advice at http://tex.stackexchange.com/a/62318/5522
```

```
793 \def\@textbottom{\vskip \z@ \atplus 1pt}  
794 \let\@texttop\relax
```

In two-column layouts, force both columns to be the same height by inserting extra internal vertical space to fill out the page.

```
795 \ifcase\ACM@format@nr  
796 \relax % manuscript  
797 \or % acmsmall  
798 \or % acmlarge  
799 \or % acmtog  
800 \flushbottom  
801 \or % sigconf  
802 \flushbottom  
803 \or % siggraph  
804 \flushbottom  
805 \or % sigplan  
806 \flushbottom  
807 \or % sigchi  
808 \flushbottom  
809 \or % sigchi-a  
810 \or % acmengage  
811 \flushbottom  
812 \or % acmcpc  
813 \flushbottom  
814 \fi
```

### 3.12 Fonts

Somehow PDFTeX and XeTeX require different incantations to make a PDF compliant with the current Acrobat bugs. Xpdf is much better.

The code below is by Ross Moore.

```
815 \ifPDFTeX  
816 \input{glyptounicode}
```

```

817 \pdfglyptounicode{f_f}{FB00}
818 \pdfglyptounicode{f_f_i}{FB03}
819 \pdfglyptounicode{f_f_1}{FB04}
820 \pdfglyptounicode{f_i}{FB01}
821 \pdfglyptounicode{t_t}{0074 0074}
822 \pdfglyptounicode{f_t}{0066 0074}
823 \pdfglyptounicode{T_h}{0054 0068}
824 \pdfgentounicode=1
825 \RequirePackage{cmap}
826 \fi

```

\if@ACM@newfonts Whether we load the new fonts

```

827 \newif\if@ACM@newfonts
828 \@ACM@newfontstrue
829 \IfFileExists{libertine.sty}{}{\ClassWarning{@classname}{You do not
830     have the libertine package installed. Please upgrade your
831     TeX}\@ACM@newfontsfalse}
832 \IfFileExists{zi4.sty}{}{\ClassWarning{@classname}{You do not
833     have the inconsolata (zi4.sty) package installed. Please upgrade your
834     TeX}\@ACM@newfontsfalse}
835 \IfFileExists{newtxmath.sty}{}{\ClassWarning{@classname}{You do not
836     have the newtxmath package installed. Please upgrade your
837     TeX}\@ACM@newfontsfalse}

```

We use Libertine throughout.

```

838 \if@ACM@newfonts
839     \RequirePackage[T1]{fontenc}
840     % Note that the order in which packages are loaded matters,
841     % and the correct order depends on the LaTeX engine used.
842     % See https://github.com/borisveytsman/acmart/issues/402
843     % and https://github.com/borisveytsman/acmart/issues/410
844     \ifxetex
845         \RequirePackage[libertine]{newtxmath}
846         \RequirePackage[tt=false]{libertine}
847         \setmonofont[StylisticSet=3]{inconsolata}
848     \else
849         \ifluatex
850             \RequirePackage[libertine]{newtxmath}
851             \RequirePackage[tt=false]{libertine}
852             \setmonofont[StylisticSet=3]{inconsolata}
853         \else
854             \RequirePackage[tt=false, type1=true]{libertine}
855             \RequirePackage[varqu]{zi4}
856             \RequirePackage[libertine]{newtxmath}
857         \fi
858     \fi
859 \fi

```

\liningnums Libertine defines \liningnums, which makes fontspec unhappy. While we do not use fontspec, some users do.

```

860 \let\liningnums\undefined
861 \AtEndPreamble{%
862     \DeclareTextFontCommand{\liningnums}{\libertineLF}}

```

The SIGCHI extended abstracts are sans serif:

```
863 \if@ACM@sigchiamode  
864   \renewcommand{\familydefault}{\sfdefault}  
865 \fi
```

### 3.13 Image descriptions

\if@Description@present A local switch: whether there is a description in the given figure

```
866 \newif\if@Description@present  
867 \if@Description@presenttrue
```

\if@undescribed@images A global switch whether some images were *not* described

```
868 \newif\if@undescribed@images  
869 \if@undescribed@imagesfalse
```

\Description The Description macro right now just sets switches

```
870 \newcommand\Description[2][]{\global\if@Description@presenttrue\ignorespaces}
```

The global warning

```
871 \AtEndDocument{\if@undescribed@images  
872   \ClassWarningNoLine{@classname}{Some images may lack descriptions}\fi}
```

Hooks for figures and tables. We also patch algorithm and algorithm\* in case somebody uses them.

```
873 \AtBeginEnvironment{figure}{\if@Description@presentfalse  
874   \let\@vspace\@vspace@orig  
875   \let\@vspace@orig\@vspace@orig  
876 \AtBeginEnvironment{figure*}{\if@Description@presentfalse  
877   \let\@vspace\@vspace@orig  
878   \let\@vspace@orig\@vspace@orig  
879 \AtEndEnvironment{figure}{\if@Description@present\else  
880   \global\if@undescribed@imagestrue  
881   \ClassWarning{@classname}{A possible image without description}\fi}  
882 \AtEndEnvironment{figure*}{\if@Description@present\else  
883   \global\if@undescribed@imagestrue  
884   \ClassWarning{@classname}{A possible image without description}\fi}  
885 \AtBeginEnvironment{table}{\let\@vspace\@vspace@orig  
886   \let\@vspace@orig\@vspace@orig  
887 \AtBeginEnvironment{table*}{\let\@vspace\@vspace@orig  
888   \let\@vspace@orig\@vspace@orig  
889 \AtBeginEnvironment{algorithm}{\let\@vspace\@vspace@orig  
890   \let\@vspace@orig\@vspace@orig  
891 \AtBeginEnvironment{algorithm*}{\let\@vspace\@vspace@orig  
892   \let\@vspace@orig\@vspace@orig  
893 \AtBeginEnvironment{lstlisting}{\let\@vspace\@vspace@orig  
894   \let\@vspace@orig\@vspace@orig  
895 \AtBeginEnvironment{lstlisting*}{\let\@vspace\@vspace@orig  
896   \let\@vspace@orig\@vspace@orig  
897 \AtBeginEnvironment{minted}{\let\@vspace\@vspace@orig  
898   \let\@vspace@orig\@vspace@orig  
899 \AtBeginEnvironment{minted*}{\let\@vspace\@vspace@orig  
900   \let\@vspace@orig\@vspace@orig  
901 \AtBeginEnvironment{listing}{\let\@vspace\@vspace@orig
```

```

902   \let\@vspacer\@vspacer@orig}
903 \AtBeginEnvironment{listing*}{\let\@vspace\@vspace@orig
904   \let\@vspacer\@vspacer@orig}
905

```

### 3.14 Floats

We use the caption package

```

906 \RequirePackage{caption, float}
907 \captionsetup[table]{position=top}
908 \if@ACM@journal
909   \captionsetup{labelfont={sf, small},
910     textfont={sf, small}, margin=\z@}
911   \captionsetup[figure]{name={Fig.}}
912 \else
913   \captionsetup{labelfont={bf},
914     textfont={bf}, labelsep=colon, margin=\z@}
915 \ifcase\ACM@format@nr
916   \relax % manuscript
917   \or % acmsmall
918   \or % acmlarge
919   \or % acmtog
920   \or % sigconf
921   \or % siggraph
922     \captionsetup{textfont={it}}
923   \or % sigplan
924     \captionsetup{labelfont={bf},
925       textfont={normalfont}, labelsep=period, margin=\z@}
926 \or % sigchi
927   \captionsetup[figure]{labelfont={bf, small},
928     textfont={bf, small}}
929   \captionsetup[table]{labelfont={bf, small},
930     textfont={bf, small}}
931 \or % sigchi-a
932   \captionsetup[figure]{labelfont={bf, small},
933     textfont={bf, small}}
934   \captionsetup[table]{labelfont={bf, small},
935     textfont={bf, small}}
936 \or % acmengage
937 \or % acmcpc
938 \fi
939 \fi

```

`sidebar` The `sidebar` environment:

```

940 \newfloat{sidebar}{}{sbar}
941 \floatname{sidebar}{Sidebar}
942 \renewenvironment{sidebar}{\Collect@Body\@sidebar}{}%

```

`\@sidebar` The processing of the saved text

```

943 \long\def\@sidebar#1{\bgroup\let\@vspace\@vspace@orig
944   \let\@vspacer\@vspacer@orig\captionsetup{type=sidebar}%
945   \marginpar{\small#1}\egroup}

```

```

marginfigure The marginfigure environment:
946 \newenvironment{marginfigure}{\Collect@Body\@marginfigure}{}  

  

\@marginfigure The processing of the saved text
947 \long\def\@marginfigure#1{\bgroup
948   \let\@vspace\@vspace@orig
949   \let\@vspacer\@vspacer@orig
950   \captionsetup{type=figure}%
951   \marginpar{\@Description@presentfalse\centering
952     \small#1\if@Description@present\else
953       \global\@undescribed@imagestrue
954       \ClassWarning{\@classname}{A possible image without description}
955     \fi}%
956 \egroup}  

  

margintable The margintable environment:
957 \newenvironment{margintable}{\Collect@Body\@margintable}{}  

  

\@margintable The processing of the saved text
958 \long\def\@margintable#1{\bgroup\let\@vspace\@vspace@orig
959   \let\@vspacer\@vspacer@orig\captionsetup{type=table}%
960   \marginpar{\centering\small#1}\egroup}  

  

      SIGCHI extended abstracts provide an interesting possibility to push into the margin.  

      Here we use figure* and table* for this.  

  

\fulltextwidth We define the width of the boxes as
961 \newdimen\fulltextwidth
962 \fulltextwidth=\dimexpr(\textwidth+\marginparwidth+\marginparsep)  

  

\@dblfloat We redefine the double-float command. First, we make the size bigger. Second, our
default position is going to be tp (to give marginalia a chance)
963 \if@ACM@sigchiamode
964 \def\@dblfloat{\bgroup\let\@vspace\@vspace@orig
965   \let\@vspacer\@vspacer@orig\columnwidth=\fulltextwidth
966   \let\@endfloatbox\@endwidefloatbox
967   \def\@fpsadddefault{\def\@fps{tp}}%
968   \@float
969 \fi  

  

\end@dblfloat And the end. Just adding a \bgroup.
970 \if@ACM@sigchiamode
971 \def\end@dblfloat{%
972   \end@float\egroup}
973 \fi  

  

\@endwidefloatbox This is the end of a wide box—we basically move everything to the left
974 \def\@endwidefloatbox{%
975   \par\vskip\z@skip
976   \@minipagefalse
977   \outer@nobreak
978   \egroup
979   \color@endbox

```

```

980 \global\setbox@\currbox=\vbox{\moveleft
981     \dimexpr(\fulltextwidth-\textwidth)\box@\currbox}%
982 \wd@\currbox=\textwidth
983 }

```

### 3.15 Lists

```

984 \ifcase\ACM@format@nr
985 \relax % manuscript
986 \or % acmsmall
987 \or % acmlarge
988 \or % acmtog
989 \or % sigconf
990 \or % siggraph
991 \or % sigplan
992 \def\labelenumi{\theenumi.}
993 \def\labelenumii{\theenumii.}
994 \def\labelenumiii{\theenumiii.}
995 \def\labelenumiv{\theenumiv.}
996 \or % sigchi
997 \or % sigchi-a
998 \or % acmengage
999 \or % acmcpc
1000 \fi

```

The AMS uses generous margins for lists. Note that `amsart` defines `\leftmargin` values for list levels at the beginning of the document, so we must redefine them in the same manner. Also, note that `amsart` redefines the `enumerate` and `itemize` environments with a `\makelabel` command that uses `\llap`, so the `\labelwidth` value is (effectively) irrelevant; nonetheless, we follow `amsart` and set `\labelwidth` to `\leftmargin` minus `\labelsep`.

```

1001 \newdimen\@ACM@labelwidth
1002 \AtBeginDocument{%
1003   \setlength\labelsep{4pt}
1004   \setlength{\@ACM@labelwidth}{6.5pt}
1005
1006   %% First-level list: when beginning after the first line of an
1007   %% indented paragraph or ending before an indented paragraph, labels
1008   %% should not hang to the left of the preceding/following text.
1009   \setlength\leftmargini{\z@}
1010   \addtolength\leftmargini{\parindent}
1011   \addtolength\leftmargini{2\labelsep}
1012   \addtolength\leftmargini{\@ACM@labelwidth}
1013
1014   %% Second-level and higher lists.
1015   \setlength\leftmarginii{\z@}
1016   \addtolength\leftmarginii{0.5\labelsep}
1017   \addtolength\leftmarginii{\@ACM@labelwidth}
1018   \setlength\leftmarginiii{\leftmarginii}
1019   \setlength\leftmarginiv{\leftmarginii}
1020   \setlength\leftmarginv{\leftmarginiv}
1021   \setlength\leftmarginvi{\leftmarginiv}
1022   \@listi}
1023 \newskip\listisep

```

```

1024 \listsep\smallskipamount
1025 \def\@listI{\leftmargin\leftmargini
1026   \labelwidth\leftmargini \advance\labelwidth-\labelsep
1027   \listparindent\z@
1028   \topsep\listsep}
1029 \let\@listi\@listI
1030 \def\@listii{\leftmargin\leftmarginii
1031   \labelwidth\leftmarginii \advance\labelwidth-\labelsep
1032   \topsep\z@skip}
1033 \def\@listiii{\leftmargin\leftmarginiii
1034   \labelwidth\leftmarginiii \advance\labelwidth-\labelsep}
1035 \def\@listiv{\leftmargin\leftmarginiv
1036   \labelwidth\leftmarginiv \advance\labelwidth-\labelsep}
1037 \def\@listv{\leftmargin\leftmarginv
1038   \labelwidth\leftmarginv \advance\labelwidth-\labelsep}
1039 \def\@listvi{\leftmargin\leftmarginvi
1040   \labelwidth\leftmarginvi \advance\labelwidth-\labelsep}

```

\descriptionlabel We do not use a colon by default like amsart does:

```
1041 \renewcommand{\descriptionlabel}[1]{\upshape\bfseries #1}
```

\description Make the description environment indentation consistent with that of the itemize and enumerate environments.

```

1042 \renewenvironment{description}{\list{}{%
1043   \labelwidth\@ACM@labelwidth
1044   \let\makelabel\descriptionlabel}%
1045 }{%
1046   \endlist
1047 }
1048 \let\enddescription=\endlist % for efficiency

```

### 3.16 Top-matter data

\if@ACM@maketitle@typeset The switch to check whether \maketitle is already typeset. It is initially false, and setting top matter when it is true is wrong.

```
1049 \newif\if@ACM@maketitle@typeset
1050 \@ACM@maketitle@typesetfalse
```

We use the xkeyval interface to define journal titles and the relevant information

```

1051 \define@choicekey*+{ACM}{acmJournal}[\@journalCode\@journalCode@nr]{%
1052   ACMJCSS,%
1053   CIE,%
1054   CSUR,%
1055   DGOV,%
1056   DLT,%
1057   DTRAP,%
1058   FAC,%
1059   GAMES,%
1060   HEALTH,%
1061   IMWUT,%
1062   JACM,%
1063   JATS,%
1064   JDIQ,%
1065   JDS,%

```

1066 JEA, %  
1067 JERIC, %  
1068 JETC, %  
1069 JOCCH, %  
1070 JRC, %  
1071 PACMCGIT, %  
1072 PACMHCI, %  
1073 PACMPL, %  
1074 POMACS, %  
1075 TAAS, %  
1076 TACCESS, %  
1077 TACO, %  
1078 TALG, %  
1079 TALLIP, %  
1080 TAP, %  
1081 TCPS, %  
1082 TDS, %  
1083 TEAC, %  
1084 TECS, %  
1085 TELO, %  
1086 THRI, %  
1087 TIIS, %  
1088 TIOT, %  
1089 TISSEC, %  
1090 TIST, %  
1091 TKDD, %  
1092 TMIS, %  
1093 TOCE, %  
1094 TOCHI, %  
1095 TOCL, %  
1096 TOCS, %  
1097 TOCT, %  
1098 TODAES, %  
1099 TODS, %  
1100 TOG, %  
1101 TOIS, %  
1102 TOIT, %  
1103 TOMACS, %  
1104 TOMM, %  
1105 TOMPECS, %  
1106 TOMS, %  
1107 TOPC, %  
1108 TOPS, %  
1109 TOPLAS, %  
1110 TORS, %  
1111 TOS, %  
1112 TOSEM, %  
1113 TOSN, %  
1114 TQC, %  
1115 TRETS, %  
1116 TSAS, %  
1117 TSC, %  
1118 TSLP, %  
1119 TWEB, %

```

1120   FACMP%
1121 }{%
1122 \ifcase\journalCode@nr
1123 \relax % ACMJCSS
1124   \def\@journalName{ACM Journal on Computing and Sustainable Societies}%
1125   \def\@journalNameShort{ACM J. Comput. Sustain. Soc.}%
1126   \def\@permissionCodeOne{}%
1127 \or % CIE
1128   \def\@journalName{ACM Computers in Entertainment}%
1129   \def\@journalNameShort{ACM Comput. Entertain.}%
1130   \def\@permissionCodeOne{1544-3574}%
1131 \or % CSUR
1132   \def\@journalName{ACM Computing Surveys}%
1133   \def\@journalNameShort{ACM Comput. Surv.}%
1134   \def\@permissionCodeOne{0360-0300}%
1135 \or % DGOV
1136   \def\@journalName{Digital Government: Research and Practice}%
1137   \def\@journalNameShort{Digit. Gov. Res. Pract.}%
1138   \def\@permissionCodeOne{2639-0175}%
1139 \or % DLT
1140   \def\@journalName{Distributed Ledger Technologies: Research and Practice}%
1141   \def\@journalNameShort{Distrib. Ledger Technol.}%
1142   \def\@permissionCodeOne{2769-6472}%
1143 \or % DTRAP
1144   \def\@journalName{Digital Threats: Research and Practice}%
1145   \def\@journalNameShort{Digit. Threat. Res. Pract.}%
1146   \def\@permissionCodeOne{2576-5337}%
1147 \or % FAC
1148   \def\@journalName{Formal Aspects of Computing}%
1149   \def\@journalNameShort{Form. Asp. Comput.}%
1150   \def\@permissionCodeOne{0934-5043}%
1151   \def\@permissionCodeTwo{1433-299X}%
1152 \or % GAMES
1153   \def\@journalName{ACM Games: Research and Practice}%
1154   \def\@journalNameShort{ACM Games}%
1155 \or % HEALTH
1156   \def\@journalName{ACM Transactions on Computing for Healthcare}%
1157   \def\@journalNameShort{ACM Trans. Comput. Healthcare}%
1158   \def\@permissionCodeOne{2637-8051}%
1159 \or % IMWUT
1160   \def\@journalName{Proceedings of the ACM on Interactive, Mobile,
1161     Wearable and Ubiquitous Technologies}%
1162   \def\@journalNameShort{Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.}%
1163   \def\@permissionCodeOne{2474-9567}%
1164   @ACM@screentru
1165   \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
1166 \or % JACM
1167   \def\@journalName{Journal of the ACM}%
1168   \def\@journalNameShort{J. ACM}%
1169   \def\@permissionCodeOne{0004-5411}%
1170 \or % JATS
1171   \def\@journalName{Journal on Autonomous Transportation Systems}%
1172   \def\@journalNameShort{ACM J. Auton. Transport. Syst.}%
1173   \def\@permissionCodeOne{2833-0528}%

```

```

1174 \or % JDIQ
1175   \def \@journalName{ACM Journal of Data and Information Quality}%
1176   \def \@journalNameShort{ACM J. Data Inform. Quality}%
1177   \def \@permissionCodeOne{1936-1955}%
1178 \or % JDS
1179   \def \@journalName{ACM/JMS Journal of Data Science}%
1180   \def \@journalNameShort{ACM/IMS J. Data Sci.}%
1181   \def \@permissionCodeOne{2831-3194}%
1182   \def \@permissionCodeTwo{2831-3194}%
1183 \or % JEA
1184   \def \@journalName{ACM Journal of Experimental Algorithms}%
1185   \def \@journalNameShort{ACM J. Exp. Algor.}%
1186   \def \@permissionCodeOne{1084-6654}%
1187 \or % JERIC
1188   \def \@journalName{ACM Journal of Educational Resources in Computing}%
1189   \def \@journalNameShort{ACM J. Edu. Resources in Comput.}%
1190   \def \@permissionCodeOne{1073-0516}%
1191 \or % JETC
1192   \def \@journalName{ACM Journal on Emerging Technologies in Computing Systems}%
1193   \def \@journalNameShort{ACM J. Emerg. Technol. Comput. Syst.}%
1194   \def \@permissionCodeOne{1550-4832}%
1195 \or % JOCCH
1196   \def \@journalName{ACM Journal on Computing and Cultural Heritage}%
1197   \def \@journalNameShort{ACM J. Comput. Cult. Herit.}%
1198   \def \@permissionCodeOne{1556-4673}%
1199   \def \@permissionCodeTwo{1556-4711}%
1200 \or % JRC
1201   \def \@journalName{ACM Journal on Responsible Computing}%
1202   \def \@journalNameShort{ACM J. Responsib. Comput.}%
1203   \def \@permissionCodeOne{2832-0565}%
1204 \or % PACMCGIT
1205   \def \@journalName{Proceedings of the ACM on Computer Graphics and Interactive Techniques}%
1206   \def \@journalNameShort{Proc. ACM Comput. Graph. Interact. Tech.}%
1207   \def \@permissionCodeOne{2577-6193}%
1208   \@ACM@screentrue
1209   \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
1210 \or % PACMHCI
1211   \def \@journalName{Proceedings of the ACM on Human-Computer Interaction}%
1212   \def \@journalNameShort{Proc. ACM Hum.-Comput. Interact.}%
1213   \def \@permissionCodeOne{2573-0142}%
1214   \@ACM@screentrue
1215   \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
1216 \or % PACMPL
1217   \def \@journalName{Proceedings of the ACM on Programming Languages}%
1218   \def \@journalNameShort{Proc. ACM Program. Lang.}%
1219   \def \@permissionCodeOne{2475-1421}%
1220   \@ACM@screentrue
1221   \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
1222 \or % POMACS
1223   \def \@journalName{Proceedings of the ACM on Measurement and Analysis of Computing Systems}%
1224   \def \@journalNameShort{Proc. ACM Meas. Anal. Comput. Syst.}%
1225   \def \@permissionCodeOne{2476-1249}%
1226   \@ACM@screentrue
1227   \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%

```

```

1228 \or % TAAS
1229   \def \@journalName{ACM Transactions on Autonomous and Adaptive Systems}%
1230   \def \@journalNameShort{ACM Trans. Autonom. Adapt. Syst.}%
1231   \def \@permissionCodeOne{1556-4665}%
1232 \or % TACCESS
1233   \def \@journalName{ACM Transactions on Accessible Computing}%
1234   \def \@journalNameShort{ACM Trans. Access. Comput.}%
1235   \def \@permissionCodeOne{1936-7228}%
1236 \or % TACO
1237   \def \@journalName{ACM Transactions on Architecture and Code Optimization}%
1238   \def \@journalNameShort{ACM Trans. Arch. Code Optim.}%
1239   \def \@permissionCodeOne{1544-3566}%
1240   \def \@permissionCodeTwo{1544-3973}%
1241 \or % TALG
1242   \def \@journalName{ACM Transactions on Algorithms}%
1243   \def \@journalNameShort{ACM Trans. Algor.}%
1244   \def \@permissionCodeOne{1549-6325}%
1245 \or % TALLIP
1246   \def \@journalName{ACM Transactions on Asian and Low-Resource Language Information Processing}%
1247   \def \@journalNameShort{ACM Trans. Asian Low-Resour. Lang. Inf. Process.}%
1248   \def \@permissionCodeOne{2375-4699}%
1249 \or % TAP
1250   \def \@journalName{ACM Transactions on Applied Perception}%
1251   \def \@journalNameShort{ACM Trans. Appl. Percept.}%
1252   \def \@permissionCodeOne{1544-3558}%
1253 \or % TCPS
1254   \def \@journalName{ACM Transactions on Cyber-Physical Systems}%
1255   \def \@journalNameShort{ACM Trans. Cyber-Phys. Syst.}%
1256   \def \@permissionCodeOne{2378-962X}%
1257 \or % TDS
1258   \def \@journalName{ACM/IMS Transactions on Data Science}%
1259   \def \@journalNameShort{ACM/IMS Trans. Data Sci.}%
1260   \def \@permissionCodeOne{2577-3224}%
1261 \or % TEAC
1262   \def \@journalName{ACM Transactions on Economics and Computation}%
1263   \def \@journalNameShort{ACM Trans. Econ. Comput.}%
1264   \def \@permissionCodeOne{2167-8375}%
1265 \or % TECS
1266   \def \@journalName{ACM Transactions on Embedded Computing Systems}%
1267   \def \@journalNameShort{ACM Trans. Embedd. Comput. Syst.}%
1268   \def \@permissionCodeOne{1539-9087}%
1269 \or % TELO
1270   \def \@journalName{ACM Transactions on Evolutionary Learning}%
1271   \def \@journalNameShort{ACM Trans. Evol. Learn.}%
1272   \def \@permissionCodeOne{2688-3007}%
1273 \or % THRI
1274   \def \@journalName{ACM Transactions on Human-Robot Interaction}%
1275   \def \@journalNameShort{ACM Trans. Hum.-Robot Interact.}%
1276   \def \@permissionCodeOne{2573-9522}%
1277 \or % TIIS
1278   \def \@journalName{ACM Transactions on Interactive Intelligent Systems}%
1279   \def \@journalNameShort{ACM Trans. Interact. Intell. Syst.}%
1280   \def \@permissionCodeOne{2160-6455}%
1281 \or % TIOT

```

```

1282 \def \@journalName{ACM Transactions on Internet of Things}%
1283 \def \@journalNameShort{ACM Trans. Internet Things}%
1284 \def \@permissionCodeOne{2577-6207}%
1285 \or % TISSEC
1286 \def \@journalName{ACM Transactions on Information and System Security}%
1287 \def \@journalNameShort{ACM Trans. Info. Syst. Sec.}%
1288 \def \@permissionCodeOne{1094-9224}%
1289 \or % TIST
1290 \def \@journalName{ACM Transactions on Intelligent Systems and Technology}%
1291 \def \@journalNameShort{ACM Trans. Intell. Syst. Technol.}%
1292 \def \@permissionCodeOne{2157-6904}%
1293 \or % TKDD
1294 \def \@journalName{ACM Transactions on Knowledge Discovery from Data}%
1295 \def \@journalNameShort{ACM Trans. Knowl. Discov. Data.}%
1296 \def \@permissionCodeOne{1556-4681}%
1297 \or % TMIS
1298 \def \@journalName{ACM Transactions on Management Information Systems}%
1299 \def \@journalNameShort{ACM Trans. Manag. Inform. Syst.}%
1300 \def \@permissionCodeOne{2158-656X}%
1301 \or % TOCE
1302 \def \@journalName{ACM Transactions on Computing Education}%
1303 \def \@journalNameShort{ACM Trans. Comput. Educ.}%
1304 \def \@permissionCodeOne{1946-6226}%
1305 \or % TOCHI
1306 \def \@journalName{ACM Transactions on Computer-Human Interaction}%
1307 \def \@journalNameShort{ACM Trans. Comput.-Hum. Interact.}%
1308 \def \@permissionCodeOne{1073-0516}%
1309 \or % TOCL
1310 \def \@journalName{ACM Transactions on Computational Logic}%
1311 \def \@journalNameShort{ACM Trans. Comput. Logic}%
1312 \def \@permissionCodeOne{1529-3785}%
1313 \or % TOCS
1314 \def \@journalName{ACM Transactions on Computer Systems}%
1315 \def \@journalNameShort{ACM Trans. Comput. Syst.}%
1316 \def \@permissionCodeOne{0734-2071}%
1317 \or % TOCT
1318 \def \@journalName{ACM Transactions on Computation Theory}%
1319 \def \@journalNameShort{ACM Trans. Comput. Theory}%
1320 \def \@permissionCodeOne{1942-3454}%
1321 \or % TODAES
1322 \def \@journalName{ACM Transactions on Design Automation of Electronic Systems}%
1323 \def \@journalNameShort{ACM Trans. Des. Autom. Electron. Syst.}%
1324 \def \@permissionCodeOne{1084-4309}%
1325 \or % TODS
1326 \def \@journalName{ACM Transactions on Database Systems}%
1327 \def \@journalNameShort{ACM Trans. Datab. Syst.}%
1328 \def \@permissionCodeOne{0362-5915}%
1329 \or % TOG
1330 \def \@journalName{ACM Transactions on Graphics}%
1331 \def \@journalNameShort{ACM Trans. Graph.}%
1332 \def \@permissionCodeOne{0730-0301}%
1333 \or % TOIS
1334 \def \@journalName{ACM Transactions on Information Systems}%
1335 \def \@journalNameShort{ACM Trans. Inf. Syst.}%

```

```

1336  \def\@permissionCodeOne{1046-8188}%
1337 \or % TOIT
1338  \def\@journalName{ACM Transactions on Internet Technology}%
1339  \def\@journalNameShort{ACM Trans. Internet Technol.}%
1340  \def\@permissionCodeOne{1533-5399}%
1341 \or % TOMACS
1342  \def\@journalName{ACM Transactions on Modeling and Computer Simulation}%
1343  \def\@journalNameShort{ACM Trans. Model. Comput. Simul.}%
1344  \def\@permissionCodeOne{1049-3301}%
1345  \def\@permissionCodeTwo{1558-1195}%
1346 \or % TOMM
1347  \def\@journalName{ACM Transactions on Multimedia Computing, Communications and Applications}%
1348  \def\@journalNameShort{ACM Trans. Multimedia Comput. Commun. Appl.}%
1349  \def\@permissionCodeOne{1551-6857}%
1350  \def\@permissionCodeTwo{1551-6865}%
1351 \or % TOMPECS
1352  \def\@journalName{ACM Transactions on Modeling and Performance Evaluation of Computing Systems}%
1353  \def\@journalNameShort{ACM Trans. Model. Perform. Eval. Comput. Syst.}%
1354  \def\@permissionCodeOne{2376-3639}%
1355 \or % TOMS
1356  \def\@journalName{ACM Transactions on Mathematical Software}%
1357  \def\@journalNameShort{ACM Trans. Math. Softw.}%
1358  \def\@permissionCodeOne{0098-3500}%
1359 \or % TOPC
1360  \def\@journalName{ACM Transactions on Parallel Computing}%
1361  \def\@journalNameShort{ACM Trans. Parallel Comput.}%
1362  \def\@permissionCodeOne{2329-4949}%
1363  \def\@permissionCodeTwo{2329-4957}%
1364 \or % TOPS
1365  \def\@journalName{ACM Transactions on Privacy and Security}%
1366  \def\@journalNameShort{ACM Trans. Priv. Sec.}%
1367  \def\@permissionCodeOne{2471-2566}%
1368 \or % TOPLAS
1369  \def\@journalName{ACM Transactions on Programming Languages and Systems}%
1370  \def\@journalNameShort{ACM Trans. Program. Lang. Syst.}%
1371  \def\@permissionCodeOne{0164-0925}%
1372 \or % TORS
1373  \def\@journalName{ACM Transactions on Recommender Systems}%
1374  \def\@journalNameShort{ACM Trans. Recomm. Syst.}%
1375  \def\@permissionCodeOne{2770-6699}%
1376 \or % TOS
1377  \def\@journalName{ACM Transactions on Storage}%
1378  \def\@journalNameShort{ACM Trans. Storage}%
1379  \def\@permissionCodeOne{1553-3077}%
1380 \or % TOSEM
1381  \def\@journalName{ACM Transactions on Software Engineering and Methodology}%
1382  \def\@journalNameShort{ACM Trans. Softw. Eng. Methodol.}%
1383  \def\@permissionCodeOne{1049-331X}%
1384 \or % TOSN
1385  \def\@journalName{ACM Transactions on Sensor Networks}%
1386  \def\@journalNameShort{ACM Trans. Sensor Netw.}%
1387  \def\@permissionCodeOne{1550-4859}%
1388 \or % TQC
1389  \def\@journalName{ACM Transactions on Quantum Computing}%

```

```

1390 \def\@journalNameShort{ACM Trans. Quantum Comput.}%
1391 \def\@permissionCodeOne{2643-6817}%
1392 \or % TRETS
1393 \def\@journalName{ACM Transactions on Reconfigurable Technology and Systems}%
1394 \def\@journalNameShort{ACM Trans. Reconfig. Technol. Syst.}%
1395 \def\@permissionCodeOne{1936-7406}%
1396 \or % TSAS
1397 \def\@journalName{ACM Transactions on Spatial Algorithms and Systems}%
1398 \def\@journalNameShort{ACM Trans. Spatial Algorithms Syst.}%
1399 \def\@permissionCodeOne{2374-0353}%
1400 \or % TSC
1401 \def\@journalName{ACM Transactions on Social Computing}%
1402 \def\@journalNameShort{ACM Trans. Soc. Comput.}%
1403 \def\@permissionCodeOne{2469-7818}%
1404 \or % TSLP
1405 \def\@journalName{ACM Transactions on Speech and Language Processing}%
1406 \def\@journalNameShort{ACM Trans. Speech Lang. Process.}%
1407 \def\@permissionCodeOne{1550-4875}%
1408 \or % TWEB
1409 \def\@journalName{ACM Transactions on the Web}%
1410 \def\@journalNameShort{ACM Trans. Web}%
1411 \def\@permissionCodeOne{1559-1131}%
1412 \else % FACMP, a dummy journal
1413 \def\@journalName{ACM Just Accepted}%
1414 \def\@journalNameShort{ACM Accepted}%
1415 \def\@permissionCodeOne{XXXX-XXXX}%
1416 \fi
1417 \ClassInfo{@classname}{Using journal code \@journalCode}%
1418 }{%
1419 \ClassError{@classname}{Incorrect journal #1}%
1420 }%

```

\acmJournal And the syntactic sugar around it

```

1421 \def\acmJournal#1{\setkeys{ACM}{acmJournal=#1}%
1422 \global\@ACM@journal@bibstriptrue}

```

The defaults:

```

1423 \def\@journalCode@nr{0}
1424 \def\@journalName{}%
1425 \def\@journalNameShort{@journalName}%
1426 \def\@permissionCodeOne{XXXX-XXXX}%
1427 \def\@permissionCodeTwo{}%

```

\acmConference This is the conference command

```

1428 \newcommand\acmConference[4][]{%
1429   \gdef\acmConference@shortname{\#1}%
1430   \gdef\acmConference@name{\#2}%
1431   \gdef\acmConference@date{\#3}%
1432   \gdef\acmConference@venue{\#4}%
1433   \ifx\acmConference@shortname\empty%
1434     \gdef\acmConference@shortname{\#2}%
1435   \fi
1436   \global\@ACM@journal@bibstripfalse
1437 }

```

```

1438 \if@ACM@journal\else
1439 \acmConference[Conference'17]{ACM Conference}{July 2017}{Washington,
1440 DC, USA}%
1441 \fi

\acmBooktitle The book title of the conference:
\@acmBooktitle 1442 \def\acmBooktitle#1{\gdef\@acmBooktitle{#1}}
1443 \acmBooktitle{%
1444 \ifx\acmConference@name\undefined\else
1445 \acmBooktitle{Proceedings of \acmConference@name
1446 \ifx\acmConference@name\acmConference@shortname\else
1447 \ (\acmConference@shortname)\fi}
1448 \fi

\@editorsAbbrev How to abbreviate editors
1449 \def\@editorsAbbrev{(Ed.)}

\@acmEditors The list of editors
1450 \def\@acmEditors{%
\editor Add a new editor to the list
1451 \def\editor#1{\ifx\@acmEditors\empty
1452 \gdef\@acmEditors{#1}%
1453 \else
1454 \gdef\@editorsAbbrev{(Eds.)}%
1455 \g@addto@macro\@acmEditors{\and#1}%
1456 \fi}

\subtitle The subtitle macro
1457 \def\subtitle#1{\def\@subtitle{#1}}
1458 \subtitle{%
\num@authorgroups The total number of “groups”. Each group is several authors with the same affiliations(s)
1459 \newcount\num@authorgroups
1460 \num@authorgroups=0\relax

\num@authors The total number of authors
1461 \newcount\num@authors
1462 \num@authors=0\relax

\if@insideauthorgroup Whether we are continuing an author group
1463 \newif\if@insideauthorgroup
1464 \if@insideauthorgroupfalse

\author Adding an author to the list of authors and addresses.
Note that we want to typeset the link to the author’s orcid if known. The problem
is, we know the orcid only after the author is entered. The trick is based on the idea
that \csname... \endcsname is \relax unless defined. Therefore we typeset authors by
the special macro \csname typeset@author\the\num@authors\endcsname, which is
defined by \orcid command.
1465 \renewcommand\author[2][]{%
1466 \IfSubStr{\detokenize{#2}}{,}{\ClassWarning{@classname}{Do not put several

```

```

1467     authors in the same \string\author\space macro!}{}%}
1468 \global\advance\num@authors by 1\relax
1469 \if@insideauthorgroup\else
1470   \global\advance\num@authorgroups by 1\relax
1471   \global\@insideauthorgrouptrue
1472 \fi
1473 \ifx\addresses\@empty
1474   \if@ACM@anonymous
1475     \gdef\addresses{@author{Anonymous Author(s)}%
1476       \ifx\@acmSubmissionID\@empty\else\Submission Id:
1477         \@acmSubmissionID\fi}%
1478     \gdef\authors{Anonymous Author(s)}%
1479   \else
1480     \expandafter\gdef\expandafter\addresses\expandafter{%
1481       \expandafter\@author\expandafter{%
1482         \csname typeset@author\the\num@authors\endcsname{#2}}}}%
1483     \gdef\authors{\#2}%
1484   \fi
1485 \else
1486   \if@ACM@anonymous\else
1487     \expandafter\g@addto@macro\expandafter\addresses\expandafter{%
1488       \expandafter\and\expandafter\@author\expandafter{%
1489         \csname typeset@author\the\num@authors\endcsname{#2}}}}%
1490     \g@addto@macro\authors{\and\#2}%
1491   \fi
1492 \fi
1493 \if@ACM@anonymous
1494   \ifx\shortauthors\@empty
1495     \gdef\shortauthors{Anon.%
1496       \ifx\@acmSubmissionID\@empty\else Submission Id:
1497         \@acmSubmissionID\fi}%
1498   \fi
1499 \else
1500   \def\@tempa{\#1}%
1501   \ifx\@tempa\@empty
1502     \ifx\shortauthors\@empty
1503       \gdef\shortauthors{\#2}%
1504     \else
1505       \g@addto@macro\shortauthors{\and\#2}%
1506     \fi
1507   \else
1508     \ifx\shortauthors\@empty
1509       \gdef\shortauthors{\#1}%
1510     \else
1511       \g@addto@macro\shortauthors{\and\#1}%
1512     \fi
1513   \fi
1514 \fi}

```

\affiliation The macro \affiliation mimics \address from amsart. Note that it has an optional argument, which we use differently from amsart.

```

1515 \newcommand{\affiliation}[2][]{%
1516   \global\@insideauthorgroupfalse
1517   \if@ACM@anonymous\else

```

```

1518     \g@addto@macro\addresses{\affiliation{#1}{#2}}%
1519   \fi}

@ACM@affiliation@obeypunctuation Whether to use the author's punctuation (false by default, which adds American-style
address punctuation)
1520 \define@boolkey+{@ACM@affiliation@}{@ACM@affiliation@}{obeypunctuation}%
1521 [true]{\ClassError{@classname}{The option obeypunctuation can be either true or false}{}}
```

\additionalaffiliation Additional affiliations go to footnotes

```

1522 \def\additionalaffiliation#1{\authornote{\@additionalaffiliation{#1}}}
```

\@additionalaffiliation Process \additionalaffiliation inside \authornote

```

1523 \def\@additionalaffiliation#1{\bgroup
1524   \def\position##1{\ignorespaces}%
1525   \def\institution##1##2{\ignorespaces}%
1526   \def\department{\ifnextchar[\@department]{\@department[]}{}}%
1527   \def\@department##1##2{\unskip, ##2\ignorespaces}%
1528   \let\streetaddress\position
1529   \let\city\position
1530   \let\state\position
1531   \let\postcode\position
1532   \let\country\position
1533   Also with #1\unskip.\egroup}
```

\email The macro \email mimics \email from amsart. Again, it has an optional argument that we do not currently need but keep for possible future use.

```

1534 \renewcommand{\email}[2][]{%
1535   \IfSubStr{#2}{,}{\ClassWarning{@classname}{Do not put several
1536     addresses in the same \string\email\space macro!}}{}%
1537   \if@ACM@anonymous\else
1538     \g@addto@macro\addresses{\email{#1}{#2}}%
1539   \fi}
```

\orcid We rededine the command to typeset the current author

```

1540 \def\orcid#1{\unskip\ignorespaces%
1541   \IfBeginWith{#1}{http}{%
1542     \expandafter\gdef\csname
1543       typeset@author\the\num@authors\endcsname##1{%
1544         \href{#1}{##1}}}{%
1545     \expandafter\gdef\csname
1546       typeset@author\the\num@authors\endcsname##1{%
1547         \href{https://orcid.org/#1}{##1}}}}
```

\authorsaddresses Setting up authors' addresses

```

1548 \def\authorsaddresses#1{\def\authorsaddresses{#1}}
1549 \authorsaddresses{\@mkauthorsaddresses}
```

\@mktranslatedkeywords We have two argument: the language to typeset keywords and the keywords.

```

1550 \newcommand{\mktranslatedkeywords}[2]{\bgroup
1551   \selectlanguage{#1}%
1552   {\@specialsection{\keywordsname}%
1553     \noindent#2\par}\egroup}
```

```

\@titlenotes The title notes
1554 \def\@titlenotes{}

\titlenote Adding a note to the title
1555 \def\titlenote#1{%
1556   \g@addto@macro\@title{\footnotemark}%
1557   \if@ACM@anonymous
1558     \g@addto@macro\@titlenotes{%
1559       \stepcounter{footnote}\footnotetext{Title note}}%
1560   \else
1561     \g@addto@macro\@titlenotes{\stepcounter{footnote}\footnotetext{#1}}%
1562   \fi}

@subtitlenotes The subtitle notes
1563 \def\@subtitlenotes{}

\subtitlenote Adding a note to the subtitle
1564 \def\subtitlenote#1{%
1565   \g@addto@macro\@subtitle{\footnotemark}%
1566   \if@ACM@anonymous
1567     \g@addto@macro\@subtitlenotes{%
1568       \stepcounter{footnote}\footnotetext{Subtitle note}}%
1569   \else
1570     \g@addto@macro\@subtitlenotes{%
1571       \stepcounter{footnote}\footnotetext{#1}}%
1572   \fi}

@authornotes The author notes
1573 \def\@authornotes{}

\authornote Adding a note to the author
1574 \def\authornote#1{%
1575   \if@ACM@anonymous\else
1576     \g@addto@macro\addresses{\@authornotemark}%
1577     \g@addto@macro\@authornotes{%
1578       \stepcounter{footnote}\footnotetext{#1}}%
1579   \fi}

\authornotemark Adding a footnote mark to the authors
1580 \newcommand\authornotemark[1][\relax]{%
1581   \ifx#1\relax\relax\relax
1582   \g@addto@macro\addresses{\@authornotemark}%
1583   \else
1584   \g@addto@macro\addresses{\@@authornotemark{#1}}%
1585   \fi}

\acmVolume The current volume
1586 \def\acmVolume#1{\def\@acmVolume{#1}}
1587 \acmVolume{1}

\acmNumber The current number
1588 \def\acmNumber#1{\def\@acmNumber{#1}}
1589 \acmNumber{1}

```

```

\acmArticle The current article
1590 \def\acmArticle#1{\def\@acmArticle{#1}}
1591 \acmArticle{}

\acmArticleSeq The sequence number
1592 \def\acmArticleSeq#1{\def\@acmArticleSeq{#1}}
1593 \acmArticleSeq{@acmArticle}

\acmYear The current year
1594 \def\acmYear#1{\def\@acmYear{#1}}
1595 \acmYear{\the\year}

\acmMonth The current month
1596 \def\acmMonth#1{\def\@acmMonth{#1}}
1597 \acmMonth{\the\month}

\@acmPubDate The publication date
1598 \def\@acmPubDate{\ifcase\@acmMonth\or
1599   January\or February\or March\or April\or May\or June\or
1600   July\or August\or September\or October\or November\or
1601   December\fi^@\acmYear}

\acmPrice The price
1602 \def\acmPrice#1{\def\@acmPrice{#1}}
1603 \acmPrice{15.00}

\acmSubmissionID The submission ID
1604 \def\acmSubmissionID#1{\def\@acmSubmissionID{#1}}
1605 \acmSubmissionID{}

\acmISBN The book ISBN
1606 \def\acmISBN#1{\def\@acmISBN{#1}}
1607 \acmISBN{978-x-xxxx-xxxx-x/YY/MM}

\acmDOI The paper DOI
1608 \def\acmDOI#1{\def\@acmDOI{#1}}
1609 \acmDOI{10.1145/nnnnnnn.nnnnnnn}

@if@ACM@badge Whether to print a badge. Note that either a left or right badge triggers it:
1610 \newif\if@ACM@badge
1611 \@ACM@badg>false

@ACM@badge@width The width of the badge
1612 \newlength\@ACM@badge@width
1613 \setlength\@ACM@badge@width{5pc}

@ACM@title@width The width of the badge
1614 \newlength\@ACM@title@width

@ACM@badge@skip The space between the badge and the title
1615 \newlength\@ACM@badge@skip
1616 \setlength\@ACM@badge@skip{1pc}

```

```

\acmBadgeR Setting the right badge
1617 \newcommand\acmBadgeR[2][]{@ACM@badgetrue
1618   \def\@acmBadgeR@url{\#1}%
1619   \def\@acmBadgeR@image{\#2}}
1620 \def\@acmBadgeR@url{}
1621 \def\@acmBadgeR@image{}

\acmBadgeL Setting the left badge
1622 \newcommand\acmBadgeL[2][]{@ACM@badgetrue
1623   \def\@acmBadgeL@url{\#1}%
1624   \def\@acmBadgeL@image{\#2}}
1625 \def\@acmBadgeL@url{}
1626 \def\@acmBadgeL@image{}

\startPage The start page of the paper
1627 \def\startPage#1{\def\@startPage{\#1}}
1628 \startPage{}

\terms Terms are obsolete. We use CCS now.
1629 \def\terms#1{\ClassWarning{@classname}{The command \string\terms{} is
1630   obsolete. I am going to ignore it}{}}

\keywords Keywords are mostly obsolete. We use CCS now. Still it makes sense to keep them for
compatibility.
1631 \def\keywords#1{\def\@keywords{\#1}}
1632 \let\@keywords\empty
1633 \AtEndDocument{\if@ACM@nonacm\else\ifx\@keywords\empty
1634   \ifnum\getrefnumber{TotPages}>2\relax
1635     \ClassWarningNoLine{@classname}{ACM keywords are mandatory
1636       for papers over two pages}%
1637   \fi\fi\fi}

\abstract The amsart package puts abstract in a box. Since we do not know whether we will
use two-column mode, we prefer to save the text
1638 \renewenvironment{abstract}{\Collect@Body\@saveabstract}{}

\@saveabstract And saving the abstract
1639 \long\def\@saveabstract#1{\if@ACM@maketitle@typeset
1640   \ClassError{@classname}{Abstract must be defined before maketitle
1641     command. Please move it!}\fi
1642   \long\gdef\@abstract{\#1}}
1643 \@saveabstract{}

\@lempy The long version of \@empty (to compare with \@abstract)
1644 \long\def\@lempy{>

\if@ACM@printccs Whether to print CCS
1645 \define@boolkey+{@ACM@topmatter@}{@ACM@}{printccs}[true]{%
1646   \if@ACM@printccs
1647     \ClassInfo{@classname}{Printing CCS}%
1648   \else
1649     \ClassInfo{@classname}{Suppressing CCS}%
1650   \fi}{\ClassError{@classname}{The option printccs can be either true or false}}}

```

```

\if@ACM@printacmref Whether to print the ACM bibstrip
1651 \define@boolkey+{@ACM@topmatter@}{@ACM@}{printacmref}[true]{%
1652   \if@ACM@printacmref
1653     \ClassInfo{@classname}{Printing bibformat}%
1654   \else
1655     \ClassInfo{@classname}{Suppressing bibformat}%
1656   \fi}{\ClassError{@classname}{The option printacmref can be either true or false}}%
1657 \AtEndDocument{\if@ACM@nonacm\else\if@ACM@printacmref\else
1658   \ifnum\getrefnumber{TotPages}>1\relax
1659     \ClassWarningNoLine{@classname}{%
1660       ACM reference format is mandatory \MessageBreak
1661       for papers over one page. \MessageBreak
1662       Please add printacmref=true to the \MessageBreak
1663       \string\settopmatter\space command.}%
1664   \fi\fi\fi}
\if@ACM@printfolios Whether to print folios
1665 \define@boolkey+{@ACM@topmatter@}{@ACM@}{printfolios}[true]{%
1666   \if@ACM@printfolios
1667     \ClassInfo{@classname}{Printing folios}%
1668   \else
1669     \ClassInfo{@classname}{Suppressing folios}%
1670   \fi}{\ClassError{@classname}{The option printfolios can be either true or false}}%
\@ACM@authorsperrow The number of authors per row. 0 means use the default algorithm.
1671 \define@cmdkey{@ACM@topmatter@}{@ACM@}{authorsperrow}[0]{%
1672   \IfInteger{#1}{\ClassInfo{@classname}{Setting authorsperrow to
1673     #1}}{\ClassWarning{@classname}{The parameter authorsperrow must be
1674     numerical. Ignoring the input #1}\gdef\@ACM@authorsperrow{0}}}
\settopmatter The usual syntactic sugar
1675 \def\settopmatter#1{\setkeys{@ACM@topmatter@}{#1}}
Now the settings
1676 \settopmatter{printccs=true, printacmref=true}
1677 \if@ACM@manuscript
1678   \settopmatter{printfolios=true}
1679 \else
1680   \if@ACM@journal
1681     \settopmatter{printfolios=true}
1682   \else
1683     \settopmatter{printfolios=false}
1684   \fi
1685 \fi
1686 \settopmatter{authorsperrow=0}
\@received The container for the paper history
1687 \def\@received{}
\received The \received command
1688 \newcommand\received[2][]{\def\@tempa{#1}%
1689   \ifx\@tempa\empty

```

```

1690     \ifx\@received\@empty
1691         \gdef\@received{Received #2}%
1692     \else
1693         \g@addto@macro{\@received}{; revised #2}%
1694     \fi
1695 \else
1696     \ifx\@received\@empty
1697         \gdef\@received{#1 #2}%
1698     \else
1699         \g@addto@macro{\@received}{; #1 #2}%
1700     \fi
1701 \fi}
1702 \AtEndDocument{%
1703     \ifx\@received\@empty\else
1704         \par\bigskip\noindent\small\normalfont\@received\par
1705     \fi}

```

\acmArticleType Article type. We set up the color.

```

1706 \define@choicekey+{ACM}{articletype}[\ACM@ArticleType\ACM@ArticleType@nr]{%
1707     Research,Review,Discussion,Invited,Position}[Review]{%
1708     \ifcase\ACM@ArticleType@nr
1709         \relax % Research
1710         \colorlet{@ACM@Article@color}{ACMBlue}%
1711     \or % Review
1712         \colorlet{@ACM@Article@color}{ACMOrange}%
1713     \or % Discussion
1714         \colorlet{@ACM@Article@color}{ACMGreen}%
1715     \or % Invited
1716         \colorlet{@ACM@Article@color}{ACMPurple}%
1717     \or % Position
1718         \colorlet{@ACM@Article@color}{ACMRed}%
1719     \fi
1720 }{%
1721     \ClassError{@classname}{Article Type must be Research, Review, \MessageBreak
1722     Discussion, Invited, or Position}}
1723 \def\acmArticleType#1{\setkeys{ACM}{articletype=#1}}
1724 \newenvironment{@ACM@color@frame}{%
1725     \def\FrameCommand{\hspace*{-6.5pc}%
1726         \colorbox{@ACM@Article@color}{\hspace*{10pt}\!white}}%
1727     \MakeFramed {\advance\hspace -6.5pc\relax\FrameRestore}}{\endMakeFramed}
1728 \if@ACM@acmcp
1729 \acmArticleType{Research}%
1730 \fi

```

\acmCodeLink The code link

```

1731 \def\acmCodeLink#1{%
1732     \ifx\@acmCodeDataLink\@empty
1733         \gdef\@acmCodeDataLink{\url{#1}}%
1734     \else
1735         \g@addto@macro{\@acmCodeDataLink}{\url{#1}}%
1736     \fi}
1737 \def\@acmCodeDataLink{}

```

\acmDataLink The code link

```

1738 \let\acmDataLink\acmCodeLink

```

### 3.17 Concepts system

We exclude CCSXML stuff generated by the ACM system:

```
1739 \RequirePackage{comment}  
1740 \excludecomment{CCSXML}
```

\@concepts This is the storage macro and counter for concepts  
1741 \let\@concepts\empty  
1742 \newcounter{@concepts}

\ccsdesc The first argument is the significance, the second is the concept(s)  
1743 \newcommand\ccsdesc[2][100]{%  
1744 \ccsdesc@parse#1^#2^~\ccsdesc@parse@end}

\ccsdesc@parse The parser of the expression Significance~General~Specific (we need textcomp for \textrightarrow). Note that Specific can be empty!  
1745 \def\textrightarrow{\$\rightarrow\$}  
1746 \def\ccsdesc@parse#1^#2^#3^{%  
1747 \stepcounter{@concepts}%  
1748 \expandafter\ifx\csname CCS@General@#2\endcsname\relax  
1749 \expandafter\gdef\csname CCS@General@#2\endcsname{\textbullet\textbf{#2}}%  
1750 \expandafter\gdef\csname CCS@Punctuation@#2\endcsname{; }%  
1751 \expandafter\gdef\csname CCS@Specific@#2\endcsname{}%  
1752 \g@addto@macro{\@concepts}{\csname CCS@General@#2\endcsname  
1753 \csname CCS@Punctuation@#2\endcsname  
1754 \csname CCS@Specific@#2\endcsname}%  
1755 \fi  
1756 \ifx#3\relax\relax\else  
1757 \expandafter\gdef\csname CCS@Punctuation@#2\endcsname{  
1758 \textrightarrow\ }%  
1759 \expandafter\g@addto@macro\expandafter{\csname CCS@Specific@#2\endcsname}{%  
1760 \addtocounter{@concepts}{-1}}%  
1761 \ifnum#1>499\textbf{#3}\else  
1762 \ifnum#1>299\textit{#3}\else  
1763 #3\fi\fi\ifnum\value{@concepts}=0.\else; \fi}%  
1764 \fi  
1765 \fi  
1766 \ccsdesc@parse@finish}

```
1767 \AtEndDocument{\if@ACM\nonacm\else\ifx\@concepts\empty\relax  
1768   \ifnum\getrefnumber{TotPages}>2\relax  
1769   \ClassWarningNoLine{@classname}{CCS concepts are mandatory  
1770     for papers over two pages}%  
1771 \fi\fi\fi}
```

\ccdesc@parse@finish Gobble everything to \ccsdesc@parse@end  
1772 \def\ccsdesc@parse@finish#1\ccsdesc@parse@end{}

### 3.18 Copyright system

This is from acmcopyright.sty

\if@printcopyright Whether to print a copyright symbol  
1773 \newif\if@printcopyright  
1774 \if@printcopyrighttrue

```
\if@printpermission Whether to print the permission block
```

```
1775 \newif\if@printpermission  
1776 \if@printpermissiontrue
```

```
\if@acmowned Whether the ACM owns the rights to the paper
```

```
1777 \newif\if@acmowned  
1778 \if@acmownedtrue
```

Keys:

```
1779 \define@choicekey*{ACM@}{acmcopyrightmode}[%  
1780   \acm@copyrightinput\acm@copyrightmode]{none,%  
1781   acmcopyright,acmlicensed,rightsretained,%  
1782   usgov,usgovmixed,cagov,cagovmixed,licensedusgovmixed,%  
1783   licensedcagov,licensedcagovmixed,othergov,licensedothergov,%  
1784   iw3c2w3,iw3c2w3g,cc}{%  
1785   \if@printpermissiontrue  
1786   \if@printcopyrighttrue  
1787   \if@acmownedtrue  
1788   \ifnum\acm@copyrightmode=0\relax % none  
1789   \if@printpermissionfalse  
1790   \if@printcopyrightfalse  
1791   \if@acmownedfalse  
1792   \fi  
1793   \ifnum\acm@copyrightmode=2\relax % acmlicensed  
1794   \if@acmownedfalse  
1795   \fi  
1796   \ifnum\acm@copyrightmode=3\relax % rightsretained  
1797   \if@acmownedfalse  
1798   \AtBeginDocument{\acmPrice{} }%  
1799   \fi  
1800   \ifnum\acm@copyrightmode=4\relax % usgov  
1801   \if@printpermissiontrue  
1802   \if@printcopyrightfalse  
1803   \if@acmownedfalse  
1804   \AtBeginDocument{\acmPrice{} }%  
1805   \fi  
1806   \ifnum\acm@copyrightmode=6\relax % cagov  
1807   \if@acmownedfalse  
1808   \fi  
1809   \ifnum\acm@copyrightmode=8\relax % licensedusgovmixed  
1810   \if@acmownedfalse  
1811   \fi  
1812   \ifnum\acm@copyrightmode=9\relax % licensedcagov  
1813   \if@acmownedfalse  
1814   \fi  
1815   \ifnum\acm@copyrightmode=10\relax % licensedcagovmixed  
1816   \if@acmownedfalse  
1817   \fi  
1818   \ifnum\acm@copyrightmode=11\relax % othergov  
1819   \if@acmownedtrue  
1820   \fi  
1821   \ifnum\acm@copyrightmode=12\relax % licensedothergov  
1822   \if@acmownedfalse  
1823   \fi
```

```

1824 \ifnum\acm@copyrightmode=13\relax % iw3c2w3
1825 \@acmownedfalse
1826 \AtBeginDocument{\acmPrice{}}
1827 \fi
1828 \ifnum\acm@copyrightmode=14\relax % iw3c2w3g
1829 \@acmownedfalse
1830 \AtBeginDocument{\acmPrice{}}
1831 \fi
1832 \ifnum\acm@copyrightmode=15\relax % cc
1833 \@acmownedfalse
1834 \AtBeginDocument{\acmPrice{}}
1835 \fi}

\setcopyright This is the syntactic sugar around setting keys.
1836 \def\setcopyright#1{\setkeys{ACM@}{acmcopyrightmode=#1}}
1837 \setcopyright{acmcopyright}

\setcctype The type of Creative Commons license used
1838 \newcommand\setcctype[2][4.0]{%
1839   \def\ACM@cc@version{#1}%
1840   \def\ACM@cc@type{#2}%
1841 \setcctype{by}

@copyrightowner Here is the owner of the copyright
1842 \def\@copyrightowner{%
1843   \ifcase\acm@copyrightmode\relax % none
1844     \or % acmcopyright
1845     Association for Computing Machinery.
1846     \or % acmlicensed
1847     Copyright held by the owner/author(s). Publication rights licensed to
1848     ACM\@.
1849     \or % rightsretained
1850     Copyright held by the owner/author(s).
1851     \or % usgov
1852     \or % usgovmixed
1853     Association for Computing Machinery.
1854     \or % cagov
1855     Crown in Right of Canada.
1856     \or % cagovmixed
1857     Association for Computing Machinery.
1858     \or % licensedusgovmixed
1859     Copyright held by the owner/author(s). Publication rights licensed to
1860     ACM\@.
1861     \or % licensedcagov
1862     Crown in Right of Canada. Publication rights licensed to
1863     ACM\@.
1864     \or % licensedcagovmixed
1865     Copyright held by the owner/author(s). Publication rights licensed to
1866     ACM\@.
1867     \or % othergov
1868     Association for Computing Machinery.
1869     \or % licensedothergov
1870     Copyright held by the owner/author(s). Publication rights licensed to
1871     ACM\@.

```

```

1872 \or % ic2w3www
1873 IW3C2 (International World Wide Web Conference Committee), published
1874 under Creative Commons CC-BY~4.0 License.
1875 \or % ic2w3wwwgoogle
1876 IW3C2 (International World Wide Web Conference Committee), published
1877 under Creative Commons CC-BY-NC-ND~4.0 License.
1878 \or % cc
1879 Copyright held by the owner/author(s).
1880 \fi}

\@formatdoi Print a clickable DOI
1881 \def\@formatdoi#1{\url{https://doi.org/#1}]

\@ACM@copyright@check@cc At present cC licenses can be used only for acm engage format or for non-acm stuff. This
macro checks whether the CC license is applicable and generates an error if not.
1882 \def\@ACM@copyright@check@cc{%
1883   \if@ACM@nonacm
1884     \ClassInfo{@classname}{Using CC license with a non-acm
1885       material}%
1886   \else
1887     \if@ACM@engage
1888       \ClassInfo{@classname}{Using CC license with ACM Engage
1889         material}%
1890     \else
1891       \ClassError{@classname}{%
1892         Sorry, Creative Commons licenses are\MessageBreak
1893         currently not used with ACM publications\MessageBreak
1894         typeset by the authors}{Please use nonacm
1895           option or ACM Engage class to enable CC licenses}%
1896     \fi
1897   \fi}
1898 \def\@copyrightpermission{%
1899   \ifcase\acm@copyrightmode\relax % none
1900     \or % acmcopyright
1901       Permission to make digital or hard copies of all or part of this
1902       work for personal or classroom use is granted without fee provided
1903       that copies are not made or distributed for profit or commercial
1904       advantage and that copies bear this notice and the full citation on
1905       the first page. Copyrights for components of this work owned by
1906       others than ACM must be honored. Abstracting with credit is
1907       permitted. To copy otherwise, or republish, to post on servers or to
1908       redistribute to lists, requires prior specific permission
1909       and\hspace*{.5pt}/or a fee. Request permissions from
1910       permissions@acm.org.
1911   \or % acmlicensed
1912     Permission to make digital or hard copies of all or part of this
1913     work for personal or classroom use is granted without fee provided
1914     that copies are not made or distributed for profit or commercial
1915     advantage and that copies bear this notice and the full citation on
1916     the first page. Copyrights for components of this work owned by
1917     others than the author(s) must be honored. Abstracting with credit
1918     is permitted. To copy otherwise, or republish, to post on servers

```

1919 or to redistribute to lists, requires prior specific permission  
1920 and\hspace\*{.5pt}/or a fee. Request permissions from  
1921 permissions@acm.org.  
1922 \or % rightsretained  
1923 Permission to make digital or hard copies of part or all of this work  
1924 for personal or classroom use is granted without fee provided that  
1925 copies are not made or distributed for profit or commercial advantage  
1926 and that copies bear this notice and the full citation on the first  
1927 page. Copyrights for third-party components of this work must be  
1928 honored. For all other uses, contact the  
1929 owner\hspace\*{.5pt}/author(s).  
1930 \or % usgov  
1931 This paper is authored by an employee(s) of the United States  
1932 Government and is in the public domain. Non-exclusive copying or  
1933 redistribution is allowed, provided that the article citation is  
1934 given and the authors and agency are clearly identified as its  
1935 source.  
1936 \or % usgovmixed  
1937 ACM acknowledges that this contribution was authored or co-authored  
1938 by an employee, contractor, or affiliate of the United States  
1939 government. As such, the United States government retains a  
1940 nonexclusive, royalty-free right to publish or reproduce this  
1941 article, or to allow others to do so, for government purposes only.  
1942 \or % cagov  
1943 This article was authored by employees of the Government of Canada.  
1944 As such, the Canadian government retains all interest in the  
1945 copyright to this work and grants to ACM a nonexclusive,  
1946 royalty-free right to publish or reproduce this article, or to allow  
1947 others to do so, provided that clear attribution is given both to  
1948 the authors and the Canadian government agency employing them.  
1949 Permission to make digital or hard copies for personal or classroom  
1950 use is granted. Copies must bear this notice and the full citation  
1951 on the first page. Copyrights for components of this work owned by  
1952 others than the Canadian Government must be honored. To copy  
1953 otherwise, distribute, republish, or post, requires prior specific  
1954 permission and\hspace\*{.5pt}/or a fee. Request permissions from  
1955 permissions@acm.org.  
1956 \or % cagovmixed  
1957 ACM acknowledges that this contribution was co-authored by an  
1958 affiliate of the national government of Canada. As such, the Crown  
1959 in Right of Canada retains an equal interest in the copyright.  
1960 Reprints must include clear attribution to ACM and the author's  
1961 government agency affiliation. Permission to make digital or hard  
1962 copies for personal or classroom use is granted. Copies must bear  
1963 this notice and the full citation on the first page. Copyrights for  
1964 components of this work owned by others than ACM must be honored.  
1965 To copy otherwise, distribute, republish, or post, requires prior  
1966 specific permission and\hspace\*{.5pt}/or a fee. Request permissions  
1967 from permissions@acm.org.  
1968 \or % licensedusgovmixed  
1969 Publication rights licensed to ACM\@. ACM acknowledges that this  
1970 contribution was authored or co-authored by an employee, contractor  
1971 or affiliate of the United States government. As such, the  
1972 Government retains a nonexclusive, royalty-free right to publish or

1973 reproduce this article, or to allow others to do so, for Government  
1974 purposes only.  
1975 \or % licensedcagov  
1976 This article was authored by employees of the Government of Canada.  
1977 As such, the Canadian government retains all interest in the  
1978 copyright to this work and grants to ACM a nonexclusive,  
1979 royalty-free right to publish or reproduce this article, or to allow  
1980 others to do so, provided that clear attribution is given both to  
1981 the authors and the Canadian government agency employing them.  
1982 Permission to make digital or hard copies for personal or classroom  
1983 use is granted. Copies must bear this notice and the full citation  
1984 on the first page. Copyrights for components of this work owned by  
1985 others than the Canadian Government must be honored. To copy  
1986 otherwise, distribute, republish, or post, requires prior specific  
1987 permission and\hspace\*{.5pt}/or a fee. Request permissions from  
1988 permissions@acm.org.  
1989 \or % licensedcagovmixed  
1990 Publication rights licensed to ACM\@. ACM acknowledges that this  
1991 contribution was authored or co-authored by an employee, contractor  
1992 or affiliate of the national government of Canada. As such, the  
1993 Government retains a nonexclusive, royalty-free right to publish or  
1994 reproduce this article, or to allow others to do so, for Government  
1995 purposes only.  
1996 \or % othergov  
1997 ACM acknowledges that this contribution was authored or co-authored  
1998 by an employee, contractor or affiliate of a national government. As  
1999 such, the Government retains a nonexclusive, royalty-free right to  
2000 publish or reproduce this article, or to allow others to do so, for  
2001 Government purposes only.  
2002 \or % licensedothergov  
2003 Publication rights licensed to ACM\@. ACM acknowledges that this  
2004 contribution was authored or co-authored by an employee, contractor  
2005 or affiliate of a national government. As such, the Government  
2006 retains a nonexclusive, royalty-free right to publish or reproduce  
2007 this article, or to allow others to do so, for Government purposes  
2008 only.  
2009 \or % iw3c2w3  
2010 This paper is published under the Creative Commons Attribution^4.0  
2011 International (CC-BY^4.0) license. Authors reserve their rights to  
2012 disseminate the work on their personal and corporate Web sites with  
2013 the appropriate attribution.  
2014 \or % iw3c2w3  
2015 This paper is published under the Creative Commons  
2016 Attribution-NonCommercial-NoDerivs^4.0 International  
2017 (CC-BY-NC-ND^4.0) license. Authors reserve their rights to  
2018 disseminate the work on their personal and corporate Web sites with  
2019 the appropriate attribution.  
2020 \or % CC  
2021 \@ACM@copyright@check@cc  
2022 \IfEq{\ACM@cc@type}{zero}{%  
2023 \def\ACM@CC@Url{https://creativecommons.org/publicdomain/zero/1.0/legalcode}}{  
2024 \edef\ACM@CC@Url{https://creativecommons.org/licenses/\ACM@cc@type/\ACM@cc@version/legalcode}}%  
2025 \href{\ACM@CC@Url}{\includegraphics[height=5ex]{doclicense-CC-\ACM@cc@type-88x31}}\\  
2026 \href{\ACM@CC@Url}{%

```

2027 This work is licensed under a Creative Commons
2028 \IfEq{\ACM@cc@type}{zero}{CC0 1.0 Universal}{%
2029   \IfEq{\ACM@cc@type}{by}{Attribution}{%
2030     \IfEq{\ACM@cc@type}{by-sa}{Attribution-ShareAlike}{%
2031       \IfEq{\ACM@cc@type}{by-nd}{Attribution-NoDerivatives}{%
2032         \IfEq{\ACM@cc@type}{by-nc}{Attribution-NonCommercial}{%
2033           \IfEq{\ACM@cc@type}{by-nc-sa}{Attribution-NonCommercial-ShareAlike}{%
2034             \IfEq{\ACM@cc@type}{by-nc-nd}{Attribution-NonCommercial-NoDerivatives}{%
2035               ~\IfEq{\ACM@cc@version}{4.0}{4.0 International}{3.0 Unported}%
2036             }
2037           License.}%
2038         \fi}

```

\copyrightyear By default, the copyright year is the same as \acmYear, but one can override this:

```

2039 \def\copyrightyear#1{\def\@copyrightyear{#1}}
2040 \copyrightyear{\@acmYear}

```

\@teaserfigures The teaser figures container

```

2041 \def\@teaserfigures{}

```

teaserfigure The teaser figure

```

2042 \newenvironment{teaserfigure}{\Collect@Body\@saveteaser}{}

```

\@saveteaser Saving the teaser

```

2043 \long\def\@saveteaser#1{\g@addto@macro\@teaserfigures{\@teaser{#1}}}

```

\thanks We redefine amsart \thanks so the anonymous key works

```

2044 \renewcommand{\thanks}[1]{%
2045   \@ifnotempty{#1}{%
2046     \if@ACM@anonymous
2047       \g@addto@macro\thankses{\thanks{A note}}%
2048     \else
2049       \g@addto@macro\thankses{\thanks{#1}}%
2050     \fi}}

```

\anon We provide \anon command, which blinds parts of the text if the package option anonymous is set

```

2051 \newcommand{\anon}[2][ANONYMIZED]{%
2052   \if@ACM@anonymous%
2053     {\color{ACMOrange}\#1}%
2054   \else%
2055     \#2%
2056   \fi}

```

### 3.19 Maketitle hook

The current L<sup>A</sup>T<sub>E</sub>X provides a nice lthooks mechanism. However, since it is relatively new, we will use oldfashioned approach—at least for now.

\@beginmaketitlehook The hook

```

2057 \ifx\@beginmaketitlehook\@undefined
2058   \let\@beginmaketitlehook\@empty
2059 \fi

```

```
\AtBeginMaketitle Adding to the hook
2060 \def\AtBeginMaketitle{\g@addto@macro\@beginmaketitlehook}
```

### 3.20 ACM Engage top matter

```
\@acmengagemetadata The special metadata for ACM engage course materials
2061 \def\@acmengagemetadata{}
```

```
\setengagemetadata Adding topic to engage metadata
```

```
2062 \def\setengagemetadata#1#2{%
2063   \g@addto@macro{\@acmengagemetadata}{%
2064     \@setengagemetadata{#1}{#2}}}
```

### 3.21 Typesetting top matter

```
\mkttitle@bx Some of our formats use a two-column design. Some use a one-column design. In all cases we use a wide title. Thus we typeset the top matter in a special box to be used in the construction \atwocolumn[\box].
```

```
2065 \newbox\mkttitle@bx
```

```
\maketitle The (in)famous \maketitle. Note that in sigchi-a mode, authors are not in the title box.
```

Another note: there is a subtle difference between author notes, title notes and thanks. The latter two refer to the paper itself and therefore belong to the copyright/permission block. By the way, this was the default behavior of the old ACM classes.

```
2066 \def\maketitle{\@beginmaketitlehook
2067   \@ACM@maketitle@typesettrue
2068   \if@ACM@anonymous
2069     % Anonymize omission of \author-s
2070     \ifnum\num@authorgroups=0\author{}\fi
2071   \fi
2072   \begingroup
2073   \let\@vspace\@vspace@orig
2074   \let\@vspacer\@vspacer@orig
2075   \let\@footnotemark\@footnotemark@nolink
2076   \let\@footnotetext\@footnotetext@nolink
2077   \renewcommand\thefootnote{\@fnsymbol\c@footnote}%
2078   \hsize=\textwidth
2079   \def\@makefnmark{\hbox{\@textsuperscript{\@thefnmark}}}%
2080   \atmkttitle\if@ACM@sigchiamode\else\@mkauthors\fi\@mkteasers
2081   \@printtopmatter
2082   \if@ACM@sigchiamode\@mkauthors\fi
2083   \setcounter{footnote}{0}%
2084   \def\@makefnmark{\hbox{\@textsuperscript{\normalfont\@thefnmark}}}%
2085   \attnotes
2086   \asubtnotes
2087   \authornotes
2088   \let\@makefnmark\relax
2089   \let\@thefnmark\relax
2090   \let\@makefntext\noindent
2091   \ifx\@empty\thankses\else
2092     \footnotetextauthorsaddresses{%
```

```

2093     \def\par{\let\par\@par}\parindent\z@\@setthanks}%
2094   \fi
2095 \if@ACM@acmcp\else
2096   \ifx\empty\@authorsaddresses\else
2097     \if@ACM@anonymous\else
2098       \if@ACM@journal@bibstrip
2099         \footnotetextauthorsaddresses{%
2100           \def\par{\let\par\@par}\parindent\z@\@setauthorsaddresses}%
2101         \fi
2102       \fi
2103     \fi
2104   \fi
2105 \if@ACM@nonacm
2106   \ifnum\acm@copyrightmode=15\relax % cc
2107     \footnotetextcopyrightpermission{\@copyrightpermission}%
2108   \fi
2109 \else
2110   \if@ACM@acmcp\else
2111     \footnotetextcopyrightpermission{%
2112       \if@ACM@authordraft
2113         \raisebox{-2ex}{[\z@][\z@]{\makebox[0pt][l]{\large\bfseries
2114           Unpublished working draft. Not for distribution.}}}%
2115         \color[gray]{0.9}%
2116       \fi
2117     \parindent\z@\parskip0.1\baselineskip
2118   \if@ACM@authorversion\else
2119     \if@printpermission\@copyrightpermission\par\fi
2120   \fi
2121   \if@ACM@manuscript\else
2122     \if@ACM@journal@bibstrip\else % Print the conference information
2123       \if@ACM@engage
2124         {\itshape \acmBooktitle, \acmYear.}\par
2125       \else
2126         {\itshape \acmConference@shortname, \acmConference@date, \acmConference@venue}\par
2127       \fi
2128     \fi
2129   \fi
2130   \if@printcopyright
2131     \copyright\ \@copyrightyear\ \@copyrightowner\\
2132   \else
2133     \@copyrightyear.\
2134   \fi
2135   \if@ACM@manuscript
2136     Manuscript submitted to ACM\\
2137   \else
2138     \if@ACM@authorversion
2139       This is the author's version of the work. It is posted here for
2140       your personal use. Not for redistribution. The definitive Version
2141       of Record was published in
2142       \if@ACM@journal@bibstrip
2143         \emph{@journalName}%
2144       \else
2145         \emph{@acmBooktitle}%
2146       \fi

```

```

2147      \ifx\@acmDOI\@empty
2148      .
2149      \else
2150          , \@formatdoi{\@acmDOI}.
2151      \fi\\
2152      \else
2153          \if@ACM@nonacm\else
2154              \if@ACM@journal@bibstrip
2155                  \@permissionCodeOne/\@acmYear/\@acmMonth-ART\@acmArticle
2156                  \ifx\@acmPrice\@empty\else\ $\@acmPrice\fi\\
2157                  \@formatdoi{\@acmDOI}%
2158          \else % Conference
2159              \ifx\@acmISBN\@empty\else ACM~ISBN~\@acmISBN
2160              \ifx\@acmPrice\@empty.\else\.\dots\$@\acmPrice\fi\\
2161              \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi%
2162          \fi
2163      \fi
2164      \fi
2165  \fi}%
2166  \fi
2167  \fi
2168 \endgroup
2169 \if@ACM@engage\@typesetengagemetadata\fi
2170 \setcounter{footnote}{0}%
2171 \@mkabstract
2172 \ifx\@translatedabSTRACTS\@empty\else
2173 \@translatedabSTRACTS\fi
2174 \if@ACM@printCCS
2175 \ifx\@concepts\@empty\else\bgroup
2176     {\@specialsection{CCS Concepts}%
2177         \noindent\@concepts\par}\egroup
2178     \fi
2179 \fi
2180 \if@ACM@acmcP\else
2181     \ifx\@keywords\@empty\else\bgroup
2182         {\@specialsection{\@keywordsname}%
2183             \noindent\@keywords\par}\egroup
2184     \fi
2185     \ifx\@translatedKeywords\@empty\else
2186         \@translatedKeywords
2187     \fi
2188 \fi
2189 \let\metadata@authors=\authors
2190 \nxandlist{, }{, }{, }\metadata@authors
2191 \def\@ACM@checkaffil{}%
2192 \hypersetup{%
2193     pdfauthor={\metadata@authors},
2194     pdftitle={\@title},
2195     pdfsubject={\@concepts},
2196     pdfkeywords={\@keywords},
2197     pdfcreator={LaTeX with acmart
2198         \csname ver@acmart.cls\endcsname\space
2199         and hyperref
2200         \csname ver@hyperref.sty\endcsname}}%

```

```

2201  \andify{authors}
2202  \andify{shortauthors}
2203  \global\let\authors=\authors
2204  \global\let\shortauthors=\shortauthors
2205  \if@ACM@printacmref
2206      \@mkbibcitation
2207  \fi
2208  \global\@topnum\z@ % this prevents floats from falling
2209      % at the top of page 1
2210  \global\@botnum\z@ % we do not want them to be on the bottom either
2211  \@printendtopmatter
2212  \@afterindentfalse
2213  \@afterheading
2214  \if@ACM@acmcpc
2215      \set@ACM@acmcpcbox
2216      \AtEndDocument{\end@ACM@color@frame}%
2217      \color@ACM@color@frame
2218  \fi
2219 }

\set@ACM@acmcpcbox Setting infobox for acmcpc
2220 \newbox\@ACM@acmcpcbox
2221 \def\set@ACM@acmcpcbox{%
2222     \bgroup
2223     \hsize=5pc
2224     \global\setbox\@ACM@acmcpcbox=\vtop to \textheight{%
2225         \setlength{\parindent}{\z@}%
2226         {\Large LOGO\par}%
2227         \scriptsize
2228         \vfill
2229         \ifx\@acmCodeDataLink\empty\else
2230             Code and data links:\\ \@acmCodeDataLink\par\vfill
2231         \fi
2232         \ifx\@keywords\empty\else Keywords:
2233             \@keywords\par\vfill
2234         \fi
2235         \ifx\@empty\@authorsaddresses\else\@setauthorsaddresses\vfill\fi
2236     }
2237 }
```

\@specialsection This macro starts sections for proceedings and uses \small for journals

```

2238 \def\@specialsection#1{%
2239     \let\@vspace\@vspace@orig
2240     \let\@vspacer\@vspacer@orig
2241     \ifcase\ACM@format@nr
2242         \relax % manuscript
2243         \par\medskip\small\noindent#1: %
2244         \or % acmsmall
2245         \par\medskip\small\noindent#1: %
2246         \or % acmlarge
2247         \par\medskip\small\noindent#1: %
2248         \or % acmtog
2249         \par\medskip\small\noindent#1: %
2250         \or % sigconf
```

```

2251     \section*{\#1}%
2252 \or % siggraph
2253     \section*{\#1}%
2254 \or % sigplan
2255     \noindent\par\#1\%
2256 \or % sigchi
2257     \section*{\#1}%
2258 \or % sigchi-a
2259     \section*{\#1}%
2260 \or % acmengage
2261     \section*{\#1}%
2262 \or % acmcnp
2263     \section*{\#1}%
2264     \fi
2265 \let\vspace\@vspace@acm
2266 \let\@vspace@acm\@vspace@acm
2267 }

```

\@printtopmatter The printing of top matter starts a new page and uses the given title box. Note that for sigchi-a we print badges here rather than in \mkttitle since we want them in the margins.

Note that if there are too many authors, \mkttitle@bx might overflow the page. Therefore we start with checking this and if this happens, we split the box and print it page by page.

```

2268 \def\@printtopmatter{%
2269   \ifx\@startPage\empty
2270     \gdef\@startPage{1}%
2271   \else
2272     \setcounter{page}{\@startPage}%
2273   \fi
2274   \tempdima=\ht\mkttitle@bx
2275   \advance\tempdima by \dp\mkttitle@bx
2276   \ifdim\tempdima>0.9\textheight
2277     \loop
2278       \setbox\tempboxa=\vsplit\mkttitle@bx to 0.9\textheight
2279       \thispagestyle{firstpagestyle}%
2280       \noindent\unvbox\tempboxa
2281       \clearpage
2282       \tempdima=\ht\mkttitle@bx
2283       \advance\tempdima by \dp\mkttitle@bx
2284       \ifdim\tempdima>0.9\textheight\repeat
2285   \fi
2286   \thispagestyle{firstpagestyle}%
2287   \noindent
2288   \ifcase\ACM@format@nr
2289     \relax % manuscript
2290     \box\mkttitle@bx\par
2291   \or % acmsmall
2292     \box\mkttitle@bx\par
2293   \or % acmlarge
2294     \box\mkttitle@bx\par
2295   \or % acmtog
2296     \twocolumn[\box\mkttitle@bx]%
2297   \or % sigconf

```

```

2298     \twocolumn[\box\mkttitle@bx]%
2299 \or % siggraph
2300     \twocolumn[\box\mkttitle@bx]%
2301 \or % sigplan
2302     \twocolumn[\box\mkttitle@bx]%
2303 \or % sigchi
2304     \twocolumn[\box\mkttitle@bx]%
2305 \or % sigchi-a
2306     \par\box\mkttitle@bx\par\bigskip
2307     \if@ACM@badge
2308         \marginpar{\noindent
2309             \ifx\@acmBadgeL@image\empty\else
2310                 \href{\@acmBadgeL@url}{%
2311                     \includegraphics[width=\@ACM@badge@width]{\@acmBadgeL@image}}%
2312                 \hskip\@ACM@badge@skip
2313             \fi
2314             \ifx\@acmBadgeR@image\empty\else
2315                 \href{\@acmBadgeR@url}{%
2316                     \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}%
2317             \fi}%
2318     \fi
2319 \or % acmengage
2320     \twocolumn[\box\mkttitle@bx]%
2321 \or % acmcnp
2322     \box\mkttitle@bx\par
2323 \fi
2324 }

```

\@mkttitle The title of the article

```

2325 \def\@mkttitle{%
2326   \ifcase\ACM@format@nr
2327     \relax % manuscript
2328     \@mkttitle@i
2329   \or % acmsmall
2330     \@mkttitle@i
2331   \or % acmlarge
2332     \@mkttitle@i
2333   \or % acmtog
2334     \@mkttitle@i
2335   \or % sigconf
2336     \@mkttitle@iii
2337   \or % siggraph
2338     \@mkttitle@iii
2339   \or % sigplan
2340     \@mkttitle@iii
2341   \or % sigchi
2342     \@mkttitle@iii
2343   \or % sigchi-a
2344     \@mkttitle@iv
2345   \or % acmengage
2346     \@mkttitle@iii
2347   \or % acmcnp
2348     \@mkttitle@i
2349   \fi

```

```

2350 }

\@titlefont The font to typeset the title
2351 \def\@titlefont{%
2352   \ifcase\ACM@format@nr
2353     \relax % manuscript
2354     \LARGE\sffamily\bfseries
2355     \or % acmsmall
2356     \LARGE\sffamily\bfseries
2357     \or % acmlarge
2358     \LARGE\sffamily\bfseries
2359     \or % acmtog
2360     \Huge\sffamily
2361     \or % sigconf
2362     \Huge\sffamily\bfseries
2363     \or % siggraph
2364     \Huge\sffamily\bfseries
2365     \or % sigplan
2366     \Huge\bfseries
2367     \or % sigchi
2368     \Huge\sffamily\bfseries
2369     \or % sigchi-a
2370     \Huge\bfseries
2371     \or % acmengage
2372     \Huge\sffamily\bfseries
2373     \or % acmcnp
2374     \LARGE\sffamily\bfseries
2375     \fi}
}

\@subtitlefont The font to typeset the subtitle
2376 \def\@subtitlefont{\normalsize
2377   \ifcase\ACM@format@nr
2378     \relax % manuscript
2379     \mdseries
2380     \or % acmsmall
2381     \mdseries
2382     \or % acmlarge
2383     \mdseries
2384     \or % acmtog
2385     \LARGE
2386     \or % sigconf
2387     \LARGE\mdseries
2388     \or % siggraph
2389     \LARGE\mdseries
2390     \or % sigplan
2391     \LARGE\mdseries
2392     \or % sigchi
2393     \LARGE\mdseries
2394     \or % sigchi-a
2395     \mdseries
2396     \or % acmengage
2397     \LARGE\mdseries
2398     \or % acmcnp
2399     \mdseries

```

```

2400   \fi}

\@mkttitle@i The version of \mkttitle for most journals
2401 \def\@mkttitle@i{\hsize=\textwidth
2402   \if@ACM@acmcp
2403     \advance\hsize by -6pc%
2404   \fi
2405   \@ACM@title@width=\hsize
2406   \ifx\@acmBadgeL@image\@empty\else
2407     \advance\@ACM@title@width by -\@ACM@badge@width
2408     \advance\@ACM@title@width by -\@ACM@badge@skip
2409   \fi
2410   \ifx\@acmBadgeR@image\@empty\else
2411     \advance\@ACM@title@width by -\@ACM@badge@width
2412     \advance\@ACM@title@width by -\@ACM@badge@skip
2413   \fi
2414   \setbox\mkttitle@bx=\vbox{\noindent\@titlefont
2415     \ifx\@acmBadgeL@image\@empty\else
2416       \raisebox{-.5\baselineskip}{[\z@][\z@]{\href{\@acmBadgeL@url}{%
2417         \includegraphics[width=\@ACM@badge@width]{\@acmBadgeL@image}}}}%
2418       \hskip\@ACM@badge@skip
2419     \fi
2420     \parbox[t]{\@ACM@title@width}{\raggedright
2421       \noindent
2422       \title\@translatedtitle%
2423     \ifx\@subtitle\@empty\else
2424       \par\noindent{\@subtitlefont\@subtitle\@translatedsubtitle}%
2425     \fi}%
2426     \ifx\@acmBadgeR@image\@empty\else
2427       \hskip\@ACM@badge@skip
2428       \raisebox{-.5\baselineskip}{[\z@][\z@]{\href{\@acmBadgeR@url}{%
2429         \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}}}%
2430     \fi
2431     \par\bigskip}%
2432
\@mkttitle@ii The version of \mkttitle for TOG. Since v1.06, this is subsumed by the \mkttitle@i
macro
\@mkttitle@iii The version of \mkttitle for SIG proceedings. Note that since the title is centered, we
leave space for the left badge even if only the right badge is defined.
2432 \def\@mkttitle@iii{\hsize=\textwidth
2433   \setbox\mkttitle@bx=\vbox{\@titlefont\centering
2434     \@ACM@title@width=\hsize
2435     \if@ACM@badge
2436       \advance\@ACM@title@width by -2\@ACM@badge@width
2437       \advance\@ACM@title@width by -2\@ACM@badge@skip
2438       \parbox[b]{\@ACM@badge@width}{\strut
2439         \ifx\@acmBadgeL@image\@empty\else
2440           \raisebox{-.5\baselineskip}{[\z@][\z@]{\href{\@acmBadgeL@url}{%
2441             \includegraphics[width=\@ACM@badge@width]{\@acmBadgeL@image}}}}%
2442           \fi}%
2443         \hskip\@ACM@badge@skip
2444       \fi
2445       \parbox[t]{\@ACM@title@width}{\centering\@titlefont

```

```

2446      \@title\@translatedtitle%
2447      \ifx\@subtitle\@empty\else
2448          \par\noindent{\@subtitlefont\@subtitle\@translatedsubtitle}
2449      \fi
2450  }%
2451 \if@ACM@badge
2452     \hskip\@ACM@badge@skip
2453     \parbox[b]{\@ACM@badge@width}{\strut
2454         \ifx\@acmBadgeR@image\@empty\else
2455             \raisebox{-.5\baselineskip}{[\z@][\z@]{\href{\@acmBadgeR@url}{%
2456                 \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}}}%
2457         \fi}%
2458     \fi
2459     \par\bigskip}%

```

\@mktitle@iv The version of \@mktitle for sigchi-a

```

2460 \def\@mktitle@iv{\hsize=\textwidth
2461     \setbox\mktitle@bx=\vbox{\raggedright\leftskip5pc\@titlefont
2462         \noindent\leavevmode\leaders\hrule height 2pt\hfill\kern0pt\par
2463         \noindent\@title\@translatedtitle%
2464     \ifx\@subtitle\@empty\else
2465         \par\noindent\@subtitlefont\@subtitle\@translatedsubtitle%
2466     \fi
2467     \par\bigskip}%

```

\@ACM@addtoaddress This macro adds an item to the address using the following rules:

1. If we start a paragraph, add the item
2. Otherwise, add a comma and the item
3. However, the comma is deleted if it is at the end of a line. We use the magic `\cleaders` trick for this.

```

2468 \newbox\@ACM@commabox
2469 \def\@ACM@addtoaddress#1{%
2470     \ifvmode\else
2471         \if@ACM@affiliation@obeypunctuation\else
2472             \setbox\@ACM@commabox=\hbox{, }%
2473             \unskip\cleaders\copy\@ACM@commabox\hskip\wd\@ACM@commabox
2474     \fi\fi
2475 #1}

```

\institution Theoretically we can define the macros for \affiliation inside the \@mkauthors-style \position commands. However, this would lead to a strange error if an author uses them outside \department \affiliation. Of course we can make them produce an error message, but...

```

\streetaddress 2476 \def\streetaddress#1{\unskip\ignorespaces}
    \city 2477 \def\postcode#1{\unskip\ignorespaces}
    \state 2478 \if@ACM@journal
\postcode 2479 \def\position#1{\unskip\ignorespaces}
\country 2480 \def\institution#1{\global\@ACM@instpresenttrue
    2481     \unskip\ignorespaces}
    2482 \def\city#1{\global\@ACM@citypresenttrue\unskip\ignorespaces}
    2483 \def\state#1{\unskip\ignorespaces}
    2484 \newcommand\department[2][0]{\unskip\ignorespaces}

```

```

2485 \def\country#1{\StrDel{#1}{ }[\@tempa]%
2486   \ifx\@tempa\empty\else
2487     \global\@ACM@countrypresenttrue\fi
2488     \if@ACM@affiliation@obeypunctuation\else, \fi#1\ignorespaces}
2489 \else
2490   \def\position#1{\if@ACM@affiliation@obeypunctuation#1\else#1\par\fi}%
2491   \def\institution#1{\global\@ACM@instpresenttrue
2492     \if@ACM@affiliation@obeypunctuation#1\else#1\par\fi}%
2493   \newcommand\department[2][0]{\if@ACM@affiliation@obeypunctuation
2494     #2\else#2\par\fi}%
2495 % \def\streetaddress#1{\if@ACM@affiliation@obeypunctuation#1\else#1\par\fi}%
2496 % \def\city#1{\global\@ACM@citypresenttrue\@ACM@addtoaddress{#1}}%
2497 % \let\state\@ACM@addtoaddress
2498 % \def\postcode#1{\if@ACM@affiliation@obeypunctuation#1\else\unskip\space#1\fi}%
2499 % \def\country#1{\global\@ACM@countrypresenttrue\@ACM@addtoaddress{#1}}%
2500 \fi

```

\@mkauthors Typesetting the authors

```

2501 \def\@mkauthors{\begin{group}
2502   \hsize=\textwidth
2503   \ifcase\@ACM@format@nr
2504     \relax % manuscript
2505     \@mkauthors@i
2506     \or % acmsmall
2507     \@mkauthors@i
2508     \or % acmlarge
2509     \@mkauthors@i
2510     \or % acmtog
2511     \@mkauthors@i
2512     \or % sigconf
2513     \@mkauthors@iii
2514     \or % siggraph
2515     \@mkauthors@iii
2516     \or % sigplan
2517     \@mkauthors@iii
2518     \or % sigchi
2519     \@mkauthors@iii
2520     \or % sigchi-a
2521     \@mkauthors@iv
2522     \or % acmengage
2523     \@mkauthors@iii
2524     \or % acmcp
2525     \@mkauthors@i
2526   \fi
2527 \end{group}
2528 }

```

\@authorfont Somehow different conferences use different fonts for author names. Why?

```
2529 \def\@authorfont{\Large\sffamily}
```

\@affiliationfont Font for affiliations

```
2530 \def\@affiliationfont{\normalsize\normalfont}
```

Adjusting fonts for different formats

```

2531 \ifcase\ACM@format@nr
2532 \relax % manuscript
2533 \or % acmsmall
2534   \def\@authorfont{\large\sffamily}
2535   \def\@affiliationfont{\small\normalfont}
2536 \or % acmlarge
2537 \or % acmtog
2538   \def\@authorfont{\LARGE\sffamily}
2539   \def\@affiliationfont{\large}
2540 \or % sigconf
2541   \def\@authorfont{\LARGE}
2542   \def\@affiliationfont{\large}
2543 \or % siggraph
2544   \def\@authorfont{\normalsize\normalfont}
2545   \def\@affiliationfont{\normalsize\normalfont}
2546 \or % sigplan
2547   \def\@authorfont{\Large\normalfont}
2548   \def\@affiliationfont{\normalsize\normalfont}
2549 \or % sigchi
2550   \def\@authorfont{\bfseries}
2551   \def\@affiliationfont{\mdseries}
2552 \or % sigchi-a
2553   \def\@authorfont{\bfseries}
2554   \def\@affiliationfont{\mdseries}
2555 \or % acmengage
2556   \def\@authorfont{\LARGE}
2557   \def\@affiliationfont{\large}
2558 \or % acmcnp
2559   \def\@authorfont{\large\sffamily}
2560   \def\@affiliationfont{\small\normalfont}
2561 \fi

```

\@typeset@author@line At this point we have \@currentauthors and \@currentaffiliations. We typeset them in the journal style

```

2562 \def\@typeset@author@line{%
2563   \andify{@currentauthors}\par\noindent
2564   \@currentauthors\def\@currentauthors{}%
2565   \ifx\@currentaffiliations\empty\else
2566     \andify{@currentaffiliations}
2567     \unskip, {\@currentaffiliations}\par
2568   \fi
2569   \def\@currentaffiliations{}}

```

\if@ACM@instpresent Whether the given affiliation has institution

```

2570 \newif\if@ACM@instpresent
2571 \if@ACM@instpresenttrue

```

\if@ACM@citypresent Whether the given affiliation has city

```

2572 \newif\if@ACM@citypresent
2573 \if@ACM@citypresenttrue

```

\if@ACM@countrypresent Whether the given affiliation has country

```

2574 \newif\if@ACM@countrypresent
2575 \if@ACM@countrypresenttrue

```

```
\@ACM@resetaffil Reset affiliation flags
```

```
2576 \def\@ACM@resetaffil{%
2577   \global\@ACM@instpresentfalse
2578   \global\@ACM@citypresentfalse
2579   \global\@ACM@countrypresentfalse
2580 }
```

```
\@ACM@checkaffil Check affiliation flags
```

```
2581 \def\@ACM@checkaffil{%
2582   \if@ACM@instpresent\else
2583     \ClassWarningNoLine{\@classname}{No institution present for an affiliation}%
2584   \fi
2585   \if@ACM@citypresent\else
2586     \ClassWarningNoLine{\@classname}{No city present for an affiliation}%
2587   \fi
2588   \if@ACM@countrypresent\else
2589     \ClassError{\@classname}{No country present for an affiliation}{ACM
2590       requires each author to indicate their country using country macro.}%
2591   \fi
2592 }
```

\@mkauthors@i This version is used in most journal formats. Note that \and between authors with the same affiliation becomes \_and\_:

```
2593 \def\@mkauthors@i{%
2594   \def\@currentauthors{}%
2595   \def\@currentaffiliations{}%
2596   \global\let\and\@typeset@author@line
2597   \def\@author##1{%
2598     \ifx\@currentauthors\empty
2599       \gdef\@currentauthors{\@authorfont\MakeTextUppercase{##1}}%
2600     \else
2601       \g@addto@macro{\@currentauthors}{\and\MakeTextUppercase{##1}}%
2602     \fi
2603     \gdef\and{}%
2604   \def\email##1##2{}%
2605   \def\affiliation##1##2{}%
2606   \def\@tempa##2\ifx\@tempa\empty\else
2607     \ifx\@currentaffiliations\empty
2608       \gdef\@currentaffiliations{%
2609         \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2610         \setkeys{@ACM@affiliation@}{##1}%
2611         \@ACM@resetaffil
2612         \@affiliationfont##2\@ACM@checkaffil}%
2613     \else
2614       \g@addto@macro{\@currentaffiliations}{\and
2615         \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2616         \setkeys{@ACM@affiliation@}{##1}\@ACM@resetaffil
2617         ##2\@ACM@checkaffil}%
2618     \fi
2619   \fi
2620   \global\let\and\@typeset@author@line}%
2621   \if@ACM@acmc
2622     \advance\hsize by -6pc%
2623   \fi
```

```

2624   \global\setbox\mktitle@bx=\vbox{\noindent\unvbox\mktitle@bx\par\medskip
2625     \noindent\addresses@typeset@author@line
2626     \par\medskip}%
2627 }

```

\@mkauthors@ii The \@mkauthors@ii command was the version used in acmtog. It is no longer necessary.

\author@bx The box to put an individual author in  
2628 \newbox\author@bx

\author@bx@wd The width of the author box  
2629 \newdimen\author@bx@wd

\author@bx@sep The separation between author boxes  
2630 \newskip\author@bx@sep  
2631 \author@bx@sep=1pc\relax

\@typeset@author@bx Typesetting the box with authors. Note that in sigchi-a the box is not centered.  
2632 \def\@typeset@author@bx{\bgroup\hsize=\author@bx@wd
2633 \def\and{\par}\normalbaselines
2634 \global\setbox\author@bx=\vtop{\if@ACM@sigchiamode\else\centering\fi
2635 \authorfont\@currentauthors\par\affiliationfont
2636 \currentaffiliation\egroup
2637 \box\author@bx\hspace{\author@bx@sep}%
2638 \gdef\@currentauthors{}%
2639 \gdef\@currentaffiliation{}}

\@mkauthors@iii The sigconf version. Here we use a centered design with each author in a separate box.

```

2640 \def\@mkauthors@iii{%
First, we need to determine the design of the author strip. The boxes are separated by
\author@bx@sep plus two \author@bx@sep margins. This means that each box must
be of width ( $\textwidth - \author@bx@sep)/N - \author@bx@sep$ , where  $N$  is the
number of boxes per row.
2641 \author@bx@wd=\textwidth\relax
2642 \advance\author@bx@wd by -\author@bx@sep\relax
2643 \ifnum\@ACM@authorsperrow>0\relax
2644   \divide\author@bx@wd by \@ACM@authorsperrow\relax
2645 \else
2646   \ifcase\num@authorgroups
2647     \relax % 0?
2648   \or % 1=one author per row
2649   \or % 2=two authors per row
2650     \divide\author@bx@wd by \num@authorgroups\relax
2651   \or % 3=three authors per row
2652     \divide\author@bx@wd by \num@authorgroups\relax
2653   \or % 4=two authors per row (!)
2654     \divide\author@bx@wd by 2\relax
2655   \else % three authors per row
2656     \divide\author@bx@wd by 3\relax
2657   \fi
2658 \fi
2659 \advance\author@bx@wd by -\author@bx@sep\relax

```

Now, parsing of \addresses:

```
2660 \gdef\@currentauthors{}%
2661 \gdef\@currentaffiliation{}%
2662 \def\@author##1{\ifx\@currentauthors\@empty
2663   \gdef\@currentauthors{\par##1}%
2664 \else
2665   \g@addto@macro\@currentauthors{\par##1}%
2666 \fi
2667 \gdef\and{}%
2668 \def\email##1##2{\ifx\@currentaffiliation\@empty
2669   \gdef\@currentaffiliation{\bgroup
2670     \mathchardef\UrlBreakPenalty=1000\nolinkurl{##2}\egroup}%
2671 \else
2672   \g@addto@macro\@currentaffiliation{\par\bgroup
2673     \mathchardef\UrlBreakPenalty=1000\nolinkurl{##2}\egroup}%
2674 \fi}%
2675 \def\affiliation##1##2{\ifx\@currentaffiliation\@empty
2676   \gdef\@currentaffiliation{%
2677     \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2678     \setkeys{@ACM@affiliation@}{##1}@ACM@resetaffil
2679     ##2@ACM@checkaffil}%
2680 \else
2681   \g@addto@macro\@currentaffiliation{\par
2682     \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2683     \setkeys{@ACM@affiliation@}{##1}@ACM@resetaffil
2684     ##2@ACM@checkaffil}%
2685 \fi
2686 \global\let\and\@typeset@author@bx
2687 }%
```

Actual typesetting is done by the \and macro:

```
2688 \hsize=\textwidth
2689 \global\setbox\mktitle@bx=\vbox{\noindent
2690   \unvbox\mktitle@bx\par\medskip\leavevmode
2691   \lineskip=1pc\relax\centering\hspace*{-1em}%
2692   \addresses\let\and\@typeset@author@bx\and\par\bigskip}}
```

\@mkauthors@iv The sigchi-a version. We put authors in the main text with no more than 2 authors per line, unless overridden.

```
2693 \def\@mkauthors@iv{%
```

First, we need to determine the design of the author strip. The boxes are separated by \author@bx@sep plus two \author@bx@sep margins. This means that each box must be of width ( $\textwidth - \author@bx@sep)/N - \author@bx@sep$ , where  $N$  is the number of boxes per row.

```
2694 \author@bx@wd=\columnwidth\relax
2695 \advance\author@bx@wd by -\author@bx@sep\relax
2696 \ifnum\@ACM@authorsperrow>0\relax
2697   \divide\author@bx@wd by \@ACM@authorsperrow\relax
2698 \else
2699   \ifcase\num@authorgroups
2700     \relax % 0?
2701     \or % 1=one author per row
2702     \else % 2=two authors per row
```

```

2703      \divide\author@bx@wd by 2\relax
2704      \fi
2705  \fi
2706  \advance\author@bx@wd by -\author@bx@sep\relax

```

Now, parsing of \addresses:

```

2707  \gdef\@currentauthors{}%
2708  \gdef\@currentaffiliation{}%
2709  \def\@author##1{\ifx\@currentauthors\@empty
2710    \gdef\@currentauthors{\par##1}%
2711  \else
2712    \g@addto@macro\@currentauthors{\par##1}%
2713  \fi
2714  \gdef\and{}%
2715  \def\email##1##2{\ifx\@currentaffiliation\@empty
2716    \gdef\@currentaffiliation{\nolinkurl{##2}}%
2717  \else
2718    \g@addto@macro\@currentaffiliation{\par\nolinkurl{##2}}%
2719  \fi}%
2720  \def\affiliation##1##2{\ifx\@currentaffiliation\@empty
2721    \gdef\@currentaffiliation{%
2722      \setkeys{ACM@affiliation}{obeypunctuation=false}%
2723      \setkeys{ACM@affiliation}{##1}\@ACM@resetaffil
2724      ##2\@ACM@checkaffil}%
2725  \else
2726    \g@addto@macro\@currentaffiliation{\par
2727      \setkeys{ACM@affiliation}{obeypunctuation=false}%
2728      \setkeys{ACM@affiliation}{##1}\@ACM@resetaffil
2729      ##2\@ACM@checkaffil}%
2730  \fi
2731  \global\let\and\@typeset@author@bx}%
2732 %

```

Actual typesetting is done by the \and macro

```

2733  \bgroup\hsize=\columnwidth
2734  \par\raggedright\leftskip=\z@
2735  \lineskip=1pc\noindent
2736  \addresses\let\and\@typeset@author@bx\and\par\bigskip\egroup}

```

\@mkauthorsaddresses Typesetting authors' addresses in the footnote style

```

2737 \def\@mkauthorsaddresses{%
2738   \ifnum\@authors>1\relax
2739     Authors' \else Author's \fi
2740   \ifnum\@authorgroups>1\relax
2741     addresses: \else address: \fi
2742   \bgroup
2743   \def\streetaddress##1{\unskip, ##1}%
2744   \def\postcode##1{\unskip, ##1}%
2745   \def\position##1{\unskip\ignorespaces}%
2746   \gdef\@ACM@institution@separator{, }%
2747   \def\institution##1{\unskip\@ACM@institution@separator ##1\gdef\@ACM@institution@separator{ and }%
2748   \def\city##1{\unskip, ##1}%
2749   \def\state##1{\unskip, ##1}%
2750   \renewcommand\department[2][0]{\unskip\@addpunct, ##2}%
2751   \def\country##1{\unskip, ##1}%

```

```

2752 \def\and{\unskip; \gdef\@ACM@institution@separator{, }}%
2753 \def\@author##1##1{%
2754 \def\email##1##2{\unskip, \nolinkurl{##2}}%
2755 \addresses
2756 \egroup}

2757 \AtEndDocument{\if@ACM@nonacm\else\if@ACM@journal
2758 \ifx\@authorsaddresses\empty
2759 \ClassWarningNoLine{@classname}{Authors'
2760 addresses are mandatory for ACM journals}%
2761 \fi\fi\fi}

\@setaddresses This is an amsart macro that we do not need.
2762 \def\@setaddresses{}

\@authornotemark Adding a footnote mark to authors. This version adds a “normal” footnote mark.
2763 \def\@authornotemark{\g@addto@macro\@currentauthors{\footnotemark\relax}{}}

\@@authornotemark Adding a footnote mark to authors with a given number
2764 \def\@@authornotemark#1{\g@addto@macro\@currentauthors{\footnotemark[#1]}{}}

\@mkteasers Typesetting the teasers
2765 \def\@mkteasers{%
2766 \ifx\@teaserfigures\empty\else
2767 \def\@teaser##1{\par\bigskip\bgroup
2768 \captionsetup{type=figure}##1\egroup\par}
2769 \global\setbox\mktitle@bx=\vbox{\noindent\unvbox\mktitle@bx\par
2770 \noindent\@Description@presentfalse
2771 \@teaserfigures\par\if@Description@present\else
2772 \global\@undescribed@imagestrue
2773 \ClassWarning{@classname}{A possible image without
2774 description}\fi
2775 \medskip}%
2776 \fi}

\@mkabstract Typesetting the abstract
2777 \def\@mkabstract{\bgroup
2778 \ifx\@abstract\@empty\else
2779 {\phantomsection\addcontentsline{toc}{section}{\abstractname}%
2780 \if@ACM@journal
2781 \everypar{\setbox\z@\lastbox\everypar{}}\small
2782 \else
2783 \section*\{\abstractname}\%
2784 \fi
2785 \ignorespaces\@abstract\par}%
2786 \fi\egroup}

\@mktranslatedabstract Typesetting a translated abstract
2787 \def\@mktranslatedabstract#1{\selectlanguage{#1}%
2788 \if@ACM@journal
2789 \everypar{\setbox\z@\lastbox\everypar{}}\small
2790 \else
2791 \section*\{\abstractname}\%
2792 \fi
2793 \ignorespaces}

```

```

\@mkbibcitation Print the bibcitation format
2794 \def\@mkbibcitation{\bgroup
2795   \let\@vspace\@vspace@orig
2796   \let\@vspacer\@vspacer@orig
2797   \def@pages@word{\ifnum\getrefnumber{TotPages}=1\relax page\else pages\fi}%
2798   \def\footnotemark{}%
2799   \def\\{\unskip{} \ignorespaces}%
2800   \def\footnote{\ClassError{@classname}{Please do not use footnotes
2801     inside a \string\title{} or \string\author{} command! Use
2802     \string\titlenote{} or \string\authornote{} instead!}}%
2803   \def@article@string{\ifx\@acmArticle\@empty{\ } \else,
2804     Article\~\@acmArticle\ \fi}%
2805   \par\medskip\small\noindent{\bfseries ACM Reference Format:}\par\nobreak
2806   \noindent\bgroup
2807     \def\\{\unskip{}, \ignorespaces}\authors\egroup. \@acmYear. \@title
2808   \ifx\@subtitle\@empty. \else: \@subtitle. \fi
2809   \if@ACM@nonacm\else
2810     % The 'nonacm' option disables 'printacmref' by default,
2811     % and the present \@mkbibcitation definition is never used
2812     % in this case. The conditional remains useful if the user
2813     % explicitly sets \settopmatter{printacmref=true}.
2814   \if@ACM@journal@bibstrip
2815     \textit{\@journalNameShort}
2816     \@acmVolume, \@acmNumber \@article@string (\@acmPubDate),
2817     \ref{TotPages}\~\@pages@word.
2818   \else
2819     In \textit{\@acmBooktitle}%
2820     \ifx\@acmEditors\@empty\textit{\ }\else
2821       \andify\@acmEditors\textit{, } \@acmEditors\~\@editorsAbbrev.%\fi
2822       ACM, New York, NY, USA%
2823       \@article@string\unskip, \ref{TotPages}\~\@pages@word.
2824     \fi
2825   \fi
2826 \fi
2827 \ifx\@acmDOI\@empty\else\formatdoi{\@acmDOI}\fi
2828 \par\egroup}

```

\@printendtopmatter End the top matter

```

2829 \def\@printendtopmatter{%
2830   \let\@vspace\@vspace@orig
2831   \let\@vspacer\@vspacer@orig
2832   \par\bigskip
2833   \let\@vspace\@vspace@acm
2834   \let\@vspacer\@vspacer@acm
2835 }

```

\@setthanks We redefine \\@setthanks using \long

```

2836 \def\@setthanks{\long\def\thanks{\par\#1\addpunct.}\thankses}

```

\@setauthorsaddresses

```

2837 \def\@setauthorsaddresses{\authorsaddresses\unskip\addpunct.}

```

\@typesetengagetadata Typesetting special metadata for ACM Engage

```

2838 \def\@typesetengagemetadata{%
2839   \def\@setengagemetadata##1##2{\par\noindent\textrm{##1} ##2\par}%
2840   \acmengagemetadata}

```

### 3.22 Headers and Footers

We use `fancyhdr` for our headers and footers:

```
2841 \RequirePackage{fancyhdr}
```

`\ACM@restore@pagestyle` The following code by Ross Moore protects against changes by the `totpages` package:

```

2842 \let\ACM@ps@plain\ps@plain
2843 \let\ACM@ps@myheadings\ps@myheadings
2844 \let\ACM@ps@headings\ps@headings
2845 \def\ACM@restore@pagestyle{%
2846   \let\ps@plain\ACM@ps@plain
2847   \let\ps@myheadings\ACM@ps@myheadings
2848   \let\ps@headings\ACM@ps@headings}
2849 \AtBeginDocument{\ACM@restore@pagestyle}

```

`\ACM@linecount@bx` This is the box displayed in review mode

```

2850 \if@ACM@review
2851   \newsavebox{\ACM@linecount@bx}
2852   \newlength\ACM@linecount@bxht
2853   \newcount\ACM@linecount
2854   \ACM@linecount@ne\relax
2855   \def\ACM@mk@linecount{%
2856     \savebox{\ACM@linecount@bx}[4em][t]{\parbox[t]{4em}{\normalfont
2857       \normalsize
2858       \setlength{\ACM@linecount@bxht}{0pt}%
2859       \loop\color{red}\scriptsize\the\ACM@linecount\loop
2860         \global\advance\ACM@linecount by \ne
2861         \addtolength{\ACM@linecount@bxht}{\baselineskip}%
2862         \ifdim\ACM@linecount@bxht<\textheight\repeat
2863         \color{red}\scriptsize\the\ACM@linecount\hfill
2864       \global\advance\ACM@linecount by \ne\fi}
2865 \fi

```

`\ACM@linecountL` How to display the box on the left

```

2866 \def\ACM@linecountL{%
2867   \if@ACM@review
2868   \ACM@mk@linecount
2869   \begin{picture}(0,0)%
2870     \put(-26,-22){\usebox{\ACM@linecount@bx}}%
2871   \end{picture}%
2872 \fi}

```

`\ACM@linecountR` How to display the box on the right. In one column formats we do not step the numbers.

```

2873 \def\ACM@linecountR{%
2874   \if@ACM@review
2875     \ifcase\ACM@format@nr
2876       \relax % manuscript
2877       \relax
2878     \or % acmsmall

```

```

2879      \relax
2880      \or % acmlarge
2881          \relax
2882          \or % acmtog
2883              \ACM@mk@linecount
2884          \or % sigconf
2885              \ACM@mk@linecount
2886          \or % siggraph
2887              \ACM@mk@linecount
2888          \or % sigplan
2889              \ACM@mk@linecount
2890          \or % sigchi
2891              \ACM@mk@linecount
2892          \or % sigchi-a
2893              \ACM@mk@linecount
2894          \or % acmengage
2895              \ACM@mk@linecount
2896          \or % acmcpc
2897              \relax
2898      \fi
2899      \begin{picture}(0,0)%
2900          \put(20,-22){\usebox{\ACM@linecount@bx}}%
2901      \end{picture}%
2902  \fi}

```

\ACM@timestamp The timestamp system

```

2903 \if@ACM@timestamp
2904     % Subtracting 30 from \time gives us the effect of rounding down despite
2905     % \numexpr rounding to nearest
2906     \newcounter{ACM@time@hours}
2907     \setcounter{ACM@time@hours}{\numexpr (\time - 30) / 60 \relax}
2908     \newcounter{ACM@time@minutes}
2909     \setcounter{ACM@time@minutes}{\numexpr \time - \theACM@time@hours * 60 \relax}
2910     \newcommand\ACM@timestamp{%
2911         \footnotesize%
2912         \ifx\@acmSubmissionID\empty\relax\else
2913             Submission ID: \@acmSubmissionID. \%
2914         \fi
2915         \the\year-\two@digits{\the\month}-\two@digits{\the\day}. \%
2916         \two@digits{\theACM@time@hours}:\two@digits{\theACM@time@minutes}. \%
2917         Page \thepage\ of \@startPage--\pageref*{TotPages}. \%
2918     }
2919 \fi

```

\@shortauthors Even if the author redefined \shortauthors, we do not print it in the headers when in anonymous mode:

```

2920 \def\@shortauthors{%
2921     \if@ACM@anonymous
2922         Anon.
2923         \ifx\@acmSubmissionID\empty\else Submission Id: \@acmSubmissionID\fi
2924     \else\shortauthors\fi}

```

\@headfootfont The font to typeset header and footer text.

```

2925 \def\@headfootfont{\sffamily\footnotesize}

```

`standardpagestyle` The page style for all pages but the first one    The page style for all pages but the first one

```

2926 \AtBeginDocument{%
2927   \fancypagestyle{standardpagestyle}{%
2928     \fancyhf{}%
2929     \renewcommand{\headrulewidth}{\z@}%
2930     \renewcommand{\footrulewidth}{\z@}%
2931     \def\@acmArticlePage{%
2932       \ifx\@acmArticle\empty%
2933         \if@ACM@printfolios\thepage\fi%
2934       \else%
2935         \@acmArticle\if@ACM@printfolios:\thepage\fi%
2936       \fi%
2937     }%
2938   \if@ACM@journal@bibstrip
2939     \ifcase\ACM@format@nr
2940       \relax % manuscript
2941       \fancyhead[LE]{\ACM@linecountL\if@ACM@printfolios\thepage\fi}%
2942       \fancyhead[RO]{\if@ACM@printfolios\thepage\fi}%
2943       \fancyhead[RE]{\@shortauthors}%
2944       \fancyhead[LO]{\ACM@linecountL\shorttitle}%
2945       \if@ACM@nonacm\else%
2946         \fancyfoot[RO,LE]{\footnotesize Manuscript submitted to ACM}%
2947       \fi%
2948     \or % acmsmall
2949       \fancyhead[LE]{\ACM@linecountL \@headfootfont\@acmArticlePage}%
2950       \fancyhead[RO]{\@headfootfont\@acmArticlePage}%
2951       \fancyhead[RE]{\@headfootfont\@shortauthors}%
2952       \fancyhead[LO]{\ACM@linecountL \@headfootfont\shorttitle}%
2953       \if@ACM@nonacm\else%
2954         \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \acmVolume, No.%
2955           \acmNumber, Article \acmArticle. Publication date: \acmPubDate.}%
2956       \fi
2957     \or % acmlarge
2958       \fancyhead[LE]{\ACM@linecountL \@headfootfont
2959         \acmArticlePage\quad\textbullet\quad\@shortauthors}%
2960       \fancyhead[LO]{\ACM@linecountL}%
2961       \fancyhead[RO]{\@headfootfont
2962         \shorttitle\quad\textbullet\quad\acmArticlePage}%
2963       \if@ACM@nonacm\else%
2964         \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \acmVolume, No.%
2965           \acmNumber, Article \acmArticle. Publication date: \acmPubDate.}%
2966       \fi
2967     \or % acmtog
2968       \fancyhead[LE]{\ACM@linecountL \@headfootfont
2969         \acmArticlePage\quad\textbullet\quad\quad\@shortauthors}%
2970       \fancyhead[LO]{\ACM@linecountL}%
2971       \fancyhead[RE]{\ACM@linecountR}%
2972       \fancyhead[RO]{\@headfootfont
2973         \shorttitle\quad\textbullet\quad\quad\acmArticlePage\ACM@linecountR}%
2974       \if@ACM@nonacm\else%
2975         \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \acmVolume, No.%
2976           \acmNumber, Article \acmArticle. Publication date: \acmPubDate.}%
2977       \fi

```

```

2978 \else % Proceedings
2979   \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
2980   \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
2981   \fancyhead[RE]{\@headfootfont\shortauthors\ACM@linecountR}%
2982   \if@ACM@nonacm
2983     \fancyhead[LE]{\ACM@linecountL}%
2984     \fancyhead[RO]{\ACM@linecountR}%
2985   \else%
2986     \if@ACM@engage
2987       \fancyhead[LE]{\ACM@linecountL\@headfootfont\footnotesize
2988         EngageCSEdu. \ifx\@acmDOI\empty\else\@formatdoi{\@acmDOI}\fi}%
2989       \fancyhead[RO]{\@headfootfont
2990         EngageCSEdu. \ifx\@acmDOI\empty\else\@formatdoi{\@acmDOI}\fi
2991         \ACM@linecountR}%
2992     \else
2993       \fancyhead[LE]{\ACM@linecountL\@headfootfont\footnotesize
2994         \acmConference@shortname,
2995         \acmConference@date, \acmConference@venue}%
2996       \fancyhead[RO]{\@headfootfont
2997         \acmConference@shortname,
2998         \acmConference@date, \acmConference@venue\ACM@linecountR}%
2999     \fi
3000   \fi
3001 \fi
3002 \else % Proceedings
3003   \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
3004   \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
3005   \fancyhead[RE]{\@headfootfont\shortauthors\ACM@linecountR}%
3006   \if@ACM@nonacm
3007     \fancyhead[LE]{\ACM@linecountL}%
3008     \fancyhead[RO]{\ACM@linecountR}%
3009   \else%
3010     \if@ACM@engage
3011       \fancyhead[LE]{\ACM@linecountL\@headfootfont
3012         EngageCSEdu. \ifx\@acmDOI\empty\else\@formatdoi{\@acmDOI}\fi}%
3013       \fancyhead[RO]{\@headfootfont
3014         EngageCSEdu. \ifx\@acmDOI\empty\else\@formatdoi{\@acmDOI}\fi
3015         \ACM@linecountR}%
3016     \else
3017       \fancyhead[LE]{\ACM@linecountL\@headfootfont
3018         \acmConference@shortname,
3019         \acmConference@date, \acmConference@venue}%
3020       \fancyhead[RO]{\@headfootfont
3021         \acmConference@shortname,
3022         \acmConference@date, \acmConference@venue\ACM@linecountR}%
3023     \fi
3024   \fi
3025 \fi
3026 \if@ACM@sigchiamode
3027   \fancyheadoffset[L]{\dimexpr(\marginparsep+\marginparwidth)}%
3028 \fi
3029 \if@ACM@timestamp
3030   \fancyfoot[LO,RE]{\ACM@timestamp}
3031 \fi

```

```

3032 \if@ACM@acmcp
3033 \renewcommand{\footrulewidth}{0.1\p@}%
3034 \fancyheadoffset[L]{46pt}%
3035 \fancyhead[L]{\makebox[\z@][1]{%
3036     \raisebox{-\dimexpr0.25\textheight*\ACM@ArticleType@nr}{%
3037         \rotatebox{90}{\colorbox{@ACM@Article@color}{\color{white}%
3038             \strut\ACM@ArticleType~Article}}}}}}}%
3039 \ACM@linecountL}%
3040 \fancyhead[R]{\makebox[\z@][r]{\box@\ACM@acmcbox}}}%
3041 \fancyfoot[L,C]{}%
3042 \fancyfoot[R]{\footnotesize
3043     \journalName, Volume~\acmVolume, Issue~\acmNumber,
3044     \ifx\acmArticle\empty\else Article~\acmArticle\fi\space
3045     (\acmPubDate)\ifx\acmDOI\empty\else\\\formatdoi{\acmDOI}\fi}
3046 \fi
3047 }%
3048 \pagestyle{standardpagestyle}
3049 }

@folio@wd Folio blob width, height, offsets and max number
@folio@ht 3050 \newdimen@\folio@wd
@folio@voffset 3051 \@folio@wd=\z@
@folio@max 3052 \newdimen@\folio@ht
3053 \@folio@ht=\z@
3054 \newdimen@\folio@voffset
3055 \@folio@voffset=\z@
3056 \def@\folio@max{1}
3057 \ifcase\ACM@format@nr
3058 \relax % manuscript
3059 \or % acmsmall
3060   \@folio@wd=45.75pt\relax
3061   \@folio@ht=1.25in\relax
3062   \@folio@voffset=.2in\relax
3063   \def@\folio@max{8}
3064 \or % acmlarge
3065   \@folio@wd=43.25pt\relax
3066   \@folio@ht=79pt\relax
3067   \@folio@voffset=.55in\relax
3068   \def@\folio@max{10}
3069 \fi

@folioblob The macro to typeset the folio blob.
3070 \def@\folioblob{\@tempcnta=0\acmArticleSeq\relax
3071 \ifnum@\tempcnta=0\relax\else
First, we calculate \acmArticleSeq modulo \@folio@max
3072 \loop
3073   \ifnum@\tempcnta>@\folio@max\relax
3074     \advance@\tempcnta by -\@folio@max
3075   \repeat
3076   \advance@\tempcnta by -1\relax
3077   \tempdima=\@folio@ht\relax
3078   \multiply@\tempdima by \the@\tempcnta\relax
3079   \advance@\tempdima by -\@folio@voffset\relax

```

```

3080     \begin{picture}(0,0)
3081     \makebox[\z@]{\raisebox{-\tempdima}{%
3082         \rlap{%
3083             \raisebox{-0.45\@folio@ht}{\z@}\z@}%
3084             \rule{\@folio@wd}{\@folio@ht}}}}%
3085     \parbox{\@folio@wd}{%
3086         \centering
3087         \textcolor{white}{\LARGE\sffamily\bfseries\@acmArticle}}}
3088     \end{picture}\fi}
3089

```

`firstpagestyle` The page style for the first page only.

```

3090 \AtBeginDocument{%
3091 \fancypagestyle{firstpagestyle}{%
3092     \fancyhf{}%
3093     \renewcommand{\headrulewidth}{\z@}%
3094     \renewcommand{\footrulewidth}{\z@}%
3095     \if@ACM@journal@bibstrip
3096         \ifcase\ACM@format@nr
3097             \relax % manuscript
3098             \fancyhead[L]{\ACM@linecountL}%
3099             \fancyfoot[RO,LE]{\if@ACM@printfolios\small\thepage\fi}%
3100             \if@ACM@nonacm\else%
3101                 \fancyfoot[RE,LO]{\footnotesize Manuscript submitted to ACM}%
3102             \fi%
3103         \or % acmsmall
3104             \if@ACM@nonacm\else%
3105                 \fancyfoot[RO,LE]{\footnotesize @journalNameShort, Vol. \acmVolume, No.%
3106                     \acmNumber, Article \acmArticle. Publication date:%
3107                     \acmPubDate.}%
3108             \fi%
3109             \fancyhead[LE]{\ACM@linecountL\folioblob}%
3110             \fancyhead[LO]{\ACM@linecountL}%
3111             \fancyhead[RO]{\folioblob}%
3112             \fancyheadoffset[RO,LE]{0.6\@folio@wd}%
3113         \or % acmlarge
3114             \if@ACM@nonacm\else%
3115                 \fancyfoot[RO,LE]{\footnotesize @journalNameShort, Vol. \acmVolume, No.%
3116                     \acmNumber, Article \acmArticle. Publication date:%
3117                     \acmPubDate.}%
3118             \fi%
3119             \fancyhead[RO]{\folioblob}%
3120             \fancyhead[LE]{\ACM@linecountL\folioblob}%
3121             \fancyhead[LO]{\ACM@linecountL}%
3122             \fancyheadoffset[RO,LE]{1.4\@folio@wd}%
3123         \or % acmtog
3124             \if@ACM@nonacm\else%
3125                 \fancyfoot[RO,LE]{\footnotesize @journalNameShort, Vol. \acmVolume, No.%
3126                     \acmNumber, Article \acmArticle. Publication date:%
3127                     \acmPubDate.}%
3128             \fi%
3129             \fancyhead[L]{\ACM@linecountL}%
3130             \fancyhead[R]{\ACM@linecountR}%
3131         \else % Conference proceedings

```

```

3132     \fancyhead[L]{\ACM@linecountL}%
3133     \fancyhead[R]{\ACM@linecountR}%
3134     \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
3135     \fi
3136 \else
3137     \fancyhead[L]{\ACM@linecountL}%
3138     \fancyhead[R]{\ACM@linecountR}%
3139     \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
3140     \fi
3141 \if@ACM@timestamp
3142     \ifnum\ACM@format@nr=0\relax % Manuscript
3143     \fancyfoot[LO,RE]{\ACM@timestamp\quad
3144         \if@ACM@nonacm\else
3145             \footnotesize Manuscript submitted to ACM
3146         \fi}
3147     \else
3148     \fancyfoot[LO,RE]{\ACM@timestamp}
3149     \fi
3150 \fi
3151 \if@ACM@acmcpc
3152 \renewcommand{\footrulewidth}{0.1\p@}%
3153 \fancyheadoffset[L]{46pt}%
3154 \fancyhead[L]{\makebox[\z@][l]{%
3155     \raisebox{-\dimexpr0.25\textheight*\ACM@ArticleType@nr}{%
3156         \rotatebox{90}{\colorbox{@ACM@Article@color}{\color{white}%
3157             \strut\ACM@ArticleType~Article}}}}}}%
3158 \ACM@linecountL}%
3159 \fancyhead[R]{\makebox[\z@][r]{\box@\ACM@acmcpcbox}}%
3160 \fancyfoot[L,C]{}%
3161 \fancyfoot[R]{\footnotesize
3162     @journalName, Volume^@\acmVolume, Issue^@\acmNumber,
3163     \ifx@\acmArticle@\empty\else Article^@\acmArticle\fi\space
3164     (@acmPubDate)\ifx@\acmDOI@\empty\else\\@\formatdoi{@acmDOI}\fi
3165     \fi
3166 }%

```

### 3.23 Sectioning

\ACM@NRAjust Ross Moore's macro.

Initially \ACM@sect@format@ just passes through its #1 argument unchanged. When a sectioning macro such as \section occurs, the \ACM@NRAjust redefines \ACM@sect@format@ to expand into the styling commands; e.g., \@secfont. Then \Sectionformat is temporarily redefined to produce \realSectionformat{\ACM@sect@format{#1}}{#2}, which ultimately becomes \Sectionformat{\@secfont{#1}}{#2}. This is done to allow \Sectionformat to be variable, as may be needed in particular circumstances. Its current expansion is saved as \realSectionformat which is used with the modified 1st argument, then \Sectionformat is reverted to its former expansion.

To style the section-number, the line #1{} is used at the end of \ACM@NRAjust. This imposes style-changing commands for fonts and sizes, but any \MakeUppercase acts on just the {}. It's a bit hacky, by essentially assuming that only numbers occur here, not letters to be case-changed. (This should be acceptable

in a class-file, as it ought to be possible to change the case elsewhere, if that was ever desired.) Also, it can result in `\@adddotafter` being called too soon, so a slight adjustment is made, via `\ACM@adddotafter`, which now tests whether its argument is empty. But the coding has to allow for other packages to have also patched `\@adddotafter`.

```

3167 \def\ACM@NRadjust#1{%
3168   \begingroup
3169     \expandafter\ifx\csname Sectionformat\endcsname\relax
3170       % do nothing when \Sectionformat is unknown
3171       \def\next{\endgroup #1}%
3172     \else
3173       \def\next{\endgroup
3174         \let\realSectionformat\Sectionformat
3175         \def\ACM@sect@format@{#1}%
3176           \let\Sectionformat\ACM@NR@adjustedSectionformat
3177         %% next lines added 2018-06-17 to ensure section number is styled
3178         \let\real@adddotafter@\adddotafter
3179         \let@\adddotafter\ACM@adddotafter
3180         #1{}% imposes the styles, but nullifies \MakeUppercase
3181         \let@\adddotafter\real@adddotafter
3182       }%
3183   \fi \next
3184 }

```

`\ACM@NR@adjustedSectionformat`

```

3185 \def\ACM@NR@adjustedSectionformat#1#2{%
3186   \realSectionformat{\ACM@sect@format{#1}}{#2}%
3187   \let\Sectionformat\realSectionformat
3188 \DeclareRobustCommand{\ACM@sect@format}{\ACM@sect@format@}
3189 \def\ACM@sect@format@null#1{#1}
3190 \let\ACM@sect@format@\ACM@sect@format@null
3191 \AtBeginDocument{%
3192   \expandafter\ifx\csname LTX@adddotafter\endcsname\relax
3193     \let\LTX@adddotafter@\adddotafter
3194   \fi
3195 }

```

`\ACM@adddotafter`

```

3196 \def\ACM@adddotafter#1{\ifx\relax#1\relax\else\LTX@adddotafter{#1}\fi}

```

Sectioning is different for different levels

```

3197 \renewcommand\section{\@startsection{section}{1}{\z@}%
3198   {-.75\baselineskip \oplus -2\p@ \ominus -.2\p@}%
3199   {.25\baselineskip}%
3200   {\ACM@NRadjust@\secfont}}
3201 \renewcommand\subsection{\@startsection{subsection}{2}{\z@}%
3202   {-.75\baselineskip \oplus -2\p@ \ominus -.2\p@}%
3203   {.25\baselineskip}%
3204   {\ACM@NRadjust@\subsecfont}}
3205 \renewcommand\subsubsection{\@startsection{subsubsection}{3}{\z@}%
3206   {-.5\baselineskip \oplus -2\p@ \ominus -.2\p@}%
3207   {-3.5\p@}%
3208   {\ACM@NRadjust{\subsubsecfont\adddotafter}}}

```

```

3209 \renewcommand\paragraph{\@startsection{paragraph}{4}{\parindent}%
3210   {-5\baselineskip \oplus -2\p@ \minus -.2\p@}%
3211   {-3.5\p@}%
3212   {\ACM@NRAjust{\@parfont\@adddotafter}}}%
3213 \newcommand\noindentparagraph{\@startsection{paragraph}{4}{\z@}%
3214   {-5\baselineskip \oplus -2\p@ \minus -.2\p@}%
3215   {-3.5\p@}%
3216   {\ACM@NRAjust{\@parfont}}}%
3217
3218 \renewcommand\part{\@startsection{part}{9}{\z@}%
3219   {-10\p@ \oplus -4\p@ \minus -2\p@}%
3220   {4\p@}%
3221   {\ACM@NRAjust\@parfont}}}

\section@raggedright Special version of \raggedright compatible with \MakeUppercase
3222 \def\section@raggedright{\rightskip\@flushglue
3223   \rightskip\rightskip
3224   \leftskip\z@skip
3225   \parindent\z@}

\@secfont Fonts for sections etc. are different for different formats.
\@subsecfont 3226 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}
\@subsubsecfont 3227 \def\@subsecfont{\sffamily\bfseries\section@raggedright}%
\@parfont 3228 \def\@subsubsecfont{\sffamily\itshape}%
3229 \def\@parfont{\itshape}%
3230 \setcounter{secnumdepth}{3}%
3231 \ifcase\ACM@format@nr
3232 \relax % manuscript
3233 \or % acmssmall
3234 \or % acmlarge
3235 \def\@secfont{\sffamily\large\section@raggedright\MakeTextUppercase}%
3236 \def\@subsecfont{\sffamily\large\section@raggedright}%
3237 \or % acmtog
3238 \def\@secfont{\sffamily\large\section@raggedright\MakeTextUppercase}%
3239 \def\@subsecfont{\sffamily\large\section@raggedright}%
3240 \or % sigconf
3241 \def\@secfont{\bfseries\Large\section@raggedright\MakeTextUppercase}%
3242 \def\@subsecfont{\bfseries\Large\section@raggedright}%
3243 \or % siggraph
3244 \def\@secfont{\sffamily\bfseries\Large\section@raggedright\MakeTextUppercase}%
3245 \def\@subsecfont{\sffamily\bfseries\Large\section@raggedright}%
3246 \or % sigplan
3247 \def\@secfont{\bfseries\Large\section@raggedright}%
3248 \def\@subsecfont{\bfseries\section@raggedright}%
3249 \def\@subsubsecfont{\bfseries\section@raggedright}%
3250 \def\@parfont{\bfseries\itshape}%
3251 \def\@subparfont{\itshape}%
3252 \or % sigchi
3253 \setcounter{secnumdepth}{1}%
3254 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}%
3255 \def\@subsecfont{\sffamily\bfseries\section@raggedright}%
3256 \or % sigchi-a
3257 \setcounter{secnumdepth}{0}%
3258 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}%

```

```

3259 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
3260 \or % acmengage
3261 \def\@secfont{\bfseries\Large\section@raggedright\MakeTextUppercase}
3262 \def\@subsecfont{\bfseries\Large\section@raggedright}
3263 \or %acmcnp
3264 \fi

\@adddotafter Add punctuation after a sectioning command
3265 \def\@adddotafter#1{#1\@addpunct{.} }

\@addspaceafter Add space after a sectioning command
3266 \def\@addspaceafter#1{#1\@addpunct{\enspace} }

3267 \if@ACM@acmcnp
3268   \setcounter{secnumdepth}{-1}%
3269 \fi

```

### 3.24 TOC lists

\@dotsep Related to the \tableofcontents are all the horizontal fillers. Base L<sup>A</sup>T<sub>E</sub>X defines \@dottedtocline, which we should not disable. Yet, this command expects \@dotsep to be defined but leaves this to the class implementation. Since amsart does not provide this, we copy the standard variant from article here.

```
3270 \providecommand*\@dotsep{4.5}
```

### 3.25 Theorems

\@acmplainbodyfont The font to typeset the body of the acmplain theorem style.

```
3271 \def\@acmplainbodyfont{\itshape}
```

\@acmplainindent The amount to indent the acmplain theorem style.

```
3272 \def\@acmplainindent{\parindent}
```

\@acmplainheadfont The font to typeset the head of the acmplain theorem style.

```
3273 \def\@acmplainheadfont{\scshape}
```

\@acmplainnotefont The font to typeset the note of the acmplain theorem style.

```
3274 \def\@acmplainnotefont{\emptyset}
```

Customization of the acmplain theorem style:

```

3275 \ifcase\ACM@format@nr
3276 \relax % manuscript
3277 \or % acmsmall
3278 \or % acmlarge
3279 \or % acmtog
3280 \or % sigconf
3281 \or % siggraph
3282 \or % sigplan
3283   \def\@acmplainbodyfont{\itshape}
3284   \def\@acmplainindent{\z@}
3285   \def\@acmplainheadfont{\bfseries}
3286   \def\@acmplainnotefont{\normalfont}

```

```

3287 \or % sigchi
3288 \or % sigchi-a
3289 \or % acmengage
3290 \or % acmcp
3291 \fi

acmplain The acmplain theorem style
3292 \newtheoremstyle{acmplain}%
3293   {.5\baselineskip\@plus.2\baselineskip
3294     \@minus.2\baselineskip}% space above
3295   {.5\baselineskip\@plus.2\baselineskip
3296     \@minus.2\baselineskip}% space below
3297   {@acmplainbodyfont}% body font
3298   {@acmplainindent}% indent amount
3299   {@acmplainheadfont}% head font
3300   {.}% punctuation after head
3301   {.5em}% spacing after head
3302   {\thmname{\#1}\thmnumber{ \#2}\thmnote{ {@acmplainnotefont(\#3)}}}% head spec

{@acmdefinitionbodyfont The font to typeset the body of the acmdefinition theorem style.
3303 \def{@acmdefinitionbodyfont}{\normalfont}

{@acmdefinitionindent The amount to indent the acmdefinition theorem style.
3304 \def{@acmdefinitionindent}{\parindent}

{@acmdefinitionheadfont The font to typeset the head of the acmdefinition theorem style.
3305 \def{@acmdefinitionheadfont}{\itshape}

{@acmdefinitionnotefont The font to typeset the note of the acmdefinition theorem style.
3306 \def{@acmdefinitionnotefont}{\emptyset}

Customization of the acmdefinition theorem style:
3307 \ifcase\ACM@format@nr
3308   \relax % manuscript
3309 \or % acmsmall
3310 \or % acmlarge
3311 \or % acmtog
3312 \or % sigconf
3313 \or % siggraph
3314 \or % sigplan
3315   \def{@acmdefinitionbodyfont}{\normalfont}
3316   \def{@acmdefinitionindent}{\z@}
3317   \def{@acmdefinitionheadfont}{\bfseries}
3318   \def{@acmdefinitionnotefont}{\normalfont}
3319 \or % sigchi
3320 \or % sigchi-a
3321 \or % acmengage
3322 \or % acmcp
3323 \fi

acmdefinition The acmdefinition theorem style
3324 \newtheoremstyle{acmdefinition}%
3325   {.5\baselineskip\@plus.2\baselineskip

```

```

3326     \@minus.2\baselineskip}% space above
3327     {.5\baselineskip\@plus.2\baselineskip
3328     \@minus.2\baselineskip}% space below
3329     {\@acmdefinitionbodyfont}% body font
3330     {\@acmdefinitionindent}% indent amount
3331     {\@acmdefinitionheadfont}% head font
3332     {.}% punctuation after head
3333     {.5em}% spacing after head
3334     {\thmname{\#1}\thmnumber{ \#2}\thmnote{ {\@acmdefinitionnotefont{\#3}}}}% head spec

```

Make `acmplain` the default theorem style.

```
3335 \theoremstyle{acmplain}
```

Delay defining the theorem environments until after other packages have been loaded. In particular, the `cleveref` package must be loaded before the theorem environments are defined in order to show the correct environment name (see <https://github.com/borisveytsman/acmart/issues/138>). The `acmthm` option is used to suppress the definition of any theorem environments. Also, to avoid obscure errors arising from these environment definitions conflicting with environments defined by the user or by user-loaded packages, we only define environments that have not yet been defined.

```

3336 \AtEndPreamble{%
3337   \if@ACM@acmthm
3338   \theoremstyle{acmplain}
3339   \@ifundefined{theorem}{%
3340     \newtheorem{theorem}{Theorem}[section]
3341   }{%
3342     \@ifundefined{conjecture}{%
3343       \newtheorem{conjecture}{theorem}[Conjecture]
3344     }{%
3345       \@ifundefined{proposition}{%
3346         \newtheorem{proposition}{theorem}[Proposition]
3347       }{%
3348         \@ifundefined{lemma}{%
3349           \newtheorem{lemma}{theorem}[Lemma]
3350         }{%
3351           \@ifundefined{corollary}{%
3352             \newtheorem{corollary}{theorem}[Corollary]
3353           }{%
3354             \theoremstyle{acmdefinition}
3355             \@ifundefined{example}{%
3356               \newtheorem{example}{theorem}[Example]
3357             }{%
3358               \@ifundefined{definition}{%
3359                 \newtheorem{definition}{theorem}[Definition]
3360               }{%
3361                 \fi
3362               \theoremstyle{acmplain}
3363             }%
3364 }%
3365 }%
3366 }%
3367 }%
3368 }%
3369 }%
3370 }%
3371 }%
3372 }%
3373 }%
3374 }%
3375 }%
3376 }%
3377 }%
3378 }%
3379 }%
3380 }%
3381 }%
3382 }%
3383 }%
3384 }%
3385 }%
3386 }%
3387 }%
3388 }%
3389 }%
3390 }%
3391 }%
3392 }%
3393 }%
3394 }%
3395 }%
3396 }%
3397 }%
3398 }%
3399 }%
3400 }%
3401 }%
3402 }%
3403 }%
3404 }%
3405 }%
3406 }%
3407 }%
3408 }%
3409 }%
3410 }%
3411 }%
3412 }%
3413 }%
3414 }%
3415 }%
3416 }%
3417 }%
3418 }%
3419 }%
3420 }%
3421 }%
3422 }%
3423 }%
3424 }%
3425 }%
3426 }%
3427 }%
3428 }%
3429 }%
3430 }%
3431 }%
3432 }%
3433 }%
3434 }%
3435 }%
3436 }%
3437 }%
3438 }%
3439 }%
3440 }%
3441 }%
3442 }%
3443 }%
3444 }%
3445 }%
3446 }%
3447 }%
3448 }%
3449 }%
3450 }%
3451 }%
3452 }%
3453 }%
3454 }%
3455 }%
3456 }%
3457 }%
3458 }%
3459 }%
3460 }%
3461 }%
3462 }%
3463 }%
3464 }%
3465 }%
3466 }%
3467 }%
3468 }%
3469 }%
3470 }%
3471 }%
3472 }%
3473 }%
3474 }%
3475 }%
3476 }%
3477 }%
3478 }%
3479 }%
3480 }%
3481 }%
3482 }%
3483 }%
3484 }%
3485 }%
3486 }%
3487 }%
3488 }%
3489 }%
3490 }%
3491 }%
3492 }%
3493 }%
3494 }%
3495 }%
3496 }%
3497 }%
3498 }%
3499 }%
3500 }%
3501 }%
3502 }%
3503 }%
3504 }%
3505 }%
3506 }%
3507 }%
3508 }%
3509 }%
3510 }%
3511 }%
3512 }%
3513 }%
3514 }%
3515 }%
3516 }%
3517 }%
3518 }%
3519 }%
3520 }%
3521 }%
3522 }%
3523 }%
3524 }%
3525 }%
3526 }%
3527 }%
3528 }%
3529 }%
3530 }%
3531 }%
3532 }%
3533 }%
3534 }%
3535 }%
3536 }%
3537 }%
3538 }%
3539 }%
3540 }%
3541 }%
3542 }%
3543 }%
3544 }%
3545 }%
3546 }%
3547 }%
3548 }%
3549 }%
3550 }%
3551 }%
3552 }%
3553 }%
3554 }%
3555 }%
3556 }%
3557 }%
3558 }%
3559 }%
3560 }%
3561 }%
3562 }%
3563 }%
3564 }%
3565 }%
3566 }%
3567 }%
3568 }%
3569 }%
3570 }%
3571 }%
3572 }%
3573 }%
3574 }%
3575 }%
3576 }%
3577 }%
3578 }%
3579 }%
3580 }%
3581 }%
3582 }%
3583 }%
3584 }%
3585 }%
3586 }%
3587 }%
3588 }%
3589 }%
3590 }%
3591 }%
3592 }%
3593 }%
3594 }%
3595 }%
3596 }%
3597 }%
3598 }%
3599 }%
3600 }%
3601 }%
3602 }%
3603 }%
3604 }%
3605 }%
3606 }%
3607 }%
3608 }%
3609 }%
3610 }%
3611 }%
3612 }%
3613 }%
3614 }%
3615 }%
3616 }%
3617 }%
3618 }%
3619 }%
3620 }%
3621 }%
3622 }%
3623 }%
3624 }%
3625 }%
3626 }%
3627 }%
3628 }%
3629 }%
3630 }%
3631 }%
3632 }%
3633 }%
3634 }%
3635 }%
3636 }%
3637 }%
3638 }%
3639 }%
3640 }%
3641 }%
3642 }%
3643 }%
3644 }%
3645 }%
3646 }%
3647 }%
3648 }%
3649 }%
3650 }%
3651 }%
3652 }%
3653 }%
3654 }%
3655 }%
3656 }%
3657 }%
3658 }%
3659 }%
3660 }%
3661 }%
3662 }%
3663 }%
3664 }%
3665 }%
3666 }%
3667 }%
3668 }%
3669 }%
3670 }%
3671 }%
3672 }%
3673 }%
3674 }%
3675 }%
3676 }%
3677 }%
3678 }%
3679 }%
3680 }%
3681 }%
3682 }%
3683 }%
3684 }%
3685 }%
3686 }%
3687 }%
3688 }%
3689 }%
3690 }%
3691 }%
3692 }%
3693 }%
3694 }%
3695 }%
3696 }%
3697 }%
3698 }%
3699 }%
3700 }%
3701 }%
3702 }%
3703 }%
3704 }%
3705 }%
3706 }%
3707 }%
3708 }%
3709 }%
3710 }%
3711 }%
3712 }%
3713 }%
3714 }%
3715 }%
3716 }%
3717 }%
3718 }%
3719 }%
3720 }%
3721 }%
3722 }%
3723 }%
3724 }%
3725 }%
3726 }%
3727 }%
3728 }%
3729 }%
3730 }%
3731 }%
3732 }%
3733 }%
3734 }%
3735 }%
3736 }%
3737 }%
3738 }%
3739 }%
3740 }%
3741 }%
3742 }%
3743 }%
3744 }%
3745 }%
3746 }%
3747 }%
3748 }%
3749 }%
3750 }%
3751 }%
3752 }%
3753 }%
3754 }%
3755 }%
3756 }%
3757 }%
3758 }%
3759 }%
3760 }%
3761 }%
3762 }%
3763 }%
3764 }%
3765 }%
3766 }%
3767 }%
3768 }%
3769 }%
3770 }%
3771 }%
3772 }%
3773 }%
3774 }%
3775 }%
3776 }%
3777 }%
3778 }%
3779 }%
3780 }%
3781 }%
3782 }%
3783 }%
3784 }%
3785 }%
3786 }%
3787 }%
3788 }%
3789 }%
3790 }%
3791 }%
3792 }%
3793 }%
3794 }%
3795 }%
3796 }%
3797 }%
3798 }%
3799 }%
3800 }%
3801 }%
3802 }%
3803 }%
3804 }%
3805 }%
3806 }%
3807 }%
3808 }%
3809 }%
3810 }%
3811 }%
3812 }%
3813 }%
3814 }%
3815 }%
3816 }%
3817 }%
3818 }%
3819 }%
3820 }%
3821 }%
3822 }%
3823 }%
3824 }%
3825 }%
3826 }%
3827 }%
3828 }%
3829 }%
3830 }%
3831 }%
3832 }%
3833 }%
3834 }%
3835 }%
3836 }%
3837 }%
3838 }%
3839 }%
3840 }%
3841 }%
3842 }%
3843 }%
3844 }%
3845 }%
3846 }%
3847 }%
3848 }%
3849 }%
3850 }%
3851 }%
3852 }%
3853 }%
3854 }%
3855 }%
3856 }%
3857 }%
3858 }%
3859 }%
3860 }%
3861 }%
3862 }%
3863 }%
3864 }%
3865 }%
3866 }%
3867 }%
3868 }%
3869 }%
3870 }%
3871 }%
3872 }%
3873 }%
3874 }%
3875 }%
3876 }%
3877 }%
3878 }%
3879 }%
3880 }%
3881 }%
3882 }%
3883 }%
3884 }%
3885 }%
3886 }%
3887 }%
3888 }%
3889 }%
3890 }%
3891 }%
3892 }%
3893 }%
3894 }%
3895 }%
3896 }%
3897 }%
3898 }%
3899 }%
3900 }%
3901 }%
3902 }%
3903 }%
3904 }%
3905 }%
3906 }%
3907 }%
3908 }%
3909 }%
3910 }%
3911 }%
3912 }%
3913 }%
3914 }%
3915 }%
3916 }%
3917 }%
3918 }%
3919 }%
3920 }%
3921 }%
3922 }%
3923 }%
3924 }%
3925 }%
3926 }%
3927 }%
3928 }%
3929 }%
3930 }%
3931 }%
3932 }%
3933 }%
3934 }%
3935 }%
3936 }%
3937 }%
3938 }%
3939 }%
3940 }%
3941 }%
3942 }%
3943 }%
3944 }%
3945 }%
3946 }%
3947 }%
3948 }%
3949 }%
3950 }%
3951 }%
3952 }%
3953 }%
3954 }%
3955 }%
3956 }%
3957 }%
3958 }%
3959 }%
3960 }%
3961 }%
3962 }%
3963 }%
3964 }%
3965 }%
3966 }%
3967 }%
3968 }%
3969 }%
3970 }%
3971 }%
3972 }%
3973 }%
3974 }%
3975 }%
3976 }%
3977 }%
3978 }%
3979 }%
3980 }%
3981 }%
3982 }%
3983 }%
3984 }%
3985 }%
3986 }%
3987 }%
3988 }%
3989 }%
3990 }%
3991 }%
3992 }%
3993 }%
3994 }%
3995 }%
3996 }%
3997 }%
3998 }%
3999 }%
3999 }
```

`\@proofnamefont` The font to typeset the proof name.

```
3999 \def\@proofnamefont{\scshape}
```

`\@proofindent` Whether or not to indent proofs.

```

3365 \def\@proofindent{\indent}

    Customization of the proof environment.

3366 \ifcase\ACM@format@nr
3367 \relax % manuscript
3368 \or % acmsmall
3369 \or % acmlarge
3370 \or % acmtog
3371 \or % sigconf
3372 \or % siggraph
3373 \or % sigplan
3374   \def\@proofnamefont{\itshape}
3375   \def\@proofindent{\noindent}
3376 \or % sigchi
3377 \or % sigchi-a
3378 \or % acmengage
3379 \or % acmcpc
3380 \fi

```

`proof` We want some customization of the proof environment.

```

3381 \renewenvironment{proof}[1][\proofname]{\par
3382   \pushQED{\qed}%
3383   \normalfont \topsep6\p@\oplus6\p@\relax
3384   \trivlist
3385   \item[\@proofindent\hspace{\labelsep}
3386         {\@proofnamefont #1\@addpunct{.}}]\ignorespaces
3387 }{%
3388   \popQED\endtrivlist\endpefalse
3389 }

```

### 3.26 Balancing columns

We need balancing only if the user did not disable it, and we use a two column format. Note that `pbalance` uses a different mechanism.

```

3390 \AtEndPreamble{%
3391   \if@ACM@pbalance
3392     \global\@ACM@balancefalse
3393   \ifcase\ACM@format@nr
3394     \relax % manuscript
3395     \or % acmsmall
3396     \or % acmlarge
3397     \or % acmtog
3398       \RequirePackage{pbalance}%
3399     \or % sigconf
3400       \RequirePackage{pbalance}%
3401     \or % siggraph
3402       \RequirePackage{pbalance}%
3403     \or % sigplan
3404       \RequirePackage{pbalance}%
3405     \or % sigchi
3406       \RequirePackage{pbalance}%
3407     \or % sigchi-a
3408     \or % acmengage

```

```

3409      \RequirePackage{pbalance}%
3410      \or % acmcp
3411      \fi
3412      \fi
3413      \if@ACM@balance
3414      \ifcase\ACM@format@nr
3415      \relax % manuscript
3416      \global\@ACM@balancefalse
3417      \or % acmsmall
3418      \global\@ACM@balancefalse
3419      \or % acmlarge
3420      \global\@ACM@balancefalse
3421      \or % acmtog
3422      \RequirePackage{balance}%
3423      \or % sigconf
3424      \RequirePackage{balance}%
3425      \or % siggraph
3426      \RequirePackage{balance}%
3427      \or % sigplan
3428      \RequirePackage{balance}%
3429      \or % sigchi
3430      \RequirePackage{balance}%
3431      \or % sigchi-a
3432      \global\@ACM@balancefalse
3433      \or % acmengage
3434      \RequirePackage{balance}%
3435      \or % acmcp
3436      \global\@ACM@balancefalse
3437      \fi
3438      \fi
3439 }
3440 \AtEndDocument{%
3441   \if@ACM@balance
3442   \if@twocolumn
3443   \balance
3444   \fi\fi}

```

### 3.27 Acknowledgments

```

\acksname
3445 \newcommand\acksname{Acknowledgments}

\acks This is a comment-like structure
3446 \specialcomment{acks}{%
3447   \begingroup
3448   \section*\{\acksname\}
3449   \phantomsection\addcontentsline{toc}{section}{\acksname}
3450 }{%
3451   \endgroup
3452 }

\grantsponsor We just typeset the name of the sponsor
3453 \def\grantsponsor#1#2#3{#2}

```

```
\grantnum
3454 \newcommand\grantnum[3][]{{#3%
3455   \def\@tempa{#1}\ifx\@tempa\@empty\else\space(\url{#1})\fi}}
```

### 3.28 Conditional typesetting

We use the `comment` package for conditional typesetting:

```
3456 \AtEndPreamble{%
3457 \if@ACM@screen
3458   \includecomment{screenonly}
3459   \excludecomment{printonly}
3460 \else
3461   \excludecomment{screenonly}
3462   \includecomment{printonly}
3463 \fi
3464 \if@ACM@anonymous
3465   \excludecomment{anonsuppress}
3466   \excludecomment{acks}
3467 \else
3468   \includecomment{anonsuppress}
3469 \fi}
```

### 3.29 Additional bibliography commands

`\showeprint` The command `\showeprint` has two arguments: the (optional) prefix and the eprint number. Right now the only prefix we understand is the (lowercase) word ‘arxiv’.

```
3470 \newcommand\showeprint[2][arxiv]{%
3471   \def\@tempa{#1}%
3472   \ifx\@tempa\@empty\def\@tempa{arxiv}\fi
3473   \def\@tempb{arxiv}%
3474   \ifx\@tempa\@tempb\relax
3475     arXiv:\href{https://arxiv.org/abs/#2}{#2}%
3476   \else
3477     \def\@tempb{arXiv}%
3478     \ifx\@tempa\@tempb\relax
3479       arXiv:\href{https://arxiv.org/abs/#2}{#2}%
3480     \else
3481       #1:#2%
3482     \fi
3483   \fi}
```

### 3.30 Index

`\theindex` Standard amsart uses plain page style in index pages. This clashes with line numbering for review option, so we redefine it.

```
3484 \def\theindex{\@restonecoltrue\if@twocolumn\@restonecolfalse\fi
3485   \columnseprule\z@\columnsep 35\p@
3486   \@indextitlestyle
3487   \let\item\@idxitem
3488   \parindent\z@\parskip\z@\plus.3\p@\relax
3489   \raggedright
3490   \hyphenpenalty\@M
3491   \footnotesize}
```

### 3.31 End of Class

```
\vspace We do not disable \vspace, but add warning to it
3492 \let\@vspace@orig=\@vspace
3493 \let\@vspacer@orig=\@vspacer
3494 \apptocmd{\@vspace}{\ClassWarning{@classname}{\string\vspace\space should
3495     only be used to provide space above/below surrounding
3496     objects}}{}{}
3497 \apptocmd{\@vspacer}{\ClassWarning{@classname}{\string\vspace\space should
3498     only be used to provide space above/below surrounding
3499     objects}}{}{}
3500 \let\@vspace@acm=\@vspace
3501 \let\@vspacer@acm=\@vspacer

\ACM@origbaselinestretch We produce an error if the user tries to change \baselinestretch
3502 \let\ACM@origbaselinestretch\baselinestretch
3503 \AtEndDocument{\ifx\baselinestretch\ACM@origbaselinestretch\else
3504   \ClassError{@classname}{An attempt to redefine
3505     \string\baselinestretch\space detected. Please do not do this for
3506     ACM submissions!}\fi}

3507 \normalsize\normalfont\frenchspacing
3508 
```

## References

- [1] UK TeX Users Group. UK list of TeX frequently asked questions. <https://texfaq.org>, 2019.
- [2] Michael Downes and Barbara Beeton. *The amsart, amsproc, and amsbook document classes*. American Mathematical Society, August 2004. <http://www.ctan.org/pkg/amslatex>.
- [3] Johannes L. Braams and Javier Bezos. *Babel*, 2022. <http://www.ctan.org/pkg/babel>.
- [4] Cristophe Fiorio. *algorithm2e.sty—package for algorithms*, October 2015. <http://www.ctan.org/pkg/algorithm2e>.
- [5] Rogério Brito. *The algorithms bundle*, August 2009. <http://www.ctan.org/pkg/algorithms>.
- [6] Carsten Heinz, Brooks Moses, and Jobst Hoffmann. *The Listings Package*, June 2015. <http://www.ctan.org/pkg/listings>.
- [7] Simon Fear. *Publication quality tables in L<sup>A</sup>T<sub>E</sub>X*, April 2005. <http://www.ctan.org/pkg/booktabs>.
- [8] Association for Computing Machinery. *ACM Visual Identity Standards*, 2007. <http://identitystandards.acm.org>.
- [9] Axel Sommerfeldt. *The subcaption package*, April 2013. <http://www.ctan.org/pkg/subcaption>.
- [10] Boris Veytsman, Bern Schndl, Lee Netherton, and C. V. Radhakrishnan. *A package to create a nomenclature*, September 2005. <http://www.ctan.org/pkg/nomencl>.
- [11] Nicola L. C. Talbot. *User Manual for glossaries.sty v4.44*, December 2019. <http://www.ctan.org/pkg/glossaries>.
- [12] David Carlisle. *The textcase package*, October 2004. <http://www.ctan.org/pkg/textcase>.

## Change History

|       |                                                                                                                                                          |        |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| 1.48  | \ccsdesc@parse: Added warning for missing concepts . . . . .                                                                                             | 75     |
|       | \if@ACM@printacmref: Added warning for longer papers . . . . .                                                                                           | 73     |
|       | \keywords: Added warning for missing keywords . . . . .                                                                                                  | 72     |
| 1.49  | General: Added prologue option to xcolor . . . . .                                                                                                       | 50     |
|       | Bib code cleanup (Zack Weinberg) . . . . .                                                                                                               | 35     |
|       | Documentation update (siggraph) . . . . .                                                                                                                | 35     |
| 1.53  | General: New journal: DTRAP . . . . .                                                                                                                    | 35     |
| 1.54  | General: New journals: PACMCGIT, TIOT, TDSCI . . . . .                                                                                                   | 35     |
|       | Rearranged docs . . . . .                                                                                                                                | 35     |
| 1.55  | General: Moved footnote stuff before hyperref call (Ross Moore) . . . . .                                                                                | 35     |
| 1.56  | General: Documented \Description . . . . .                                                                                                               | 35     |
| 1.57  | General: Booktabs package is now the default . . . . .                                                                                                   | 35     |
| 1.58  | General: Changes in samples (Enrico Gregorio) . . . . .                                                                                                  | 35     |
|       | New journal: HEALTH. TDS is renamed to TDSCI . . . . .                                                                                                   | 35     |
| 1.60  | General: New option: urlbreakonhyphens . . . . .                                                                                                         | 35     |
|       | \if@ACM@urlbreakonhyphens: introduced macro . . . . .                                                                                                    | 36     |
| 1.62  | General: New journal: TELO . . . . .                                                                                                                     | 35     |
| 1.63  | General: New journal: FACMP . . . . .                                                                                                                    | 35     |
|       | New journal: TQUANT . . . . .                                                                                                                            | 35     |
| 1.63a | General: Move: TQUANT to TQC . . . . .                                                                                                                   | 35     |
| 1.64  | General: Putting abstract after \maketitle now causes an error . . . . .                                                                                 | 35     |
| 1.65  | General: New journal: DGOV . . . . .                                                                                                                     | 35     |
| 1.66  | General: ACM reference format is now mandatory for papers over one page; CCS concepts and keywords are now mandatory for papers over two pages . . . . . | 35     |
|       | Authors' addresses are mandatory for journal articles . . . . .                                                                                          | 35     |
|       | \@mkauthorsaddresses: Added warning for missing addresses . . . . .                                                                                      | 97     |
| 1.69  | \vspace: Added the changed command to avoid grouping . . . . .                                                                                           | 114    |
| 1.70  | General: Name change for TDS . . . . .                                                                                                                   | 59     |
| 1.71  | General: Bibliography change: volume for @inproceedings is now in brackets together with series . . . . .                                                | 35     |
|       | LuaTeX now uses the OTF versions of fonts . . . . .                                                                                                      | 35     |
|       | Retired sigchi and sigchi-a . . . . .                                                                                                                    | 35     |
| 1.75  | General: Documentation update . . . . .                                                                                                                  | 35     |
| 1.78  | General: Documentation update: Word count . . . . .                                                                                                      | 35     |
| 1.80  | General: Updated information for TAP, TCPS, TEAC . . . . .                                                                                               | 59     |
| 1.82  | General: Added DLT and FAC . . . . .                                                                                                                     | 59     |
| 1.84  | General: Updated abbreviations and codes for several journals . . . . .                                                                                  | 59     |
| 1.85  | General: New journals: JDS, GAMES . . . . .                                                                                                              | 35, 59 |
|       | General: Added CC licenses . . . . .                                                                                                                     | 35     |
|       | Added: acmengage . . . . .                                                                                                                               | 48     |
|       | New journal: JRC . . . . .                                                                                                                               | 59     |
|       | New journals: ACMJCSS, JATS, TORS . . . . .                                                                                                              | 59     |
|       | \@mkauthors: Added: acmengage . . . . .                                                                                                                  | 91     |
|       | \@mktitle: Added: acmengage . . . . .                                                                                                                    | 87     |
|       | \@parfont: Added: acmengage . . . . .                                                                                                                    | 107    |
|       | \@printtopmatter: Added: acmengage . . . . .                                                                                                             | 86     |
|       | \@specialsection: Added: acmengage . . . . .                                                                                                             | 85     |
|       | \@subtitlefont: Added: acmengage . . . . .                                                                                                               | 88     |
|       | \@titlefont: Added: acmengage . . . . .                                                                                                                  | 88     |
|       | \ACM@linecountR: Added: acmengage . . . . .                                                                                                              | 99     |
|       | format: New format: acmengage . . . . .                                                                                                                  | 36     |

|                                                                                                                                                                                        |    |                                                                                                                                                                                                          |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| \parskip: Added: acmengage . . . . .                                                                                                                                                   | 52 | Patched \setcitetstyle command;<br>closes <a href="https://github.com/borisveytsman/acmart/issues/19">https://github.com/borisveytsman/acmart/issues/19</a> . . . . .                                    | 35  |
| 1.87                                                                                                                                                                                   |    |                                                                                                                                                                                                          |     |
| format: New format: acmcp . . . . .                                                                                                                                                    | 36 |                                                                                                                                                                                                          |     |
| v1.00                                                                                                                                                                                  |    | v1.06                                                                                                                                                                                                    |     |
| General: First released version . . . . .                                                                                                                                              | 35 | \@ACM@badge@skip: Added macro . . . . .                                                                                                                                                                  | 71  |
| v1.01                                                                                                                                                                                  |    | \@ACM@badge@width: Added macro . . . . .                                                                                                                                                                 | 71  |
| General: Changed hyperref colors in<br>screen mode (closes <a href="https://github.com/borisveytsman/acmart/issues/1">https://github.com/borisveytsman/acmart/issues/1</a> ) . . . . . | 35 | \@ACM@title@width: Added macro . . . . .                                                                                                                                                                 | 71  |
| Defined ACM colors . . . . .                                                                                                                                                           | 35 | \@mktitle@i: Added processing<br>badges . . . . .                                                                                                                                                        | 89  |
| Explicitly put draft option (closes<br><a href="https://github.com/borisveytsman/acmart/issues/4">https://github.com/borisveytsman/acmart/issues/4</a> ) . . . . .                     | 38 | Made generic . . . . .                                                                                                                                                                                   | 89  |
| Set headheight to 1pc for all<br>formats (closes <a href="https://github.com/borisveytsman/acmart/issues/5">https://github.com/borisveytsman/acmart/issues/5</a> ) . . . . .           | 35 | \@mktitle@ii: Now this macro is<br>obsolete . . . . .                                                                                                                                                    | 89  |
| v1.02                                                                                                                                                                                  |    | \@mktitle@iii: Added processing<br>badges . . . . .                                                                                                                                                      | 89  |
| General: Added TOPS and TSC (closes<br><a href="https://github.com/borisveytsman/acmart/issues/12">https://github.com/borisveytsman/acmart/issues/12</a> ) . . . . .                   | 35 | Made more generic . . . . .                                                                                                                                                                              | 89  |
| Documentation changes (closes<br><a href="https://github.com/borisveytsman/acmart/issues/13">https://github.com/borisveytsman/acmart/issues/13</a> ) . . . . .                         | 35 | \@mktitle@iv: Made more generic . . . . .                                                                                                                                                                | 90  |
| v1.03                                                                                                                                                                                  |    | \@printtopmatter: Added processing<br>badges . . . . .                                                                                                                                                   | 86  |
| General: Added anonsuppress<br>environment . . . . .                                                                                                                                   | 35 | \@subtitlefont: Added macro . . . . .                                                                                                                                                                    | 88  |
| Added authorversion option (closes<br><a href="https://github.com/borisveytsman/acmart/issues/9">https://github.com/borisveytsman/acmart/issues/9</a> ) . . . . .                      | 35 | \@titlefont: Added macro . . . . .                                                                                                                                                                       | 88  |
| \@formatdoi: Added macro . . . . .                                                                                                                                                     | 78 | \acmBadgeL: Added macro . . . . .                                                                                                                                                                        | 72  |
| \if@ACM@authorversion: Added<br>macro . . . . .                                                                                                                                        | 37 | \acmBadgeR: Added macro . . . . .                                                                                                                                                                        | 72  |
| \maketitle: Added special case of<br>authorversion . . . . .                                                                                                                           | 82 | \if@ACM@badge: Added macro . . . . .                                                                                                                                                                     | 71  |
| v1.04                                                                                                                                                                                  |    | v1.07                                                                                                                                                                                                    |     |
| General: Updated bibliography for<br>siggraph . . . . .                                                                                                                                | 35 | \maketitle: Corrected a bug with<br>abstract footnotes . . . . .                                                                                                                                         | 82  |
| \acmArticleSeq: Name change by<br>Matthew Fluet . . . . .                                                                                                                              | 71 | Corrected a bug with permssion<br>and footnotes order . . . . .                                                                                                                                          | 82  |
| \acmDOI: Name change by Matthew<br>Fluet . . . . .                                                                                                                                     | 71 | v1.08                                                                                                                                                                                                    |     |
| \acmISBN: Name change by Matthew<br>Fluet . . . . .                                                                                                                                    | 71 | General: SIGPLAN reformatting by<br>Matthew Fluet . . . . .                                                                                                                                              | 35  |
| v1.05                                                                                                                                                                                  |    | Typos corrected (Tobias Pape) . . . . .                                                                                                                                                                  | 35  |
| General: Added processing doi<br>numbers for acmsiggraph and doi<br>numbers for sigproc.bib . . . . .                                                                                  | 35 | v1.09                                                                                                                                                                                                    |     |
|                                                                                                                                                                                        |    | General: Revert SIGPLAN caption<br>rules . . . . .                                                                                                                                                       | 35  |
|                                                                                                                                                                                        |    | v1.10                                                                                                                                                                                                    |     |
|                                                                                                                                                                                        |    | General: Changes of<br>'licensedothegov' wording . . . . .                                                                                                                                               | 76  |
|                                                                                                                                                                                        |    | \maketitle: Corrected a bug with doi<br>in manuscript and author vertson,<br><a href="https://github.com/borisveytsman/acmart/issues/36">https://github.com/borisveytsman/acmart/issues/36</a> . . . . . | 82  |
|                                                                                                                                                                                        |    | standardpagestyle: Reversed folios<br>location . . . . .                                                                                                                                                 | 101 |
|                                                                                                                                                                                        |    | v1.11                                                                                                                                                                                                    |     |
|                                                                                                                                                                                        |    | General: Customization of ACM<br>theorem styles and proof<br>environment by Matthew Fluet . . . . .                                                                                                      | 35  |
|                                                                                                                                                                                        |    | v1.12                                                                                                                                                                                                    |     |
|                                                                                                                                                                                        |    | General: Added graceful behavior<br>when libertine fonts are absent . . . . .                                                                                                                            | 53  |
|                                                                                                                                                                                        |    | Documentation updates . . . . .                                                                                                                                                                          | 35  |

|                                                                                |     |                                                                       |     |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
|--------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------|-----|---------------------------------------------------------|----|----------------------------------------------------|-----|-------------------------------------------------|-----|--------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------|-----|--------------------------------------------------------------------|-----|------------------------------------------------|-----|------------------------------------------------------------|----|----------------------------------------------------|----|----------------------------------------------------|-----|----------------------------------------------|-----|-----------------------------------------------------|-----|--------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------|-----|--------------------------------------------------------------------|-----|----------------------------------------------------------|-----|------------------------------------------------------------|----|------------------------------------------------|----|------------------------------------------------|----|----------------------------------------------|----|--------------------------------------|-----|-------------------------------|-----|----------------------------------------------------|-----|-----------------------------------------------------|-----|----------------------------------------------------------|-----|------------------------------------------------------------|----|------------------------------------------------|----|------------------------------------------------|----|----------------------------------------------|----|--------------------------------------|----|----------------------------|-----|------------------------------|-----|-----------------------------------------------------|-----|----------------------------------------------------------|----|
| \@marginfigure: Now centering by default .....                                 | 57  | \affiliation: Added code for author groups .....                      | 68  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \@margintable: Now centering by default .....                                  | 57  | \author: Added code for author groups .....                           | 67  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \@parfont: Moved to \section@raggedright .....                                 | 107 | \city: Added macro .....                                              | 90  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \copyrightpermissionfootnoterule: Added macro .....                            | 52  | \country: Added macro .....                                           | 90  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \descriptionlabel: Redefined .....                                             | 59  | \department: Added macro .....                                        | 90  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \footnoterule: Made shorter .....                                              | 53  | \grantnum: Added macro .....                                          | 113 |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \if@ACM@natbib@override: Added macro .....                                     | 37  | \grantsponsor: Added macro .....                                      | 112 |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \if@ACM@newfonts: Added macro .....                                            | 54  | \if@insideauthorgroup: Introduced macro .....                         | 67  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \maketitle: Moved thankses to copyrightpermission box .....                    | 82  | \institution: Added macro .....                                       | 90  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \section@raggedright: Introduced macro .....                                   | 107 | \num@authorgroups: Renamed .....                                      | 67  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| v1.13                                                                          |     | \orcid: Introduced macro .....                                        | 69  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| General: Font adjustments for acmsmall .....                                   | 91  | \position: Added macro .....                                          | 90  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| Increased font size for ACM Large .....                                        | 40  | \postcode: Added macro .....                                          | 90  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| Print bibliographic information by default for the proceedings .....           | 73  | \state: Added macro .....                                             | 90  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \@mpfootnotetext: Made minipage footnotes centered .....                       | 48  | \streetaddress: Added macro .....                                     | 90  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \bibliographystyle: Redefined macro .....                                      | 49  | \standardpagestyle: Better handling of anonymous mode .....           | 101 |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \bibstyle@acmauthoryear: Added macro .....                                     | 43  | v1.16                                                                 |     |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \bibstyle@acmnumeric: Added macro .....                                        | 43  | \if@ACM@printfolios: Added macro .....                                | 73  | General: Formatting header/footer (Matthew Fluet) ..... | 35 | \standardpagestyle: Added headers for sigs .....   | 101 | \@headfootfont: Added macro .....               | 100 | Expanded headers for sigchi-a .....                                            | 101 | \standardpagestyle: Customize header/footer text font .....           | 101 | Suppressed folios if sig .....                                     | 101 | v1.17                                          |     | v1.14                                                      |    | General: \citetstyle updates (Matthew Fluet) ..... | 35 | General: Slightly decreased margins for sigs ..... | 50  | Patched \citetstyle .....                    | 41  | \@makefnmark: Redefined .....                       | 48  | \bibstyle@acmauthoryear: Moved def of \bibstyle@acmauthoryear before use ..... | 43  | \@mkauthors: TOG now uses the same authors block as other journals .. | 91  | \bibstyle@acmnumeric: Moved def of \bibstyle@numeric before use .. | 43  | \@mkauthors@ii: Deleted .....                            | 94  | v1.15                                                      |    | \@ACM@addtoaddress: Added macro .....          | 90 | \@mkbibcitation: Added \nobreak .....          | 98 | \@mkauthors@iii: New authors system .....    | 94 | \@shortauthors: Introduced macro ..  | 100 | Changed format for sigs ..... | 98  | \@typeset@author@bx: Moved to separate macro ..... | 94  | \acmArticle: The default is now numerical .....     | 71  | \acks: Added macro .....                                 | 112 | \acmMonth: The default must be numerical. Closes #50. .... | 71 | \acmNumber: The default is now numerical ..... | 70 | \acmVolume: The default is now numerical ..... | 70 | \acmYear: The default is now numerical ..... | 71 | \description: Decreased indent ..... | 59 | \grantnum: Added url ..... | 113 | \grantsponsor: Renamed ..... | 112 | \standardpagestyle: Added paper title to sigs ..... | 101 | \if@ACM@printacmref: Renamed from \if@ACM@printbib ..... | 73 |
| \if@ACM@printfolios: Added macro .....                                         | 73  | General: Formatting header/footer (Matthew Fluet) .....               | 35  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \standardpagestyle: Added headers for sigs .....                               | 101 | \@headfootfont: Added macro .....                                     | 100 |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| Expanded headers for sigchi-a .....                                            | 101 | \standardpagestyle: Customize header/footer text font .....           | 101 |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| Suppressed folios if sig .....                                                 | 101 | v1.17                                                                 |     |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| v1.14                                                                          |     | General: \citetstyle updates (Matthew Fluet) .....                    | 35  | General: Slightly decreased margins for sigs .....      | 50 | Patched \citetstyle .....                          | 41  | \@makefnmark: Redefined .....                   | 48  | \bibstyle@acmauthoryear: Moved def of \bibstyle@acmauthoryear before use ..... | 43  | \@mkauthors: TOG now uses the same authors block as other journals .. | 91  | \bibstyle@acmnumeric: Moved def of \bibstyle@numeric before use .. | 43  | \@mkauthors@ii: Deleted .....                  | 94  | v1.15                                                      |    | \@ACM@addtoaddress: Added macro .....              | 90 | \@mkbibcitation: Added \nobreak .....              | 98  | \@mkauthors@iii: New authors system .....    | 94  | \@shortauthors: Introduced macro ..                 | 100 | Changed format for sigs .....                                                  | 98  | \@typeset@author@bx: Moved to separate macro .....                    | 94  | \acmArticle: The default is now numerical .....                    | 71  | \acks: Added macro .....                                 | 112 | \acmMonth: The default must be numerical. Closes #50. .... | 71 | \acmNumber: The default is now numerical ..... | 70 | \acmVolume: The default is now numerical ..... | 70 | \acmYear: The default is now numerical ..... | 71 | \description: Decreased indent ..... | 59  | \grantnum: Added url .....    | 113 | \grantsponsor: Renamed .....                       | 112 | \standardpagestyle: Added paper title to sigs ..... | 101 | \if@ACM@printacmref: Renamed from \if@ACM@printbib ..... | 73  |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| General: \citetstyle updates (Matthew Fluet) .....                             | 35  | General: Slightly decreased margins for sigs .....                    | 50  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| Patched \citetstyle .....                                                      | 41  | \@makefnmark: Redefined .....                                         | 48  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \bibstyle@acmauthoryear: Moved def of \bibstyle@acmauthoryear before use ..... | 43  | \@mkauthors: TOG now uses the same authors block as other journals .. | 91  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \bibstyle@acmnumeric: Moved def of \bibstyle@numeric before use ..             | 43  | \@mkauthors@ii: Deleted .....                                         | 94  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| v1.15                                                                          |     | \@ACM@addtoaddress: Added macro .....                                 | 90  | \@mkbibcitation: Added \nobreak .....                   | 98 | \@mkauthors@iii: New authors system .....          | 94  | \@shortauthors: Introduced macro ..             | 100 | Changed format for sigs .....                                                  | 98  | \@typeset@author@bx: Moved to separate macro .....                    | 94  | \acmArticle: The default is now numerical .....                    | 71  | \acks: Added macro .....                       | 112 | \acmMonth: The default must be numerical. Closes #50. .... | 71 | \acmNumber: The default is now numerical .....     | 70 | \acmVolume: The default is now numerical .....     | 70  | \acmYear: The default is now numerical ..... | 71  | \description: Decreased indent .....                | 59  | \grantnum: Added url .....                                                     | 113 | \grantsponsor: Renamed .....                                          | 112 | \standardpagestyle: Added paper title to sigs .....                | 101 | \if@ACM@printacmref: Renamed from \if@ACM@printbib ..... | 73  |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \@ACM@addtoaddress: Added macro .....                                          | 90  | \@mkbibcitation: Added \nobreak .....                                 | 98  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \@mkauthors@iii: New authors system .....                                      | 94  | \@shortauthors: Introduced macro ..                                   | 100 | Changed format for sigs .....                           | 98 | \@typeset@author@bx: Moved to separate macro ..... | 94  | \acmArticle: The default is now numerical ..... | 71  | \acks: Added macro .....                                                       | 112 | \acmMonth: The default must be numerical. Closes #50. ....            | 71  | \acmNumber: The default is now numerical .....                     | 70  | \acmVolume: The default is now numerical ..... | 70  | \acmYear: The default is now numerical .....               | 71 | \description: Decreased indent .....               | 59 | \grantnum: Added url .....                         | 113 | \grantsponsor: Renamed .....                 | 112 | \standardpagestyle: Added paper title to sigs ..... | 101 | \if@ACM@printacmref: Renamed from \if@ACM@printbib .....                       | 73  |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \@shortauthors: Introduced macro ..                                            | 100 | Changed format for sigs .....                                         | 98  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \@typeset@author@bx: Moved to separate macro .....                             | 94  | \acmArticle: The default is now numerical .....                       | 71  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \acks: Added macro .....                                                       | 112 | \acmMonth: The default must be numerical. Closes #50. ....            | 71  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \acmNumber: The default is now numerical .....                                 | 70  | \acmVolume: The default is now numerical .....                        | 70  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \acmYear: The default is now numerical .....                                   | 71  | \description: Decreased indent .....                                  | 59  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \grantnum: Added url .....                                                     | 113 | \grantsponsor: Renamed .....                                          | 112 |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |
| \standardpagestyle: Added paper title to sigs .....                            | 101 | \if@ACM@printacmref: Renamed from \if@ACM@printbib .....              | 73  |                                                         |    |                                                    |     |                                                 |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                |     |                                                            |    |                                                    |    |                                                    |     |                                              |     |                                                     |     |                                                                                |     |                                                                       |     |                                                                    |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |     |                               |     |                                                    |     |                                                     |     |                                                          |     |                                                            |    |                                                |    |                                                |    |                                              |    |                                      |    |                            |     |                              |     |                                                     |     |                                                          |    |

|       |                                                                                                                                          |     |                                                                             |                                                                                                      |     |
|-------|------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----|
| v1.18 | General: Natbib is now the default for all formats . . . . .                                                                             | 35  | standardpagestyle: Corrected printfolios (Matthew Fluet) . . . . .          | 101                                                                                                  |     |
|       | \@mkauthors@i: Now we andify affiliations . . . . .                                                                                      | 93  | v1.30                                                                       | General: Added \frenchspacing . . . . .                                                              | 114 |
|       | \@typeset@author@line: Added macro . . . . .                                                                                             | 92  |                                                                             | Bibtex style now recognizes https:// in doi . . . . .                                                | 35  |
| v1.19 | General: Include 'Abstract', 'Acknowledgements', and 'References' in PDF bookmarks (Matthew Fluet) . . . . .                             | 35  |                                                                             | Switched to T1: looks like libertine has problems with \l in OT1 . . . . .                           | 54  |
|       | Include 'References' in PDF bookmarks (Matthew Fluet) . . . . .                                                                          | 41  |                                                                             | Updated IMWUT and PACMPL . . . . .                                                                   | 59  |
|       | \@mkabstract: Include 'Abstract' in PDF bookmarks (Matthew Fluet) . . . . .                                                              | 97  | \department: Added optional parameter . . . . .                             | 90                                                                                                   |     |
|       | \acks: Include 'Acknowledgements' in PDF bookmarks (Matthew Fluet) . . . . .                                                             | 112 | v1.31                                                                       | General: Documentation changes . . . . .                                                             | 35  |
| v1.20 | General: Bug fixes for bst . . . . .                                                                                                     | 35  | \@additionalaffiliation: Added macro . . . . .                              | 69                                                                                                   |     |
|       | \@mkabstract: Deleted spurious space . . . . .                                                                                           | 97  | \@mkbibcitation: Disabled linebreak . . . . .                               | 98                                                                                                   |     |
| v1.21 | \showeprint: Added macro . . . . .                                                                                                       | 113 | \@startsection: Added \tochangmeasure . . . . .                             | 45                                                                                                   |     |
| v1.22 | General: More bibliography changes for Aptara . . . . .                                                                                  | 35  | Redefined macro . . . . .                                                   | 47                                                                                                   |     |
| v1.23 | General: Add PACMPL journal option . . . . .                                                                                             | 35  | \@textbottom: Redefined . . . . .                                           | 53                                                                                                   |     |
| v1.24 | General: Add IMWUT journal option . . . . .                                                                                              | 59  | \acmMonth: The default now is the current month (Matteo Riondato) . . . . . | 71                                                                                                   |     |
| v1.25 | General: Updated PACMPL . . . . .                                                                                                        | 59  | \acmYear: The default now is the current year (Matteo Riondato) . . . . .   | 71                                                                                                   |     |
| v1.26 | General: Corrected \shortcite bug . . . . .                                                                                              | 35  | \additionalaffiliation: Added macro . . . . .                               | 69                                                                                                   |     |
|       | Documentation typos fixed (thanks to Stephen Spencer) . . . . .                                                                          | 35  | \l@subsection: Redefined macro . . . . .                                    | 47                                                                                                   |     |
| v1.27 | \if@ACM@printccs: Typo corrected . . . . .                                                                                               | 72  | \l@subsubsection: Redefined macro . . . . .                                 | 47                                                                                                   |     |
| v1.28 | General: Corrected option natbib behavior . . . . .                                                                                      | 43  | v1.32                                                                       | General: Added POMACS journal option . . . . .                                                       | 35  |
|       | Got rid of warnings in pdf keywords . . . . .                                                                                            | 48  |                                                                             | Format siggraph is now obsolete . . . . .                                                            | 35  |
|       | \ccsdesc@parse: Change from \to to \textrightarrow (Matteo Riondato) . . . . .                                                           | 75  | \@formatdoi: New doi format . . . . .                                       | 78                                                                                                   |     |
| v1.29 | General: Increased head to 13pt . . . . .                                                                                                | 50  | v1.33                                                                       | General: Added acmart-preload-hook . . . . .                                                         | 35  |
|       | \@mkabstract: Removed spurious indentation (John Wickerson) . . . . .                                                                    | 97  |                                                                             | Added cmap and glyptounicode . . . . .                                                               | 53  |
|       | \ccsdesc@parse: Add spacing after bullet and around rightarrow; semicolon separators no longer in bold/italic (John Wickerson) . . . . . | 75  |                                                                             | BibTeX comma before articleno bug corrected . . . . .                                                | 35  |
|       |                                                                                                                                          |     |                                                                             | BibTeX crossref bug corrected . . . . .                                                              | 35  |
|       |                                                                                                                                          |     |                                                                             | BibTeX numpages bug corrected . . . . .                                                              | 35  |
|       |                                                                                                                                          |     |                                                                             | Documentation updates . . . . .                                                                      | 35  |
|       |                                                                                                                                          |     |                                                                             | Moved \citemname definition for non-natbib bibliography, so a package may redefine it . . . . .      | 49  |
|       |                                                                                                                                          |     |                                                                             | Switched to Type 1 fonts for libertine even if OTF-capable engine is used (Kai Mindermann) . . . . . | 54  |
|       |                                                                                                                                          |     | \@ACM@addtoaddress: Added obeypunctuation code . . . . .                    | 90                                                                                                   |     |
|       |                                                                                                                                          |     | \@mkauthors@i: Added obeypunctuation code . . . . .                         | 93                                                                                                   |     |
|       |                                                                                                                                          |     | \@mkauthors@iii: Added obeypunctuation code . . . . .                       | 94                                                                                                   |     |

|                                                                                                     |     |                                                                                      |        |
|-----------------------------------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------------|--------|
| \@mkauthors@iv: Added obeypunctuation code                                                          | 95  | Deleted 'DOI' from doi numbers                                                       | 82     |
| \@subtitlefont: Added \normalsize                                                                   | 88  | Rearranged bibstrip                                                                  | 82     |
| \ACM@linecountL: Renamed macro                                                                      | 99  | The \terms command is now obsolete                                                   | 82     |
| \ACM@linecountR: Added macro                                                                        | 99  | \terms: The \terms command now just produces a warning                               | 72     |
| \ACM@timestamp: Added current page number                                                           | 100 | v1.35                                                                                |        |
| Added macro (Michael D. Adams)                                                                      | 100 | General: BibTeX bug fixed: et al.                                                    | 35     |
| Added submission id                                                                                 | 100 | If the copyright is set to usgov or rightsretained, the price is suppressed          | 76     |
| \acmSubmissionID: Added macro                                                                       | 71  | \bibstyle@acmauthoryear: Square brackets for author-year style                       | 43     |
| \city: Added obeypunctuation code                                                                   | 90  | v1.36                                                                                |        |
| \country: Added obeypunctuation code                                                                | 90  | General: Added PACMHCI journal options                                               | 59     |
| \department: Added obeypunctuation code                                                             | 90  | Added the possibility to adjust number of author boxes per row in conference formats | 35     |
| \if@ACM@affiliation@obeypunctuation: Added macro                                                    | 69  | \@ACM@authorsperrow: Added macro                                                     | 73     |
| \if@ACM@authordraft: Added macro                                                                    | 38  | \@mkauthors@iii: Added authorsperrow override                                        | 94     |
| \if@ACM@natbib@override: Deleted macro                                                              | 37  | \@mkauthors@iv: Added authorsperrow override                                         | 95     |
| \if@ACM@timestamp: Added macro (Michael D. Adams)                                                   | 38  | \if@ACM@authordraft: Corrected typo, thanks to bargteil                              | 38     |
| \institution: Added obeypunctuation code                                                            | 90  | v1.37                                                                                |        |
| \firstpagestyle: Added right linecount for two-column formats                                       | 104 | General: Reduce list indentation (Matthew Fluet)                                     | 58     |
| Added timestamp (Michael D. Adams)                                                                  | 104 | Set \normalparindent; Reduce list indentation (Matthew Fluet)                        | 35     |
| \maketitle: Fixed the bug with figures on top and bottom of the title page, thanks to David Epstein | 82  | \description: Reduce list indentation (Matthew Fluet)                                | 59     |
| \position: Added obeypunctuation code                                                               | 90  | \descriptionlabel: Reduce list indentation (Matthew Fluet)                           | 59     |
| \postcode: Added obeypunctuation code                                                               | 90  | \normalparindent: Set \normalparindent (Matthew Fluet)                               | 52     |
| \state: Added obeypunctuation code                                                                  | 90  | v1.38                                                                                |        |
| \streetaddress: Added obeypunctuation code                                                          | 90  | General: Increase default font size for SIGPLAN                                      | 35, 40 |
| \standardpagestyle: Added right linecount for two-column formats                                    | 101 | v1.39                                                                                |        |
| Added timestamp (Michael D. Adams)                                                                  | 101 | \@authornotemark: Added macro                                                        | 97     |
| v1.34                                                                                               |     | \authornotemark: Added macro                                                         | 70     |
| \@mkbibcitation: Deleted DOI from doi numbers                                                       | 98  | v1.40                                                                                |        |
| \ACM@linecount@bx: Rulers now are continuous                                                        | 99  | General: Added 'textcase' package                                                    | 41     |
| \ACM@linecountL: Rulers now are continuous                                                          | 99  | Added heightrounded to geometry                                                      | 50     |
| \ACM@linecountR: Rulers now are continuous                                                          | 99  | Added new copyright version: licensedcagov                                           | 35     |
| \maketitle: Added date to the bibstrip in conf proceedings                                          | 82  | Added package cleveref                                                               | 35     |
|                                                                                                     |     | Added Ross Moore code for glyptounicode                                              | 53     |
|                                                                                                     |     | Bibliography changes                                                                 | 35     |

|                                       |     |                                                                              |     |
|---------------------------------------|-----|------------------------------------------------------------------------------|-----|
| \@copyrightowner: Added new           |     | \maketitle: Empty DOI or ISBN are<br>not printed (by Michael Ekstrand)       | 82  |
| copyright version: licensedcagov .    | 77  |                                                                              |     |
| \@copyrightpermission: Added new      |     | v1.45                                                                        |     |
| copyright version: licensedcagov .    | 78  | \@folioblob: Switched                                                        |     |
| \@mkauthors@i: Switched to            |     | \bfseries\sffamily to                                                        |     |
| MakeTextUppercase .....               | 93  | \sffamily\bfseries .....                                                     | 103 |
| \@parfont: Switched to                |     | \@parfont: Switched                                                          |     |
| MakeTextUppercase .....               | 107 | \bfseries\sffamily to                                                        |     |
| \ACM@linecount@bx: Work around a      |     | \sffamily\bfseries .....                                                     | 107 |
| bug in xcolor: looks like cmyk        |     | \@titlefont: Switched                                                        |     |
| colors in boxes do not work .....     | 99  | \bfseries\sffamily to                                                        |     |
| \ccdesc@parse@finish: Added           |     | \sffamily\bfseries .....                                                     | 88  |
| macro .....                           | 75  | v1.46                                                                        |     |
| \city: We now do not print this even  |     | General: Added etoolbox .....                                                | 35  |
| in SIG .....                          | 90  | Bst file bug fixes: label width is<br>calculated correctly .....             | 35  |
| \country: Fixed bugs with extra       |     | Delayed hypersetup since journal<br>options may change screen mode           | 48  |
| spaces .....                          | 90  | PACM now set screen to true .....                                            | 59  |
| \l@section: Redefined macro ..        | 47  | Restore theorem defs to class file ..                                        | 35  |
| \postcode: We now do not print this   |     | \@mkauthorsaddresses: Introduced                                             |     |
| even in SIG .....                     | 90  | macro .....                                                                  | 96  |
| \state: We now do not print this even |     | \@mkbibcitation: Added subtitle ..                                           | 98  |
| in SIG .....                          | 90  | \@printendtopmatter: Made it                                                 |     |
| \streetaddress: We now do not         |     | \par\bigskip uniformly .....                                                 | 98  |
| print this even in SIG .....          | 90  | \@printtopmatter: Deleted rule ..                                            | 86  |
| v1.41                                 |     | \@setauthorsaddresses: Introduced                                            |     |
| General: Added new badges .....       | 35  | macro .....                                                                  | 98  |
| v1.42                                 |     | \ACM@linecount@bx: Rearranged the                                            |     |
| General: Deleted ACM badges .....     | 35  | code to get rid of spurious<br>underfull messages (Benjamin<br>Byholm) ..... | 99  |
| v1.43                                 |     | \author: Started counting authors ..                                         | 67  |
| \@startsection: Added                 |     | \authorsaddresses: Introduced                                                |     |
| \makeatletter .....                   | 47  | macro .....                                                                  | 69  |
| \country: Added comma before          |     | \country: Corrected spacing for<br>institution .....                         | 90  |
| country for journals .....            | 90  | \if@ACM@acmthm: Modified                                                     |     |
| v1.44                                 |     | description .....                                                            | 36  |
| General: Added package refcount ..    | 35  | \liningnums: Workaround for<br>compatibility with fontspec .....             | 54  |
| Deleted package cleveref .....        | 35  | \maketitle: Added authors' addresses                                         | 82  |
| Put theorem defs in a separate style  | 35  | Thankses go before authors'<br>addresses .....                               | 82  |
| \@acmBooktitle: Added macro ..        | 67  | \num@authors: Introduced macro ..                                            | 67  |
| \@acmEditors: Added macro ..          | 67  | v1.47                                                                        |     |
| \@editorsAbbrev: Added macro ..       | 67  | General: New journal: THRI .....                                             | 35  |
| \@folioblob: Suppress the blob if     |     | v1.48                                                                        |     |
| acmArticleSeq is empty .....          | 103 | General: \citeyear no longer<br>behaves like \citeyearpar .....              | 49  |
| \@mkbibcitation: If the paper has     |     | Code prettying (Michael D. Adams)                                            | 35  |
| just one page, use 'page' instead of  |     | Initial support for Biblatex (Daniel<br>Thomas) .....                        | 35  |
| 'pages' .....                         | 98  |                                                                              |     |
| \ACM@restore@pagestyle: Added         |     |                                                                              |     |
| macro .....                           | 99  |                                                                              |     |
| \acmArticle: The default is now       |     |                                                                              |     |
| empty .....                           | 71  |                                                                              |     |
| \acmArticleSeq: Now acmArticle        |     |                                                                              |     |
| might be empty .....                  | 71  |                                                                              |     |
| \acmBooktitle: Added macro ..         | 67  |                                                                              |     |
| \editor: Added macro .....            | 67  |                                                                              |     |
| \if@ACM@acmthm: Added macro ..        | 36  |                                                                              |     |

|                                                                                               |     |                                                                                                    |     |
|-----------------------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------|-----|
| Misc entries in the bibliography no longer produce a separate date . . . . .                  | 35  | \ACM@NR@adjustedSectionformat:<br>Added macro . . . . .                                            | 106 |
| Typos fixed (Jamie Davis) . . . . .                                                           | 35  | \ACM@NRadjust: Added macro . . . . .                                                               | 105 |
| \@headfootfont: Deleted unnecessary switch (Michael D. Adams) . . . . .                       | 100 | \author: Added submission id in anonymous mode . . . . .                                           | 67  |
| \@mkabstract: Removed spurious indentation if abstract is followed by an empty line . . . . . | 97  | \if@ACM@nonacm: Added macro . . . . .                                                              | 37  |
| \ACM@timestamp: Fromatting change (Michael D. Adams) . . . . .                                | 100 | v1.55<br>General: Now we use purple color for links . . . . .                                      | 48  |
| \if@ACM@review: Review mode now switches on folios . . . . .                                  | 36  | Table captions for SIGCHI now use the same font size as figure captions (Luis Leiva) . . . . .     | 56  |
| \maketitle: Added acmart and version info to pdfcreator tag . . . . .                         | 82  | Typo corrected (Zack Weinberg) . . . . .                                                           | 41  |
| Added language and doctitle attributes to PDF (Andreas Reichinger) . . . . .                  | 82  | \@mkbibcitation: Bug corrected . . . . .                                                           | 98  |
| Suppressed empty DOI (Serguei Mokhov) . . . . .                                               | 82  | \maketitle: Fixes topnum . . . . .                                                                 | 82  |
| v1.50<br>\copyrightpermission: New copyright statements for iw3c2w3[g] . . . . .              | 78  | v1.56<br>General: Looks like XeTeX requires explicit monotype font declaration . . . . .           | 54  |
| v1.51<br>General: Corrected the bug with price suppression . . . . .                          | 76  | Make two-column layouts flush (Philip Quinn) . . . . .                                             | 50  |
| Suppress price if the copyright is set to iw3c2w3 or iw3c2w3g . . . . .                       | 76  | \@marginfigure: Added checking for description . . . . .                                           | 57  |
| XeTeX now uses OTF fonts (Joachim Breitner) . . . . .                                         | 54  | \@mkteasers: Added check for description . . . . .                                                 | 97  |
| \firstpagestyle: We now use journal abbreviation for footers . . . . .                        | 104 | \acksname: Added macro (Philip Quinn) . . . . .                                                    | 112 |
| \standardpagestyle: We now use journal abbreviation for footers . . . . .                     | 101 | \ccsdesc@parse: End the concepts list with a period (Philip Quinn) . . . . .                       | 75  |
| v1.52<br>\copyrightowner: Rewording of licenses . . . . .                                     | 77  | \Description: Added macro . . . . .                                                                | 55  |
| \copyrightpermission: Another rewording of copyright statements for iw3c2w3[g] . . . . .      | 78  | \if@Description@present: Added macro . . . . .                                                     | 55  |
| v1.53<br>General: Added PACMCGIT, TIOT, TDSCI . . . . .                                       | 59  | \if@undescribed@images: Added macro . . . . .                                                      | 55  |
| v1.54<br>General: Added Ross's patch for sectioning . . . . .                                 | 106 | v1.57<br>\ACM@origbaselinestretch: Added check whether the user changed \baselinestretch . . . . . | 114 |
| Deleted indent for subsubsection . . . . .                                                    | 106 | \author: Added warning if \author has comma . . . . .                                              | 67  |
| XeTeX now uses T1 encoding . . . . .                                                          | 54  | \email: Added warning if \author has comma . . . . .                                               | 69  |
| \@mkbibcitation: Bug corrected (Ross Moore) . . . . .                                         | 98  | \if@ACM@balance: Added macro . . . . .                                                             | 37  |
| \@shortauthors: Added submission id in anonymous mode . . . . .                               | 100 | \vspace: Added warning . . . . .                                                                   | 114 |
| \ACM@adddotafter: Added macro . . . . .                                                       | 106 | v1.58<br>General: Added HEALTH. TDSCI is renamed to TDS . . . . .                                  | 59  |
|                                                                                               |     | Suppressed \addtocounter in pdf subject . . . . .                                                  | 48  |
|                                                                                               |     | \@dblfloat: Deleted spurious \vspace warning . . . . .                                             | 57  |
|                                                                                               |     | \@marginfigure: Deleted spurious \vspace warning . . . . .                                         | 57  |
|                                                                                               |     | \@marginable: Deleted spurious \vspace warning . . . . .                                           | 57  |

|                                       |     |
|---------------------------------------|-----|
| \@mkbibcitation: Deleted spurious     |     |
| \vspace warning . . . . .             | 98  |
| \@printendtopmatter: Deleted          |     |
| spurious \vspace warning . . . . .    | 98  |
| \@sidebar: Deleted spurious \vspace   |     |
| warning . . . . .                     | 56  |
| \maketitle: Original \vspace inside   |     |
| \maketitle . . . . .                  | 82  |
| \vspace: Preserved old versions as    |     |
| \@vspace@orig and                     |     |
| \@vspace@orig . . . . .               | 114 |
| v1.59                                 |     |
| \acmConference: Setting               |     |
| \@ACM@journal@bibstrip . . . . .      | 66  |
| \acmJournal: Setting                  |     |
| \@ACM@journal@bibstrip . . . . .      | 66  |
| \if@ACM@journal@bibstrip:             |     |
| Introduced macro . . . . .            | 39  |
| firstpagestyle: Added logic for       |     |
| conference papers using journal       |     |
| format . . . . .                      | 104 |
| Moved page styles to                  |     |
| \AtBeginDocument . . . . .            | 104 |
| standardpagestyle: Added logic for    |     |
| conference papers using journal       |     |
| format . . . . .                      | 101 |
| Moved page styles to                  |     |
| \AtBeginDocument . . . . .            | 101 |
| v1.60                                 |     |
| \@headfootfont: Moved to              |     |
| footnotesize . . . . .                | 100 |
| v1.61                                 |     |
| \@typeset@author@bx: Added            |     |
| \normalbaselines . . . . .            | 94  |
| v1.64                                 |     |
| \ACM@linecount@bx: Bug fix: made      |     |
| the spacing on the left and the       |     |
| right size equal . . . . .            | 99  |
| \if@ACM@maketitle@typeset:            |     |
| Introduced macro . . . . .            | 59  |
| \maketitle: Added a switch setting to |     |
| show that \maketitle is typeset .     | 82  |
| v1.65                                 |     |
| \@mkauthorsaddresses: Deleted         |     |
| cs@addpunct . . . . .                 | 96  |
| v1.66                                 |     |
| General: Patching algorithm and       |     |
| algorithm* to prevent spurious        |     |
| space warnings . . . . .              | 55  |
| \@specialsection: Suppress            |     |
| warnings about \vspace . . . . .      | 85  |
| v1.67                                 |     |
| General: Patching lstlisting and      |     |
| lstlisting* to prevent spurious       |     |
| space warnings . . . . .              | 55  |
| \@parfont: Deleted redefinitions of   |     |
| sections . . . . .                    | 107 |
| \@specialsection: Paragraph inside    |     |
| group does not print its argument.    |     |
| Added a bugfix . . . . .              | 85  |
| v1.68                                 |     |
| General: New command for unindent     |     |
| paras . . . . .                       | 106 |
| \@specialsection: Deleted grouping    |     |
| altogether . . . . .                  | 85  |
| v1.69                                 |     |
| General: No dots for unindented       |     |
| paragraphs . . . . .                  | 106 |
| \@printendtopmatter: Deleted          |     |
| grouping . . . . .                    | 98  |
| \@specialsection: Changed dot to      |     |
| colon for sigplan . . . . .           | 85  |
| \ACM@linecountR: Do not increase      |     |
| numbers in one column format .        | 99  |
| \ccsdesc@parse: Use math right        |     |
| arrow in text . . . . .               | 75  |
| v1.71                                 |     |
| \l@subsubsection: Bug fixed (thanks   |     |
| to Andrew Black) . . . . .            | 47  |
| v1.72                                 |     |
| General: Added hyperxmp . . . . .     | 48  |
| \author: Added \detokenize            |     |
| (Kuldeep S. Meel) . . . . .           | 67  |
| \maketitle: Do not andify authors     |     |
| for pdf metadata (Scott Pakin) . .    | 82  |
| v1.73                                 |     |
| General: Patching minted and minted*  |     |
| to prevent spurious space             |     |
| warnings . . . . .                    | 55  |
| \@ACM@checkaffil: Added macro . .     | 93  |
| \@ACM@resetaffil: Added macro . .     | 93  |
| \@mkauthors@i: Check the presence     |     |
| of required elements for              |     |
| affiliations . . . . .                | 93  |
| \@mkauthors@iii: Check the            |     |
| presence of required elements for     |     |
| affiliations . . . . .                | 94  |
| \@mkauthors@iv: Check the presence    |     |
| of required elements for              |     |
| affiliations . . . . .                | 95  |
| \city: Check the presence in affil .  | 90  |
| \country: Check the presence in affil |     |
| . . . . .                             | 90  |
| \if@ACM@citypresent: Added macro      |     |
| . . . . .                             | 92  |
| \if@ACM@countrypresent: Added         |     |
| macro . . . . .                       | 92  |
| \if@ACM@instpresent: Added macro      |     |
| . . . . .                             | 92  |
| \institution: Check the presence in   |     |
| affil . . . . .                       | 90  |

|                                                                                                                                                                            |     |                                                                                                          |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------------|-----|
| \maketitle: Do not check again the presence of address fields . . . . .                                                                                                    | 82  | \@mktranslatedabstract: Added macro . . . . .                                                            | 97  |
| v1.74                                                                                                                                                                      |     | \@mktranslatedkeywords: Added macro . . . . .                                                            | 69  |
| General: Changed the order of font loading . . . . .                                                                                                                       | 54  | \@translatedabstracts: Added macro . . . . .                                                             | 45  |
| v1.75                                                                                                                                                                      |     | \@translatedkeywords: Added macro . . . . .                                                              | 45  |
| \@ACM@checkaffil: Changed warning to error for country . . . . .                                                                                                           | 93  | \@translatedsubtitle: Added macro . . . . .                                                              | 45  |
| \@beginmaketitlehook: Introduced macro . . . . .                                                                                                                           | 81  | \@translatedtitle: Added macro . . . . .                                                                 | 44  |
| \AtBeginMaketitle: Introduced macro . . . . .                                                                                                                              | 82  | \ACM@lang@check: Added macro . . . . .                                                                   | 44  |
| \maketitle: Added \begin{maketitlehook} . . . . .                                                                                                                          | 82  | \ACM@languages: Introduced macro . . . . .                                                               | 38  |
| v1.76                                                                                                                                                                      |     | \maketitle: I13n . . . . .                                                                               | 82  |
| General: Moved hyperxmp before hyperref, see <a href="https://github.com/borisveytsman/acmart/issues/425">https://github.com/borisveytsman/acmart/issues/425</a> . . . . . | 48  | \translatedabstract: Added macro . . . . .                                                               | 45  |
| \author: Added code for orcid links . . . . .                                                                                                                              | 67  | \translatedkeywords: Added macro . . . . .                                                               | 45  |
| \if@ACM@balance: Added macro . . . . .                                                                                                                                     | 37  | \translatedsubtitle: Added macro . . . . .                                                               | 45  |
| \maketitle: Put \par inside group for keywords . . . . .                                                                                                                   | 82  | \translatedtitle: Added macro . . . . .                                                                  | 44  |
| \orcid: Added code for orcid links . . . . .                                                                                                                               | 69  | v1.85                                                                                                    |     |
| standardpagestyle: Fixed bug with no line numbers for nonacm . . . . .                                                                                                     | 101 | General: Added CC licenses . . . . .                                                                     | 76  |
| v1.77                                                                                                                                                                      |     | \acmengagemetadata: Introduced macro . . . . .                                                           | 82  |
| \@mkauthorsaddresses: New separator of institutions . . . . .                                                                                                              | 96  | \copyrightowner: Added CC licenses . . . . .                                                             | 77  |
| v1.78                                                                                                                                                                      |     | \copyrightpermission: Added CC licenses . . . . .                                                        | 78  |
| \@mkauthors@i: Unboxing \mktitle@bx . . . . .                                                                                                                              | 93  | \@typesetengagemetadata: Introduced macro . . . . .                                                      | 98  |
| \@mkauthors@iii: Unboxing \mktitle@bx . . . . .                                                                                                                            | 94  | \if@ACM@engage: Introduced macro . . . . .                                                               | 39  |
| \@mkteasers: Unboxing \mktitle@bx . . . . .                                                                                                                                | 97  | \maketitle: acm engage . . . . .                                                                         | 82  |
| \@printtopmatter: Added processing the overflowing title box . . . . .                                                                                                     | 86  | \setcctype: Added macro . . . . .                                                                        | 77  |
| \@specialsection: Again suppressed \vspace warning . . . . .                                                                                                               | 85  | \setengagemetadata: Introduced macro . . . . .                                                           | 82  |
| v1.82                                                                                                                                                                      |     | v1.86                                                                                                    |     |
| \anon: Introduced macro . . . . .                                                                                                                                          | 81  | \country: Error if country is empty . . . . .                                                            | 90  |
| v1.83                                                                                                                                                                      |     | standardpagestyle: Special treatment of ACM Engage materials . . . . .                                   | 101 |
| General: Use babel for multilanguage papers . . . . .                                                                                                                      | 43  | v1.87                                                                                                    |     |
| \@mkabstract: I13n . . . . .                                                                                                                                               | 97  | General: Added ‘framed’ package for acmcpc . . . . .                                                     | 41  |
| \@mktitle@i: Added \translatedtitle and \translatedsubtitle . . . . .                                                                                                      | 89  | No numbering sections for ACMCP . . . . .                                                                | 108 |
| \@mktitle@iii: Added \translatedtitle and \translatedsubtitle . . . . .                                                                                                    | 89  | \@ACM@copyright@check@cc: Added macro . . . . .                                                          | 78  |
| \@mktitle@iv: Added \translatedtitle and \translatedsubtitle . . . . .                                                                                                     | 90  | \@copyrightpermission: CC licenses now are allowed only for non-acm or ACM engage publications . . . . . | 78  |

|                                                                          |     |
|--------------------------------------------------------------------------|-----|
| Introduced macro . . . . .                                               | 74  |
| \acmDataLink: Introduced macro . . .                                     | 74  |
| Now this is the same as the code link                                    | 74  |
| \if@ACM@acmcp: Introduced macro . . .                                    | 39  |
| \firstpagestyle: Special treatment<br>for acmcp . . . . .                | 104 |
| \maketitle: CC license are allowed<br>for non-acm publications . . . . . | 82  |
| \set@ACM@acmcpbox: Added macro . . .                                     | 85  |
| \standardpagestyle: Special<br>treatment of ACMCP . . . . .              | 101 |

## Index

Numbers written in italic refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in roman refer to the code lines where the entry is used.

| Symbols                                               |                                                                                                |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------|
| \\$ . . . . .                                         | 2156, 2160                                                                                     |
| \- . . . . .                                          | 610                                                                                            |
| \@ 1848, 1860, 1863, 1866,                            |                                                                                                |
| 1871, 1969, 1990, 2003                                |                                                                                                |
| \@authornotemark . . . . .                            | 1584, 2764                                                                                     |
| \@par . . . . .                                       | 476, 533                                                                                       |
| \@ACM@acmcbox . . . . .                               | 2220, 2224, 3040, 3159                                                                         |
| \@ACM@acmcfalse . . . . .                             | 169                                                                                            |
| \@ACM@acmctrue . . . . .                              | 226                                                                                            |
| \@ACM@addtoaddress . . . . .                          | 2468, 2496, 2497, 2499                                                                         |
| \@ACM@authorsperrow . . . . .                         | 1671, 2643, 2644, 2696, 2697                                                                   |
| \@ACM@badge@skip . . . . .                            | 1615, 2312, 2408, 2412, 2418, 2427, 2437, 2443, 2452                                           |
| \@ACM@badge@width . . . . .                           | 1612, 2311, 2316, 2407, 2411, 2417, 2429, 2436, 2438, 2441, 2453, 2456                         |
| \@ACM@badgefalse . . . . .                            | 1611                                                                                           |
| \@ACM@badgetrue . . . . .                             | 1617, 1622                                                                                     |
| \@ACM@balancefalse . . . . .                          | 3392, 3416, 3418, 3420, 3432, 3436                                                             |
| \@ACM@checkaffil . . . . .                            | 2191, 2581, 2612, 2617, 2679, 2684, 2724, 2729                                                 |
| \@ACM@citypresentfalse . . . . .                      | 2578                                                                                           |
| \@ACM@citypresenttrue . . . . .                       | 2482, 2496, 2573                                                                               |
| \@ACM@color@frame . . . . .                           | 2217                                                                                           |
| \@ACM@commabox . . . . .                              | 2468, 2472, 2473                                                                               |
| \@ACM@copyright@check@cc . . . . .                    | 1882, 2021                                                                                     |
| \@ACM@countrypresentfalse . . . . .                   | 2579                                                                                           |
| \@ACM@countrypresenttrue . . . . .                    | 2487, 2499, 2575                                                                               |
| \@ACM@engagefalse . . . . .                           | 167                                                                                            |
| \@ACM@engagetrue . . . . .                            | 223                                                                                            |
| \@ACM@institution@separator . . . . .                 | 2746, 2747, 2752                                                                               |
| \@ACM@instpresentfalse . . . . .                      | 2577                                                                                           |
| \@ACM@instpresenttrue . . . . .                       | 2480, 2491, 2571                                                                               |
| \@ACM@journal@bibstripfalse . . . . .                 | 232, 1436                                                                                      |
| \@ACM@journal@bibstriptrue . . . . .                  | 230, 1422                                                                                      |
| \@ACM@journalfalse . . . . .                          | 3106, 3116, 3126, 3163                                                                         |
| \@ACM@labelwidth . . . . .                            | 1001, 1004, 1012, 1017, 1043, 1050                                                             |
| \@ACM@maketitle@typesetfalse . . . . .                | 1004, 1012, 1017, 1043, 1050                                                                   |
| \@ACM@maketitle@typesetttrue\@acmBadgeL@url . . . . . | 1623                                                                                           |
| \@ACM@manuscriptfalse . . . . .                       | 198                                                                                            |
| \@ACM@manuscripttrue . . . . .                        | 196                                                                                            |
| \@ACM@newfontsfalse . . . . .                         | 831, 834, 837                                                                                  |
| \@ACM@newfontstrue . . . . .                          | 828                                                                                            |
| \@ACM@printacmreffalse . . . . .                      | 95, 227                                                                                        |
| \@ACM@printfoliosttrue . . . . .                      | 78                                                                                             |
| \@ACM@resetaffil . . . . .                            | 2576, 2611, 2616, 2678, 2683, 2723, 2728                                                       |
| \@ACM@reviewtrue . . . . .                            | 140                                                                                            |
| \@ACM@screenttrue . . . . .                           | 1164, 1208, 1214, 1220, 1226                                                                   |
| \@ACM@sigchiamodefalse . . . . .                      | 200                                                                                            |
| \@ACM@sigchiamodetrue . . . . .                       | 220                                                                                            |
| \@ACM@timestamptrue . . . . .                         | 139                                                                                            |
| \@ACM@title@width . . . . .                           | 1614, 2405, 2407, 2408, 2411, 2412, 2420, 2434, 2436, 2437, 2445                               |
| \@DeclareACMFormat . . . . .                          | 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49                                                 |
| \@Description@presentfalse . . . . .                  | 873, 876, 951, 2770                                                                            |
| \@Description@presenttrue . . . . .                   | 867, 870                                                                                       |
| \@M . . . . .                                         | 476, 515, 533, 542, 3490                                                                       |
| \@abstract . . . . .                                  | 1642, 2778, 2785                                                                               |
| \@acmArticle . . . . .                                |                                                                                                |
| \@acmArticlePage . . . . .                            | 1590, 1593, 2155, 2803, 2804, 2932, 2935, 2955, 2965, 2976, 3044, 3087, 3106, 3116, 3126, 3163 |
| \@acmArticleSeq . . . . .                             | 1592, 3070                                                                                     |
| \@acmBadgeL@image . . . . .                           | 2931, 2949, 2950, 2959, 2962, 2969, 2973                                                       |
| \@acmBadgeR@image . . . . .                           | 1624, 1626, 2309, 2311, 2406, 2415, 2417, 2439, 2441                                           |
| \@acmBooktitle . . . . .                              | 1625, 2310, 2416, 2440                                                                         |
| \@acmCodeDataLink . . . . .                           | 1442, 2124, 2145, 2819                                                                         |
| \@acmDOI . . . . .                                    | 1608, 2147, 2150, 2157, 2161, 2827, 2988, 2990, 3012, 3014, 3045, 3164                         |
| \@acmEditors . . . . .                                | 1450, 1451, 1452, 1455, 2820, 2821                                                             |
| \@acmISBN . . . . .                                   | 1606, 2159                                                                                     |
| \@acmMonth . . . . .                                  | 1596, 1598, 2155                                                                               |
| \@acmNumber . . . . .                                 | 1588, 2816, 2955, 2965, 2976, 3043, 3106, 3116, 3126, 3162                                     |
| \@acmPrice . . . . .                                  | 1602, 2156, 2160                                                                               |
| \@acmPubDate . . . . .                                | 1598, 2816, 2955,                                                                              |

2965, 2976, 3045, \@article@string . . . . .  
 3107, 3117, 3127, 3164 . . . . . 2803, 2816, 2824  
\@acmSubmissionID . . . . . 1476, 1475, 1481, 1488,  
. . . . . 1477, 1496, 1497, 2597, 2662, 2709, 2753  
. . . . . 1604, 2912, 2913, 2923 \@authorfont 2529, 2534,  
\@acmVolume . . . . . 1586, 2816, 2954, 2538, 2541, 2544,  
. . . . . 2964, 2975, 3043, 2547, 2550, 2553,  
. . . . . 3105, 3115, 3125, 3162 2556, 2559, 2599, 2635  
\@acmYear . . . . . 1594, 1601, \@authornotemark . . . . .  
. . . . . 2040, 2124, 2155, 2807 . . . . . 1576, 1582, 2763  
\@acmdefinitionbodyfont . . . . . 3303, 3315, 3329 \@authornotes . . . . .  
. . . . . 3305, 3317, 3331 . . . . . 1573, 1577, 2087  
\@acmdefinitionheadfont . . . . . 3304, 3316, 3330 \@authorsaddresses . . . . .  
. . . . . 3306, 3318, 3334 . . . . . 1548,  
\@acmengagetedata . . . . . 2061, 2063, 2840 2096, 2235, 2758, 2837  
\@acmownedfalse . . . . . 1791, 1794, \@auxout . . . . . 646  
. . . . . 1797, 1803, 1807, \@begindocumenthook . . . . . 642  
. . . . . 1810, 1813, 1816, \@beginmaketitlehook . . . . .  
. . . . . 1822, 1825, 1829, 1833 . . . . . 2057, 2060, 2066  
\@acmownedtrue . . . . . 1778, 1787, 1819 \@botnum . . . . . 2210  
\@acmplainbodyfont . . . . . 3271, 3283, 3297 \@citetstyle . . . . . 308  
\@acmplainheadfont . . . . . 3273, 3285, 3299 \@classname . . . . .  
. . . . . 3272, 3284, 3298 . . . . . 24, 26, 35, 53, 55,  
\@acmplainnotefont . . . . . 3274, 3286, 3302 . . . . . 56, 61, 63, 64, 69,  
\@adddotafter . . . . . 3178, 3179, 3181, . . . . . 71, 72, 77, 80, 81,  
. . . . . 3193, 3208, 3212, 3265 . . . . . 86, 88, 89, 94, 100,  
\@additionalaffiliation . . . . . 1522, 1523 . . . . . 101, 105, 109, 114,  
\@addpunct . . . . . 2750, 2836, . . . . . 116, 117, 122, 124,  
. . . . . 2837, 3265, 3266, 3386 . . . . . 125, 130, 132, 133,  
\@addspaceafter . . . . . 3266 . . . . . 138, 142, 143, 161,  
\@affiliationfont . . . . . 2530, 2535, . . . . . 171, 177, 183, 260,  
. . . . . 2539, 2542, 2545, \@clubpenalty . . . . . 2058, 2091, 2096,  
. . . . . 2548, 2551, 2554, \@concepts . . . . . 2147, 2156, 2159,  
. . . . . 2557, 2560, 2612, 2635 . . . . . 1741, 1753,  
\@afterheading . . . . . 507, 2213 \@copyrightowner . . . . . 2160, 2161, 2172,  
\@afterindentfalse . . . . . 453, 2212 \@copyrightpermission . . . . . 2175, 2181, 2185,  
\@afterindenttrue . . . . . 451 . . . . . 1842, 2131 . . . . . 2229, 2232, 2235,  
. . . . . 1898, 2107, 2119 . . . . . 2269, 2309, 2314,  
. . . . . 2800, 3494, 3497, 3504 . . . . . 2406, 2410, 2415,  
. . . . . 2606, 2607, 2662, . . . . . 2423, 2426, 2439,  
. . . . . 2668, 2675, 2709, . . . . . 2447, 2454, 2464,  
. . . . . 2715, 2720, 2758, . . . . . 2486, 2565, 2598,  
. . . . . 2766, 2803, 2808, . . . . . 2606, 2607, 2662,  
. . . . . 2820, 2827, 2912, . . . . . 2668, 2675, 2709,  
. . . . . 2923, 2988, 2990, . . . . . 2715, 2720, 2758,  
. . . . . 3012, 3014, 3044, . . . . . 2766, 2803, 2808,  
. . . . . 3045, 3163, 3164, . . . . . 2820, 2827, 2912,  
. . . . . 3274, 3306, 3455, 3472 . . . . . 2923, 2988, 2990,

```

\@endfloatbox ..... 966 \@journalCode ..... 1410, 1414, 1425,
\@endpfalse ..... 3388 1051, 1165, 1209, 2815, 2954, 2964,
\@endwidefloatbox 966, 974 1215, 1221, 1227, 1417 2975, 3105, 3115, 3125
\@finalstrut .... 565, 578 \@journalCode@nr ... 1051, 1122, 1423
\@float ..... 968 \@journalName .. 1124,
\@flushglue ..... 3222 1128, 1132, 1136, 1410, 1414, 1425,
\@fnsymbol ..... 2077 1140, 1144, 1148, 2815, 2954, 2964,
\@folio@ht ..... 3050, 3077, 3083, 3084 1153, 1156, 1160, 2975, 3105, 3115, 3125
\@folio@max 3050, 3073, 3074 1167, 1171, 1175
\@folio@voffset 3050, 3079 1179, 1184, 1188
\@folio@wd .... 3050, 3084, 3085, 3112, 3122 1192, 1196, 1201
\@folioblob .... 3070, 3109, 3111, 3119, 3120 1205, 1211, 1217
\@footnotemark . 582, 2075 1223, 1229, 1233
\@footnotemark@nolink ..... 582, 2075 1237, 1242, 1246
\@footnotetext .... 556, 583, 2076 1250, 1254, 1258
\@footnotetext@nolink ..... 583, 2076 1262, 1266, 1270
\@for ..... 284 1274, 1278, 1282
\@formatdoi .... 1881, 2150, 2157, 2161, 1286, 1290, 1294
\@fps ..... 2827, 2988, 2990, 1298, 1302, 1306, 1299, 1302, 1306, 1309, 1314, 1318, 1310, 1314, 1318, 1322, 1326, 1330, 1334, 1338, 1342, 1347, 1352, 1356, 1360, 1365, 1369, 1373, 1377, 1381, 1385, 1389, 1393, 1397, 1401, 1405, 1409, 1413, 1424, 1425, 2143, 3043, 3162
\@hangfrom .... 475, 532 \@journalNameShort .
\@headfootfont .... 2925, 2949, 1125, 1129, 1133, 1137, 1141, 1145, 1149, 1154, 1157, 1162, 1168, 1172, 1176, 1180, 1185, 1189, 1193, 1197, 1202, 1206, 1212, 1218, 1224, 1230, 1234, 1238, 1243, 1247, 1251, 1255, 1259, 1263, 1267, 1271, 1275, 1279, 1283, 1287, 1291, 1295, 1299, 1303, 1307, 1311, 1315, 1319, 1323, 1327, 1331, 1335, 1339, 1343, 1348, 1353, 1357, 1361, 1366, 1370, 1374, 1378, 1382, 1386, 1390, 1394, 1398, 1402, 1406, 1410, 1414, 1425, 2815, 2954, 2964, 2975, 3105, 3115, 3125
\@idxitem ..... 3487 \@keywords ..... 1631, 1632, 1633, 2181, 2183, 2196, 2232, 2233
\@ifnextchar .... 1526 \@latex@error ..... 352
\@ifnotempty .... 2045 \@listI ..... 1025, 1029
\@ifnum ..... 322, 324 \@listi ..... 1022, 1029
\@ifstar ..... 460 \@listii ..... 1030
\@ifundefined .... 3339, 3342, 3345, 3348, 3351, 3355, 3358 \@listiii ..... 1033
\@iiiparbox ..... 792 \@listiv ..... 1035
\@indestitlestyle .. 3486 \@listv ..... 1037
\@input ..... 544 \@listvi ..... 1039
\@insideauthorgroupfalse ..... 1464, 1516 \@m ..... 464
\@insideauthorgrouptrue ..... 1471 \@makefnmark .... 555, 580, 2079, 2084, 2088
\@makefntext ..... 555, 564, 577, 2090
\@marginfigure . 946, 947
\@marginable .. 957, 958
\@minipagefalse .. 789, 976
\@minus 3198, 3202, 3206, 3210, 3214, 3219, 3294, 3296, 3326, 3328
\@mkabstract .. 2171, 2777
\@mkauthors 2080, 2082, 2501
\@mkauthors@i ..... 2505, 2507, 2509, 2511, 2525, 2593
\@mkauthors@ii ..... 2628
\@mkauthors@iii ..... 2513, 2515, 2517, 2519, 2523, 2640
\@mkauthors@iv 2521, 2693
\@mkauthorsaddresses ..... 1549, 2737
\@mkbibcitation 2206, 2794
\@mkteasers ... 2080, 2765
\@mktitle ..... 2080, 2325
\@mktitle@i 2328, 2330, 2332, 2334, 2348, 2401
\@mktitle@ii ..... 2432
\@mktitle@iii ..... 2336, 2338, 2340, 2342, 2346, 2432
\@mktitle@iv .. 2344, 2460
\@mktranslatedabstract ..... 441, 2787
\@mktranslatedkeywords ..... 438, 1550
\@mpargs ..... 792
\@mparswitchfalse .. 738

```

\@mpfootins ..... \@printpermissionfalse ..... 1789  
 569, 570, 784, 785, 787 ..... 1789  
 \@mpfootnotetext ... 568 \@printpermissiontrue ...  
 \@ne . 310, 314, 318, 320, 1776, 1785, 1801  
 632, 2854, 2860, 2864 ..... 1776, 1785, 1801  
 \@nil ..... 329 ..... 2081, 2268  
 \nobreakfalse . 509, 549 \@proofindent .....  
 \noskipsecfalse ... 513 ..... 3365, 3375, 3385  
 \noskipsectrue ... 510 \@proofnamefont .....  
 \@pages@word ..... 3364, 3374, 3386  
 ... 2797, 2817, 2824 \@received . 1687, 1690,  
 \par ..... 2093, 2100 1691, 1693, 1696,  
 \parboxrestore ... 573 1697, 1699, 1703, 1704  
 \parfont ..... 3212, 3216, 3221, 3226 \@restonecolfalse .. 3484  
 \permissionCodeOne \@restonecoltrue .. 3484  
 1126, 1130, 1134, \@rightskip ... 3222, 3223  
 1138, 1142, 1146, \@saveabstract 1638, 1639  
 1150, 1158, 1163, \@saveteaser .. 2042, 2043  
 1169, 1173, 1177, \@savetranslatedabstract  
 1181, 1186, 1190, ..... 441, 442  
 1194, 1198, 1203, \@secformat . 469, 526  
 1207, 1213, 1219, \@secfont ... 3200, 3226  
 1225, 1231, 1235, \@secpenalty ..... 458  
 1239, 1244, 1248, \@sect ..... 462, 463  
 1252, 1256, 1260, \@setaddresses ... 2762  
 1264, 1268, 1272, \@setauthorsaddresses  
 1276, 1280, 1284, ..... 2100, 2235, 2837  
 1288, 1292, 1296, \@setengagemetadata  
 1300, 1304, 1308, ..... 2064, 2839  
 1312, 1316, 1320, \@setthanks ... 2093, 2836  
 1324, 1328, 1332, \@shortauthors .....  
 1336, 1340, 1344, 2920, 2943, 2951,  
 1349, 1354, 1358, 2959, 2969, 2981, 3005  
 1362, 1367, 1371, \@sidebar ... 942, 943  
 1375, 1379, 1383, \@specialsection ...  
 1387, 1391, 1395, 1552, 2176, 2182, 2238  
 1399, 1403, 1407, \@ssect ..... 461, 527  
 1411, 1415, 1426, 2127, 2269, 2270, 2272, 2917  
 2155 \@startPage ... 1627, 2269, 2270, 2272, 2917  
 \permissionCodeTwo \@startsection ... 447,  
 ..... 1151, 539, 3197, 3201,  
 1182, 1199, 1240, 3205, 3209, 3213, 3218  
 1345, 1350, 1363, 1427 \@starttoc ..... 539  
 \@plus ..... 542, 550, \@subparfont ..... 3251  
 793, 3198, 3202, \@subsecfont ... 3204, 3226  
 3206, 3210, 3214, \@subsubsecfont 3208, 3226  
 3219, 3293, 3295, \@subtitle . 1457, 1565,  
 3325, 3327, 3383, 3488 2423, 2424, 2447,  
 \@printcopyrightfalse 2448, 2464, 2465, 2808 \@subtitlefont ...  
 ..... 1790, 1802 ..... 2376, 2424, 2448, 2465  
 \@printcopyrighttrue \@subtitlenotes ...  
 ..... 1774, 1786 ..... 1563, 1567, 1570, 2086  
 \@printendtopmatter \@svsec . 466, 469, 475, 490 \@svsechd ... 488, 516, 536  
 ..... 2211, 2829 \@teaser ..... 2043, 2767  
 \@teaserfigures ..... 2041, 2043, 2766, 2771  
 \@tempa ..... 284, 285, 287, 289, 291,  
 \@tempb ..... 293, 295, 297, 299, 301, 303, 305, 307,  
 \@tempc .. 309, 311, 313, 315, 317, 319, 321, 323,  
 \@tempdima ..... 325, 327, 329, 332,  
 \@tempboxa . 334, 336, 338, 340, 342, 1500, 1501,  
 \@tempcpta . 1688, 1689, 2485, 2486, 2606, 3455,  
 \@tempdima ..... 3471, 3472, 3474, 3478  
 \@tempboxa . 792, 2278, 2280 \@tempc .. 330, 331, 333,  
 \@tempcpta . 335, 337, 339, 341, 343 \@tempcpta . 3070, 3071,  
 \@tempdima ..... 3073, 3074, 3076, 3078  
 \@tempskipa ..... 3077, 3078, 3079, 3081  
 \@textbottom ..... 793 \@textsuperscript ...  
 \@texttop ..... 794 \@thefnmark . 561, 575,  
 \@title ... 1556, 2194, 580, 2079, 2084  
 2422, 2446, 2463, 2807 \@titlefont 2351, 2414,  
 \@titlefont ..... 2421, 2433, 2445, 2461  
 \@titlenotes ..... 1554, 1558, 1561, 2085  
 \@tochangmeasure 480, 493 \@toclevel ..... 464  
 \@tocline ... 552, 553, 554 \@topnum ..... 2208

```

\@translatedabstracts          \@xp ..... 546, 547           2326, 2352, 2377,
                               . 439, 446, 2172, 2173 \@xsect .... 501, 502, 538           2503, 2531, 2875,
\@translatedkeywords          \\ .... 663, 672, 1476,       2939, 3057, 3096,
                               . 436, 438, 2185, 2186 1735, 2025, 2131,           3142, 3231, 3275,
\@translatedsubtitle          2136, 2151, 2156,       3307, 3366, 3393, 3414
                               ..... 433,               \ACM@lang@check ....
                               435, 2424, 2448, 2465 \{ ..... 292           417, 431, 434, 437, 445
\@translatedtitle             \} ..... 292           \ACM@languages ....
                               430, 432, 2422, 2446, 2463 \_ ... 1447, 1749, 1759, ...
\@typeset@author@bx           2131, 2133, 2156,       2853, 2854,
                               ..... 2632,           2859, 2860, 2863, 2864
                               2686, 2692, 2731, 2736 2803, 2804, 2822, 2917
\@typeset@author@line          \A
                               2562, 2596, 2620, 2625 \abstract ..... 1638
\@typesetengagemetadata       abstract (env.) ..... 18
                               ..... 2169, 2838 \abstractname ... 376,
\@undefined .....             389, 2779, 2783, 2791
                               . 642, 860, 1444, 2057 \acks ..... 3446
\@undescribed@imagesfalse     acks (env.) ..... 24
                               ..... 869 \acksname 387, 398, 406,
\@undescribed@imagestrue      414, 3445, 3448, 3449
                               .. 880, 883, 953, 2772 \ACM@adddot@after ...
\@vspace 874, 877, 885,       ..... 3179, 3196
                               887, 889, 891, 893, \ACM@ArticleType ...
                               895, 897, 899, 901, 2022, 2024, 2025,
                               903, 943, 948, 958, 2028, 2029, 2030,
                               964, 2073, 2239, 2031, 2032, 2033, 2034
                               2265, 2795, 2830, \ACM@ArticleType@nr
                               2833, 3492, 3494, 3500 1706, 1708, 3036, 3155
\@vspace@acm .....           \ACM@cc@type ... 1840,
                               ... 2265, 2833, 3500 2028, 2029, 2030,
\@vspace@orig 874, 877,       2031, 2032, 2033, 2034
                               885, 887, 889, 891, \ACM@CC@Url ...
                               893, 895, 897, 899, 2023, 2024, 2025, 2026
                               901, 903, 943, 948, \ACM@cc@version ...
                               958, 964, 2073, 2035
                               2239, 2795, 2830, 3492 \acm@copyrightinput 1780
\@vspace@spacer 875, 878, 886, \acm@copyrightmode ...
                               888, 890, 892, 894, 1780,
                               896, 898, 900, 902, 1788, 1793, 1796,
                               904, 944, 949, 959, 1800, 1806, 1809,
                               965, 2074, 2240, 1812, 1815, 1818,
                               2266, 2796, 2831, 1821, 1824, 1828,
                               2834, 3493, 3497, 3501 1832, 1843, 1899, 2106
\@vspace@spacer@acm .....     \ACM@fontsize 146, 234,
                               ... 2266, 2834, 3501 237, 239, 241, 243,
\@vspace@spacer@orig . 875,    245, 247, 249, 251,
                               878, 886, 888, 890, 253, 255, 257, 260, 261
                               892, 894, 896, \ACM@format ... 32, 161
                               898, 900, 902, \ACM@format@nr .. 32,
                               904, 944, 949, 161, 170, 176, 182,
                               959, 965, 2074, 195, 201, 235, 593,
                               2240, 2796, 2831, 3493 678, 757, 795, 915,
\@width ..... 773, 780        984, 2241, 2288,

```

\ACM@sect@format@null . . . . . 3189, 3190  
 \ACM@timestamp . . . . . 2903, 3030, 3143, 3148  
 \acmArticle . . . . . 14, 1590  
 \acmArticleSeq . . . . . 14, 1592  
 \acmArticleType . . . . . 20, 1706  
 \acmBadgeL . . . . . 15, 1622  
 \acmBadgeR . . . . . 15, 1617  
 \acmBooktitle . . . . . 9, 1442  
 \acmCodeLink . . . . . 20, 1731, 1738  
 \acmConference . . . . . 9, 1428  
 \acmConference@date . . . . . 1431, 2126,  
                       2995, 2998, 3019, 3022  
 \acmConference@name . . . . . 1430, 1444, 1445, 1446  
 \acmConference@shortname . . . . . 1429, 1433, 1434,  
                       1446, 1447, 2126,  
                       2994, 2997, 3018, 3021  
 \acmConference@venue . . . . . 1432, 2126,  
                       2995, 2998, 3019, 3022  
 \acmDataLink . . . . . 20, 1738  
 \acmdefinition . . . . . 3324  
 \acmDOI . . . . . 15, 1608  
 \acmISBN . . . . . 15, 1606  
 \acmJournal . . . . . 9, 1421  
 \acmMonth . . . . . 14, 1596  
 \acmNumber . . . . . 14, 1588  
 \acmplain . . . . . 3292  
 \acmPrice . . . . . 15, 1602, 1798,  
                       1804, 1826, 1830, 1834  
 \acmSubmissionID . . . . . 15, 1604  
 \acmVolume . . . . . 14, 1586  
 \acmYear . . . . . 14, 1594  
 \addcontentsline . . . . . 280,  
                       482, 495, 2779, 3449  
 \additionalaffiliation . . . . . 11, 1522  
 \addpenalty . . . . . 458  
 \addresses . . . . .  
     1473, 1475, 1480,  
     1487, 1518, 1538,  
     1576, 1582, 1584,  
     2625, 2692, 2736, 2755  
 \addto . . . . . 381, 392, 400, 408  
 \addtocounter . . . . . 586, 1761  
 \addtolength . . . . . 1010, 1011,  
                       1012, 1016, 1017, 2861  
 \addvspace . . . . . 458, 550  
 \advance . . . . .  
     1026, 1031, 1034,  
     1036, 1038, 1040,  
     1468, 1470, 1727,  
     2275, 2283, 2403,  
     2407, 2408, 2411,  
     2412, 2436, 2437,  
     2622, 2642, 2659,  
     2695, 2706, 2860,  
     2864, 3074, 3076, 3079  
 \affiliation . . . . . 10,  
                       1515, 2605, 2675, 2720  
 \and . . . . . 1455, 1488,  
                       1490, 1505, 1511,  
                       2596, 2601, 2603,  
                       2614, 2620, 2633,  
                       2667, 2686, 2692,  
                       2714, 2731, 2736, 2752  
 \andify . . . . . 2201,  
                       2202, 2563, 2566, 2821  
 \anon . . . . . 24, 2051  
 \anonsuppress (env.) . . . . . 24  
 \apptocmd . . . . . 3494, 3497  
 \AtBeginDocument . . . . . 78,  
     95, 227, 635, 643,  
     1002, 1798, 1804,  
     1826, 1830, 1834,  
     2849, 2926, 3090, 3191  
 \AtBeginEnvironment . . . . .  
     873, 876, 885,  
     887, 889, 891, 893,  
     895, 897, 899, 901, 903  
 \AtBeginMaketitle . . . . . 31, 2060  
 \AtEndDocument . . . . .  
     871, 1633,  
     1657, 1702, 1767,  
     2216, 2757, 3440, 3503  
 \AtEndEnvironment . . . . . 879, 882  
 \AtEndPreamble . . . . . 608,  
     861, 3336, 3390, 3456  
 \author . . . . . 10,  
     1465, 2069, 2070, 2801  
 \author@bx . . . . . 2628, 2634, 2637  
 \author@bx@sep . . . . .  
     2630, 2637,  
     2642, 2659, 2695, 2706  
 \author@bx@wd . . . . .  
     2629, 2632,  
     2641, 2642, 2644,  
     2650, 2652, 2654,  
     2656, 2659, 2694,  
     2695, 2697, 2703, 2706  
 \authornote . . . . .  
     14, 1522, 1574, 2802  
 \authornotemark . . . . . 14, 1580  
 \authors . . . . .  
     1478, 1483, 1490,  
     2189, 2201, 2203, 2807  
 \authorsaddresses . . . . . 13, 1548

## B

\balance . . . . . 3443  
 \baselineskip . . . . .  
     2117, 2416,  
     2428, 2440, 2455,  
     2861, 3198, 3199,  
     3202, 3203, 3206,  
     3210, 3214, 3293,  
     3294, 3295, 3296,  
     3325, 3326, 3327, 3328  
 \baselinestretch . . . . .  
     3502, 3503, 3505  
 \begin . . . . . 19, 2869, 2899, 3080  
 \begingroup . . . . . 473,  
     516, 530, 539, 631,  
     2072, 2501, 3168, 3447  
 \bfseries . . . . .  
     1041, 2113, 2354,  
     2356, 2358, 2362,  
     2364, 2366, 2368,  
     2370, 2372, 2374,  
     2550, 2553, 2805,  
     3087, 3226, 3227,  
     3241, 3242, 3244,  
     3245, 3247, 3248,  
     3249, 3250, 3254,  
     3255, 3258, 3259,  
     3261, 3262, 3285, 3317  
 \bgroup . . . . . 446, 943, 947,  
     958, 964, 1523,  
     1550, 2175, 2181,  
     2222, 2632, 2669,  
     2672, 2733, 2742,  
     2767, 2777, 2794, 2806  
 \bibfont . . . . . 282  
 \bibliofont . . . . . 282  
 \bibliographystyle . . . . . 641  
 \bibsection . . . . . 278  
 \bibstyle . . . . . 306, 308, 350, 646  
 \bibstyle@acmauthoryear . . . . .  
     356  
 \bibstyle@acmnumeric . . . . . 362  
 \bigskip . . . . . 1704, 2306,  
     2431, 2459, 2467,  
     2692, 2736, 2767, 2832  
 \box . . . . . 981, 2290,  
     2292, 2294, 2296,  
     2298, 2300, 2302,

|          |                                             |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------|---------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | 2304, 2306, 2320,<br>2322, 2637, 3040, 3159 | 835, 881, 884, 954,<br>1466, 1535, 1629,<br>1673, 2773, 3494, 3497     | \DeclareTextFontCommand<br>..... 862                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>C</b> |                                             | \ClassWarningNoLine<br>.....                                           | \def ..... 24, 38, 147,<br>153, 237, 239, 241,<br>243, 245, 247, 249,<br>251, 253, 255, 257,<br>285, 287, 289, 291,<br>293, 295, 297, 299,<br>301, 303, 305, 307,<br>309, 310, 311, 312,<br>313, 314, 315, 316,<br>317, 318, 319, 321,<br>323, 325, 327, 328,<br>332, 334, 336, 338,<br>340, 342, 430, 433,<br>436, 439, 442, 447,<br>463, 488, 502, 526,<br>527, 536, 539, 552,<br>553, 554, 555, 557,<br>568, 580, 586, 587,<br>588, 589, 590, 610,<br>641, 772, 779, 781,<br>793, 943, 947, 958,<br>964, 967, 971, 974,<br>992, 993, 994, 995,<br>1025, 1030, 1033,<br>1035, 1037, 1039,<br>1124, 1125, 1126,<br>1128, 1129, 1130,<br>1132, 1133, 1134,<br>1136, 1137, 1138,<br>1140, 1141, 1142,<br>1144, 1145, 1146,<br>1148, 1149, 1150,<br>1151, 1153, 1154,<br>1156, 1157, 1158,<br>1160, 1162, 1163,<br>1167, 1168, 1169,<br>1171, 1172, 1173,<br>1175, 1176, 1177,<br>1179, 1180, 1181,<br>1182, 1184, 1185,<br>1186, 1188, 1189,<br>1190, 1192, 1193,<br>1194, 1196, 1197,<br>1198, 1199, 1201,<br>1202, 1203, 1205,<br>1206, 1207, 1211,<br>1212, 1213, 1217,<br>1218, 1219, 1223,<br>1224, 1225, 1229,<br>1230, 1231, 1233,<br>1234, 1235, 1237,<br>1238, 1239, 1240, |
|          |                                             |                                                                        | <b>D</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|          |                                             | \day ..... 2915                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|          |                                             | \DeclareNewFootnote<br>..... 776, 778                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|          |                                             | \DeclareOptionX .....<br>38, 148, 149, 150,<br>151, 152, 154, 158, 159 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|          |                                             | \DeclareRobustCommand<br>..... 630, 3188                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

```

1242, 1243, 1244, 1594, 1596, 1598, 3189, 3196, 3222,
1246, 1247, 1248, 1602, 1604, 1606, 3226, 3227, 3228,
1250, 1251, 1252, 1608, 1618, 1619, 3229, 3235, 3236,
1254, 1255, 1256, 1620, 1621, 1623, 3238, 3239, 3241,
1258, 1259, 1260, 1624, 1625, 1626, 3242, 3244, 3245,
1262, 1263, 1264, 1627, 1629, 1631, 3247, 3248, 3249,
1266, 1267, 1268, 1639, 1644, 1675, 3250, 3251, 3254,
1270, 1271, 1272, 1687, 1688, 1723, 3255, 3258, 3259,
1274, 1275, 1276, 1725, 1731, 1737, 3261, 3262, 3265,
1278, 1279, 1280, 1745, 1746, 1772, 3266, 3271, 3272,
1282, 1283, 1284, 1836, 1839, 1840, 3273, 3274, 3283,
1286, 1287, 1288, 1842, 1881, 1882, 3284, 3285, 3286,
1290, 1291, 1292, 1898, 2023, 2039, 3303, 3304, 3305,
1294, 1295, 1296, 2041, 2043, 2060, 3306, 3315, 3316,
1298, 1299, 1300, 2061, 2062, 2066, 3317, 3318, 3364,
1302, 1303, 1304, 2079, 2084, 2093, 3365, 3374, 3375,
1306, 1307, 1308, 2100, 2191, 2221, 3453, 3455, 3471,
1310, 1311, 1312, 2238, 2268, 2325, 3472, 3473, 3477, 3484
\define@boolkey . . .
    . . . 51, 59, 67, 75,
    84, 92, 104, 108,
    112, 120, 128, 136,
    1520, 1645, 1651, 1665
\define@choicekey . .
    . . . 32, 1051, 1706, 1779
\define@cmdkey . . . 1671
\definecolor . . .
    . . . 650, 651, 652,
    653, 654, 655, 656, 657
\department . . .
    . . . 11, 1526, 2476, 2750
\Description . . . 23, 870
\description . . . 1042
\descriptionlabel . .
    . . . . . 1041, 1044
\detokenize . . . . . 1466
\dimexpr . . . . . 962,
    981, 3027, 3036, 3155
\divide 2644, 2650, 2652,
    2654, 2656, 2697, 2703
\do . . . . . 284, 610
\do@url@hyp . . . . . 610
\DocInput . . . . . 20
\documentclass 8, 424, 426
\dots . . . . . 2160
\dp . . . . . 2275, 2283

```

**E**

```

\edef . . . . . 148, 149,
    150, 151, 152, 464, 2024
\editor . . . . . 9, 1451
\egroup . . . . . 446,
    791, 945, 956, 960,
    972, 978, 1533,

```

1553, 2177, 2183,  
 2237, 2636, 2670,  
 2673, 2736, 2756,  
 2768, 2786, 2807, 2828  
`\else` . . . 54, 62, 70, 79,  
 87, 99, 115, 123,  
 131, 141, 197, 231,  
 330, 351, 372, 379,  
 384, 395, 403, 411,  
 457, 464, 467, 479,  
 483, 487, 492, 496,  
 508, 520, 535, 618,  
 634, 640, 642, 665,  
 667, 784, 848, 853,  
 879, 882, 912, 952,  
 1412, 1438, 1444,  
 1446, 1453, 1469,  
 1476, 1479, 1485,  
 1486, 1496, 1499,  
 1504, 1507, 1510,  
 1517, 1537, 1560,  
 1569, 1575, 1583,  
 1633, 1648, 1654,  
 1657, 1668, 1679,  
 1682, 1692, 1695,  
 1698, 1703, 1734,  
 1757, 1762, 1763,  
 1764, 1767, 1886,  
 1890, 2048, 2054,  
 2080, 2091, 2095,  
 2096, 2097, 2109,  
 2110, 2118, 2121,  
 2122, 2125, 2132,  
 2137, 2144, 2149,  
 2152, 2153, 2156,  
 2158, 2159, 2160,  
 2161, 2172, 2175,  
 2180, 2181, 2185,  
 2229, 2232, 2235,  
 2271, 2309, 2314,  
 2406, 2410, 2415,  
 2423, 2426, 2439,  
 2447, 2454, 2464,  
 2470, 2471, 2486,  
 2488, 2489, 2490,  
 2492, 2494, 2495,  
 2498, 2565, 2582,  
 2585, 2588, 2600,  
 2606, 2613, 2634,  
 2645, 2655, 2664,  
 2671, 2680, 2698,  
 2702, 2711, 2717,  
 2725, 2739, 2741,  
 2757, 2766, 2771,  
 2778, 2782, 2790,  
 2797, 2803, 2808,  
 2809, 2818, 2820,  
 2827, 2912, 2923,  
 2924, 2934, 2945,  
 2953, 2963, 2974,  
 2978, 2985, 2988,  
 2990, 2992, 3002,  
 3009, 3012, 3014,  
 3016, 3044, 3045,  
 3071, 3100, 3104,  
 3114, 3124, 3131,  
 3136, 3144, 3147,  
 3163, 3164, 3172,  
 3196, 3455, 3460,  
 3467, 3476, 3480, 3503  
`\email` . . . . 10, 1534,  
 2604, 2668, 2715, 2754  
`\emph` . . . . . 2143, 2145  
`\empty` . . . . . 2932  
`\EnableCrossrefs` . . . . 18  
`\end` . . . . 21, 2871, 2901, 3088  
`\end@ACM@color@frame` 2216  
`\enddblfloat` . . . . . 970  
`\endfloat` . . . . . 972  
`\endcsname` 349, 350, 478,  
 480, 484, 491, 493,  
 497, 526, 546, 547,  
 561, 575, 1482,  
 1489, 1543, 1546,  
 1748, 1749, 1751,  
 1752, 1753, 1754,  
 1755, 1758, 1760,  
 2198, 2200, 3169, 3192  
`\enddescription` . . . . 1048  
`\endgroup` . . . . 477, 516,  
 534, 549, 2168,  
 2527, 3171, 3173, 3451  
`\endlist` . . . . . 1046, 1048  
`\endMakeFramed` . . . . 1727  
`\endminipage` . . . . . 781  
`\endtrivlist` . . . . . 3388  
`\enspace` . . . . . 3266  
 environments:  
     `abstract` . . . . . 18  
     `acks` . . . . . 24  
     `anonsuppress` . . . . . 24  
     `CCSXML` . . . . . 16  
     `marginfigure` . . . . . 33  
     `margintable` . . . . . 33  
     `printonly` . . . . . 23  
     `screenonly` . . . . . 23  
     `sidebar` . . . . . 33  
     `teaserfigure` . . . . . 18  
     `translatedabstract`  
         . . . . . 21  
     `\everypar` . . . . . 456,  
         511, 522, 2781, 2789  
     `\excludecomment` . . 1740,  
         3459, 3461, 3465, 3466  
     `\ExecuteOptionsX` . . . . .  
         . . . . . 50, 58, 66, 74,  
         83, 91, 103, 107,  
         111, 119, 127, 135, 145  
     `\expandafter` 329, 331,  
         643, 792, 1480,  
         1481, 1487, 1488,  
         1542, 1545, 1748,  
         1749, 1751, 1752,  
         1758, 1760, 3169, 3192  
  
**F**  
`\familydefault` . . . . . 864  
`\fancyfoot` . . . . . 2946,  
 2954, 2964, 2975,  
 2979, 3003, 3030,  
 3041, 3042, 3099,  
 3101, 3105, 3115,  
 3125, 3134, 3139,  
 3143, 3148, 3160, 3161  
`\fancyhead` . 2941, 2942,  
 2943, 2944, 2949,  
 2950, 2951, 2952,  
 2958, 2960, 2961,  
 2968, 2970, 2971,  
 2972, 2980, 2981,  
 2983, 2984, 2987,  
 2989, 2993, 2996,  
 3004, 3005, 3007,  
 3008, 3011, 3013,  
 3017, 3020, 3035,  
 3040, 3098, 3109,  
 3110, 3111, 3119,  
 3120, 3121, 3129,  
 3130, 3132, 3133,  
 3137, 3138, 3154, 3159  
`\fancyheadoffset` 3027,  
 3034, 3112, 3122, 3153  
`\fancyhf` . . . . . 2928, 3092  
`\fancypagestyle` 2927, 3091  
`\fi` . . . . . 56, 64, 72, 81, 89,  
 101, 117, 125, 133,  
 143, 156, 175, 181,  
 194, 199, 228, 233,  
 258, 259, 271, 275,  
 286, 288, 290, 292,  
 294, 296, 298, 300,  
 302, 304, 306, 308,

310, 312, 314, 316,  
 318, 320, 322, 324,  
 326, 328, 333, 335,  
 337, 339, 341, 343,  
 344, 353, 355, 369,  
 374, 377, 386, 390,  
 397, 405, 413, 416,  
 429, 444, 448, 454,  
 459, 464, 470, 481,  
 485, 494, 498, 500,  
 523, 524, 537, 548,  
 567, 607, 611, 620,  
 638, 640, 644, 647,  
 674, 675, 676, 754,  
 770, 788, 814, 826,  
 857, 858, 859, 865,  
 872, 881, 884, 938,  
 939, 955, 969, 973,  
 1000, 1416, 1435,  
 1441, 1447, 1448,  
 1456, 1472, 1477,  
 1484, 1491, 1492,  
 1497, 1498, 1506,  
 1512, 1513, 1514,  
 1519, 1539, 1562,  
 1572, 1579, 1585,  
 1601, 1637, 1641,  
 1650, 1656, 1664,  
 1670, 1684, 1685,  
 1694, 1700, 1701,  
 1705, 1719, 1730,  
 1736, 1756, 1764,  
 1765, 1771, 1792,  
 1795, 1799, 1805,  
 1808, 1811, 1814,  
 1817, 1820, 1823,  
 1827, 1831, 1835,  
 1880, 1896, 1897,  
 2038, 2050, 2056,  
 2059, 2070, 2071,  
 2080, 2082, 2094,  
 2101, 2102, 2103,  
 2104, 2108, 2116,  
 2119, 2120, 2127,  
 2128, 2129, 2134,  
 2146, 2151, 2156,  
 2160, 2161, 2162,  
 2163, 2164, 2165,  
 2166, 2167, 2169,  
 2173, 2178, 2179,  
 2184, 2187, 2188,  
 2207, 2218, 2231,  
 2234, 2235, 2264,  
 2273, 2285, 2313,  
 2317, 2318, 2323,  
 2349, 2375, 2400,  
 2404, 2409, 2413,  
 2419, 2425, 2430,  
 2442, 2444, 2449,  
 2457, 2458, 2466,  
 2474, 2487, 2488,  
 2490, 2492, 2494,  
 2495, 2498, 2500,  
 2526, 2561, 2568,  
 2584, 2587, 2591,  
 2602, 2618, 2619,  
 2623, 2634, 2657,  
 2658, 2666, 2674,  
 2685, 2704, 2705,  
 2713, 2719, 2730,  
 2739, 2741, 2761,  
 2774, 2776, 2784,  
 2786, 2792, 2797,  
 2804, 2808, 2822,  
 2825, 2826, 2827,  
 2865, 2872, 2898,  
 2902, 2914, 2919,  
 2923, 2924, 2933,  
 2935, 2936, 2941,  
 2942, 2947, 2956,  
 2966, 2977, 2979,  
 2988, 2990, 2999,  
 3000, 3001, 3003,  
 3012, 3014, 3023,  
 3024, 3025, 3028,  
 3031, 3044, 3045,  
 3046, 3069, 3088,  
 3099, 3102, 3108,  
 3118, 3128, 3134,  
 3135, 3139, 3140,  
 3146, 3149, 3150,  
 3163, 3164, 3165,  
 3183, 3194, 3196,  
 3264, 3269, 3291,  
 3323, 3361, 3380,  
 3411, 3412, 3437,  
 3438, 3444, 3455,  
 3463, 3469, 3472,  
 3482, 3483, 3484, 3506  
 \firstpagestyle . . . . . 3090  
 \floatname . . . . . 941  
 \flushbottom 800, 802,  
               804, 806, 808, 811, 813  
 \footnote . . . . . 2800  
 \footnotemark 590, 1556,  
               1565, 2763, 2764, 2798  
 \footnoterule . . . . . 779  
 \footnotesep . . . . . 565, 578  
 \footnotesize 571, 2911,  
               2925, 2946, 2954,  
               2964, 2975, 2979,  
               2987, 2993, 3003,  
               3042, 3101, 3105,  
               3115, 3125, 3134,  
               3139, 3145, 3161, 3491  
 \footnotetext . . . 1559,  
               1561, 1568, 1571, 1578  
 \footnotetextauthorsaddresses  
               . . . . . 2092, 2099  
 \footnotetextcopyrightpermission  
               . . . . . 2107, 2111  
 \footrulewidth . . . . .  
               2930, 3033, 3094, 3152  
 \foreignlanguage 432, 435  
 \format . . . . . 32  
 \FrameCommand . . . . . 1725  
 \FrameRestore . . . . . 1727  
 \frenchspacing . . . . . 3507  
 \fulltextwidth . . . . .  
               . . . . . 961, 965, 981

## G

\g@addto@macro . . 157,  
               432, 435, 438, 446,  
               1455, 1487, 1490,  
               1505, 1511, 1518,  
               1538, 1556, 1558,  
               1561, 1565, 1567,  
               1570, 1576, 1577,  
               1582, 1584, 1693,  
               1699, 1735, 1753,  
               1760, 2043, 2047,  
               2049, 2060, 2063,  
               2601, 2614, 2665,  
               2672, 2681, 2712,  
               2718, 2726, 2763, 2764  
 \gdef . . . . . 156, 1429,  
               1430, 1431, 1432,  
               1434, 1442, 1452,  
               1454, 1475, 1478,  
               1480, 1483, 1495,  
               1503, 1509, 1542,  
               1545, 1642, 1674,  
               1691, 1697, 1733,  
               1749, 1751, 1752,  
               1758, 2270, 2599,  
               2603, 2608, 2638,  
               2639, 2660, 2661,  
               2663, 2667, 2669,  
               2676, 2707, 2708,  
               2710, 2714, 2716,  
               2721, 2746, 2747, 2752

```

\geometry ... 680, 683, 2180, 2214, 2402, 2982, 3006, 3100,
690, 697, 704, 711, 2621, 3032, 3151, 3267, 3104, 3114, 3124, 3144
718, 725, 732, 741, 748 \if@ACM@acmthm . 67, 3337 \if@ACM@pbalance 108, 3391
\getrefnumber ..... \if@ACM@affiliation@obeypunkt 108, 3391 \if@ACM@printacmref
1634, 1658, 1768, 2797 ..... 1520, ..... 1651, 2205
\global ..... 510, 2471, 2488, 2490, \if@ACM@printccs ...
513, 549, 569, 870, 2492, 2493, 2495, 2498 ..... 1645, 2174
880, 883, 953, 980, \if@ACM@anonymous .. \if@ACM@printfolios
1422, 1436, 1468, ..... 120, 1474, 1665, 2933, 2935,
1470, 1471, 1516, 1486, 1493, 1517, 2941, 2942, 2979,
2203, 2204, 2208, 1537, 1557, 1566, 3003, 3099, 3134, 3139
2210, 2224, 2480, 1575, 2046, 2052, \if@ACM@review ...
2482, 2487, 2491, 2068, 2097, 2921, 3464 ..... 75, 2850, 2867, 2874
2496, 2499, 2577, \if@ACM@authordraft
2578, 2579, 2596, ..... 136, 658, 2112 \if@ACM@screen 51, 612, 3457
2620, 2624, 2634, \if@ACM@authorversion
2686, 2689, 2731, ..... 84, 2118, 2138 \if@ACM@sigchiamode
2769, 2772, 2860, \if@ACM@badge .... ..... 165, 556,
2864, 3392, 3416, 1610, 2307, 2435, 2451 666, 863, 963, 970,
3418, 3420, 3432, 3436 \if@ACM@timestamp ...
\grantnum ..... 24, 3454 ..... 128, 2903, 3029, 3141
\grantsponsor .. 24, 3453 \if@ACM@citypresent
\if@ACM@urlbreakonhyphens ..... 59, 609
\if@acmowned ..... 1777
\if@Description@present
\if@files ..... 545, 645
\if@insideauthorgroup
\if@nobreak ..... 455
\if@noskipsec ... 448, 512
\if@printcopyright .
\if@printpermission ..... 1773, 2130
\if@twocolumn . 3442, 3484
\if@undescribed@images
\ifBeginWith ..... 1541
\ifcase . 201, 235, 593,
678, 757, 795, 915,
984, 1122, 1598,
1708, 1843, 1899,
2241, 2288, 2326,
2352, 2377, 2503,
2531, 2646, 2699,
2875, 2939, 3057,
3096, 3231, 3275,
3307, 3366, 3393, 3414
\ifcsname ..... 349
\ifdim .. 452, 472, 504,
529, 2276, 2284, 2862
\IfEq ..... 2022, 2028,
2029, 2030, 2031,

```

2032, 2033, 2034, 2035  
 \IfFileExists 829, 832, 835  
 \IfInteger ..... 1672  
 \ifluatex ..... 849  
 \ifNAT@numbers .... 640  
 \ifnum 170, 176, 182, 195,  
     464, 465, 479, 483,  
     492, 496, 1634,  
     1658, 1762, 1763,  
     1764, 1768, 1788,  
     1793, 1796, 1800,  
     1806, 1809, 1812,  
     1815, 1818, 1821,  
     1824, 1828, 1832,  
     2070, 2106, 2643,  
     2696, 2738, 2740,  
     2797, 3071, 3073, 3142  
 \ifPDFTeX ..... 815  
 \IfSubStr .... 1466, 1535  
 \ifvmode ..... 2470  
 \ifvoid ..... 784  
 \ifx ..... 155,  
     234, 285, 287, 289,  
     291, 293, 295, 297,  
     299, 301, 303, 305,  
     307, 309, 311, 313,  
     315, 317, 319, 321,  
     323, 325, 327, 332,  
     334, 336, 338, 340,  
     342, 378, 418, 642,  
     1433, 1444, 1446,  
     1451, 1473, 1476,  
     1494, 1496, 1501,  
     1502, 1508, 1581,  
     1633, 1689, 1690,  
     1696, 1703, 1732,  
     1748, 1757, 1767,  
     2057, 2091, 2096,  
     2147, 2156, 2159,  
     2160, 2161, 2172,  
     2175, 2181, 2185,  
     2229, 2232, 2235,  
     2269, 2309, 2314,  
     2406, 2410, 2415,  
     2423, 2426, 2439,  
     2447, 2454, 2464,  
     2486, 2565, 2598,  
     2606, 2607, 2662,  
     2668, 2675, 2709,  
     2715, 2720, 2758,  
     2766, 2778, 2803,  
     2808, 2820, 2827,  
     2912, 2923, 2932,  
     2988, 2990, 3012,

J

\jobname ..... 544, 547

K

\kern 772, 773, 779, 780, 2462  
 \keywords ..... 15, 1631  
 \keywordsname .....  
     371, 373, 383, 385,  
     394, 396, 402, 404,  
     410, 412, 1552, 2182

L

\l@section ..... 552  
 \l@subsection ... 552, 553  
 \l@subsubsection ... 554  
 \labelenumi ..... 992  
 \labelenumii ..... 993  
 \labelenumiii ..... 994  
 \labelenumiv ..... 995  
 \labelsep .....  
     1003, 1011, 1016,

1026, 1031, 1034,  
     1036, 1038, 1040, 3385  
 \labelwidth .....  
     1026, 1031, 1034,  
     1036, 1038, 1040, 1043  
 \LARGE ..... 2354,  
     2356, 2358, 2374,  
     2385, 2387, 2389,  
     2391, 2393, 2397,  
     2538, 2541, 2556, 3087  
 \Large 2226, 2529, 2547,  
     3241, 3242, 3244,  
     3245, 3247, 3261, 3262  
 \large 2113, 2534, 2539,  
     2542, 2557, 2559,  
     3235, 3236, 3238, 3239  
 \lastbox .. 514, 2781, 2789  
 \leaders ..... 2462  
 \leavevmode 448, 2462, 2690  
 \leftmargin 1025, 1030,  
     1033, 1035, 1037, 1039  
 \leftmargini 1009, 1010,  
     1011, 1012, 1025, 1026  
 \leftmarginii .....  
     1015, 1016,  
     1017, 1018, 1030, 1031  
 \leftmarginiii .....  
     1018, 1019, 1033, 1034  
 \leftmarginiv .....  
     1019, 1020, 1035, 1036  
 \leftmarginv .....  
     1020, 1021, 1037, 1038  
 \leftmarginvi .....  
     1021, 1039, 1040  
 \leftskip . 2461, 2734, 3224  
 \let . 306, 308, 320, 322,  
     324, 350, 466, 582,  
     583, 624, 625, 626,  
     627, 628, 629, 632,  
     636, 794, 860, 874,  
     875, 877, 878, 885,  
     886, 887, 888, 889,  
     890, 891, 892, 893,  
     894, 895, 896, 897,  
     898, 899, 900, 901,  
     902, 903, 904, 943,  
     944, 948, 949, 958,  
     959, 964, 965, 966,  
     1029, 1044, 1048,  
     1528, 1529, 1530,  
     1531, 1532, 1632,  
     1738, 1741, 2058,  
     2073, 2074, 2075,  
     2076, 2088, 2089,

2090, 2093, 2100,  
 2189, 2203, 2204,  
 2239, 2240, 2265,  
 2266, 2497, 2596,  
 2620, 2686, 2692,  
 2731, 2736, 2795,  
 2796, 2830, 2831,  
 2833, 2834, 2842,  
 2843, 2844, 2846,  
 2847, 2848, 3174,  
 3176, 3178, 3179,  
 3181, 3187, 3190,  
 3193, 3487, 3492,  
 3493, 3500, 3501, 3502  
`\libertineLF` . . . . . 862  
`\lineskip` . . . . . 2691, 2735  
`\linespacing` . . . . . 542, 543  
`\liningnums` . . . . . 860  
`\list` . . . . . 1042  
`\listsep` . 1023, 1024, 1028  
`\listparindent` . . . . . 1027  
`\LoadClass` . . . . . 261  
`\long` 442, 557, 568, 943,  
 947, 958, 1639,  
 1642, 1644, 2043, 2836  
`\loop` . . . . . 2277, 2859, 3072  
`\LTX@adddotafter` . . . . .  
 . . . . . 3193, 3196

**M**

`\makeatletter` . . . . . 539  
`\makebox` . . . . . 2113, 3035,  
 3040, 3081, 3154, 3159  
`\MakeFramed` . . . . . 1727  
`\makelabel` . . . . . 1044  
`\MakeTextUppercase` .  
 2599, 2601, 3226,  
 3235, 3238, 3241,  
 3244, 3254, 3258, 3261  
`\maketitle` . . . . . 19, 2066  
`\MakeUppercase` . . . . . 3180  
`\marginfigure` . . . . . 946  
`\marginfigure` (env.) . . . . . 33  
`\marginpar` . . . . . 557,  
 945, 951, 960, 2308  
`\marginparsep` . . . . . 962, 3027  
`\marginparwidth` . . . . . 962, 3027  
`\marginable` . . . . . 957  
`\margintable` (env.) . . . . . 33  
`\mathchardef` . . . . . 2670, 2673  
`\mbox` . . . . . 328  
`\mdseries` . . . . . 2379, 2381,  
 2383, 2387, 2389,

2391, 2393, 2395,  
 2397, 2399, 2551, 2554  
`\medskip` . . . . . 2243, 2245,  
 2247, 2249, 2624,  
 2626, 2690, 2775, 2805  
`\MessageBreak` . . . . .  
 172, 178, 184, 185,  
 186, 187, 188, 189,  
 190, 191, 192, 420,  
 421, 422, 423, 425,  
 427, 1660, 1661,  
 1662, 1721, 1892, 1893  
`\metadata@authors` . . . . .  
 . . . . . 2189, 2190, 2193  
`\mktitle@bx` 2065, 2274,  
 2275, 2278, 2282,  
 2283, 2290, 2292,  
 2294, 2296, 2298,  
 2300, 2302, 2304,  
 2306, 2320, 2322,  
 2414, 2433, 2461,  
 2624, 2689, 2690, 2769  
`\month` . . . . . 1597, 2915  
`\moveleft` . . . . . 980  
`\multiply` . . . . . 3078

**N**

`\NAT@setcites` . . . . . 346  
`\NAT@aysep` . . . . . 337  
`\NAT@citetp` . . . . . 632  
`\NAT@close` . . . . .  
 286, 288, 290, 292, 335  
`\NAT@cmptrs` . . . . . 314, 316, 318  
`\NAT@cmt` . . . . . 341  
`\NAT@ctype` . . . . . 632  
`\NAT@find@eq` . . . . . 329  
`\NAT@fullfalse` . . . . . 632  
`\NAT@longnamestrue` . . . . . 326  
`\NAT@merge` . . . . . 320, 322, 324  
`\NAT@numbersfalse` . . . . . 300  
`\NAT@numberstrue` . . . . . 302, 304  
`\NAT@open` . . . . . 286,  
 288, 290, 292, 333, 632  
`\NAT@partrue` . . . . . 632  
`\NAT@rem@eq` . . . . . 331  
`\NAT@sep` 294, 296, 298, 343  
`\NAT@sort` . . . . . 310, 312, 318  
`\NAT@superfalse` . . . . . 302  
`\NAT@supertrue` . . . . . 304  
`\NAT@swafalse` . . . . . 631  
`\NAT@up` . . . . . 328  
`\NAT@yrsep` . . . . . 339  
`\NeedsTeXFormat` . . . . . 1

`\newblock` . . . . . 633  
`\newbox` . . . . .  
 2065, 2220, 2468, 2628  
`\newcommand` . . . . . 356, 362,  
 417, 431, 434, 437,  
 639, 870, 1428,  
 1515, 1550, 1580,  
 1617, 1622, 1688,  
 1743, 1838, 2051,  
 2484, 2493, 2910,  
 3213, 3445, 3454, 3470  
`\newcount` . . . . . 1459, 1461, 2853  
`\newcounter` 1742, 2906, 2908  
`\newdimen` . . . . . 961, 1001,  
 2629, 3050, 3052, 3054  
`\newenvironment` . . . . . 440,  
 946, 957, 1724, 2042  
`\newfloat` . . . . . 940  
`\newif` 162, 163, 164, 165,  
 166, 168, 827, 866,  
 868, 1049, 1463,  
 1610, 1773, 1775,  
 1777, 2570, 2572, 2574  
`\newlength` . . . . .  
 1612, 1614, 1615, 2852  
`\newsavebox` . . . . . 2851  
`\newskip` . . . . . 1023, 2630  
`\newtheorem` . . . . .  
 3340, 3343, 3346,  
 3349, 3352, 3356, 3359  
`\newtheoremstyle` . . . . .  
 . . . . . 3292, 3324  
`\newwrite` . . . . . 546  
`\next` . . . . . 3171, 3173, 3183  
`\nobreak` . . . . . 505, 2805  
`\noindent` . . . . .  
 . . . . . 555, 1553, 1704,  
 2090, 2177, 2183,  
 2243, 2245, 2247,  
 2249, 2280, 2287,  
 2308, 2414, 2421,  
 2424, 2448, 2462,  
 2463, 2465, 2563,  
 2624, 2625, 2689,  
 2735, 2769, 2770,  
 2805, 2806, 2839, 3375  
`\noindentparagraph` .  
 . . . . . 2255, 3213  
`\nolinkurl` . . . . . 2670,  
 2673, 2716, 2718, 2754  
`\normalbaselines` . . . . . 2633  
`\normalcolor` . . . . . 786  
`\normalfont` . . . . . 580,  
 1704, 2084, 2530,

2535, 2544, 2545,  
 2547, 2548, 2560,  
 2856, 3286, 3303,  
 3315, 3318, 3383, 3507  
`\normalparindent` . . . . . [771](#)  
`\normalsize` . . . . .  
     2376, 2530, 2544,  
     2545, 2548, 2857, 3507  
`\num@authorgroups` . . . . .  
     . . . . . [1459](#),  
     1470, 2070, 2646,  
     2650, 2652, 2699, 2740  
`\num@authors` . . . . .  
     [1461](#), 1468, 1482,  
     1489, 1543, 1546, 2738  
`\number` . . . . . 464  
`\numberline` . . . . . 484, 497  
`\numexpr` . . . . . 2905, 2907, 2909  
`\nxandlist` . . . . . 2190

**O**

`\onehalfspacing` . . . . . 270  
`\openout` . . . . . 547  
`\or` . . . . . 204, 206,  
     208, 210, 212, 214,  
     216, 218, 221, 224,  
     238, 240, 242, 244,  
     246, 248, 250, 252,  
     254, 256, 595, 596,  
     597, 598, 599, 600,  
     602, 603, 605, 606,  
     682, 689, 696, 703,  
     710, 717, 724, 731,  
     740, 747, 759, 760,  
     761, 763, 764, 765,  
     766, 767, 768, 769,  
     797, 798, 799, 801,  
     803, 805, 807, 809,  
     810, 812, 917, 918,  
     919, 920, 921, 923,  
     926, 931, 936, 937,  
     986, 987, 988, 989,  
     990, 991, 996, 997,  
     998, 999, 1127,  
     1131, 1135, 1139,  
     1143, 1147, 1152,  
     1155, 1159, 1166,  
     1170, 1174, 1178,  
     1183, 1187, 1191,  
     1195, 1200, 1204,  
     1210, 1216, 1222,  
     1228, 1232, 1236,  
     1241, 1245, 1249,  
     1253, 1257, 1261,

1265, 1269, 1273,  
 1277, 1281, 1285,  
 1289, 1293, 1297,  
 1301, 1305, 1309,  
 1313, 1317, 1321,  
 1325, 1329, 1333,  
 1337, 1341, 1346,  
 1351, 1355, 1359,  
 1364, 1368, 1372,  
 1376, 1380, 1384,  
 1388, 1392, 1396,  
 1400, 1404, 1408,  
 1598, 1599, 1600,  
 1711, 1713, 1715,  
 1717, 1844, 1846,  
 1849, 1851, 1852,  
 1854, 1856, 1858,  
 1861, 1864, 1867,  
 1869, 1872, 1875,  
 1878, 1900, 1911,  
 1922, 1930, 1936,  
 1942, 1956, 1968,  
 1975, 1989, 1996,  
 2002, 2009, 2014,  
 2020, 2244, 2246,  
 2248, 2250, 2252,  
 2254, 2256, 2258,  
 2260, 2262, 2291,  
 2293, 2295, 2297,  
 2299, 2301, 2303,  
 2305, 2319, 2321,  
 2329, 2331, 2333,  
 2335, 2337, 2339,  
 2341, 2343, 2345,  
 2347, 2355, 2357,  
 2359, 2361, 2363,  
 2365, 2367, 2369,  
 2371, 2373, 2380,  
 2382, 2384, 2386,  
 2388, 2390, 2392,  
 2394, 2396, 2398,  
 2506, 2508, 2510,  
 2512, 2514, 2516,  
 2518, 2520, 2522,  
 2524, 2533, 2536,  
 2537, 2540, 2543,  
 2546, 2549, 2552,  
 2555, 2558, 2648,  
 2649, 2651, 2653,  
 2701, 2878, 2880,  
 2882, 2884, 2886,  
 2888, 2890, 2892,  
 2894, 2896, 2948,  
 2957, 2967, 3059,

3064, 3103, 3113,  
 3123, 3233, 3234,  
 3237, 3240, 3243,  
 3246, 3252, 3256,  
 3260, 3263, 3277,  
 3278, 3279, 3280,  
 3281, 3282, 3287,  
 3288, 3289, 3290,  
 3309, 3310, 3311,  
 3312, 3313, 3314,  
 3319, 3320, 3321,  
 3322, 3368, 3369,  
 3370, 3371, 3372,  
 3373, 3376, 3377,  
 3378, 3379, 3395,  
 3396, 3397, 3399,  
 3401, 3403, 3405,  
 3407, 3408, 3410,  
 3417, 3419, 3421,  
 3423, 3425, 3427,  
 3429, 3431, 3433, 3435

`\orcid` . . . . . 10, [1540](#)  
`\outer@nobreak` . . . . . 977

**P**

`\p@` . . . . . 550, 755,  
     762, 772, 773, 779,  
     780, 3033, 3152,  
     3198, 3202, 3206,  
     3207, 3210, 3211,  
     3214, 3215, 3219,  
     3220, 3383, 3485, 3488  
`\PackageError` 56, 64, 72,  
     81, 89, 101, 105,  
     109, 117, 125, 133, 143  
`\PackageInfo` . . . . . 53,  
     55, 61, 63, 69,  
     71, 77, 80, 86, 88,  
     94, 100, 114, 116,  
     122, 124, 130, 132,  
     138, 142, 1165,  
     1209, 1215, 1221, 1227  
`\PageIndex` . . . . . 15  
`\pageref` . . . . . 2917  
`\pagestyle` . . . . . 3048  
`\par` . . . . . 432, 435, 449,  
     505, 541, 782, 975,  
     1553, 1704, 2093,  
     2100, 2119, 2124,  
     2126, 2177, 2183,  
     2226, 2230, 2233,  
     2243, 2245, 2247,  
     2249, 2290, 2292,  
     2294, 2306, 2322,

|                         |                        |                        |
|-------------------------|------------------------|------------------------|
| \put .....              | 2870, 2900             |                        |
|                         |                        | 3060, 3061, 3062,      |
|                         |                        | 3065, 3066, 3067,      |
|                         |                        | 3070, 3071, 3073,      |
|                         |                        | 3076, 3077, 3078,      |
|                         |                        | 3079, 3097, 3142,      |
|                         |                        | 3169, 3192, 3196,      |
|                         |                        | 3232, 3276, 3308,      |
|                         |                        | 3367, 3383, 3394,      |
|                         |                        | 3415, 3474, 3478, 3488 |
|                         |                        |                        |
|                         |                        | <b>Q</b>               |
| \qed .....              | 3382                   |                        |
| \quad .....             | 526, 2959,             |                        |
|                         | 2962, 2969, 2973, 3143 |                        |
|                         |                        |                        |
|                         |                        | <b>R</b>               |
| \raggedright .....      | 2420, 2461, 2734, 3489 |                        |
| \raisebox ..            | 2113, 2416,            |                        |
|                         | 2428, 2440, 2455,      |                        |
|                         | 3036, 3081, 3083, 3155 |                        |
|                         |                        |                        |
| \real@adddotafter ..    |                        |                        |
|                         | ..... 3178, 3181       |                        |
|                         |                        |                        |
| \realSectionformat ..   |                        |                        |
|                         | ... 3174, 3186, 3187   |                        |
|                         |                        |                        |
| \received .....         | 18, 1688               |                        |
|                         |                        |                        |
| \RecordChanges .....    | 17                     |                        |
|                         |                        |                        |
| \ref .....              | 2817, 2824             |                        |
|                         |                        |                        |
| \refname .....          | 279, 280               |                        |
|                         |                        |                        |
| \refstepcounter .....   | 468                    |                        |
|                         |                        |                        |
| \relax .....            | 170,                   |                        |
|                         | 176, 182, 195, 202,    |                        |
|                         | 236, 329, 330, 418,    |                        |
|                         | 450, 469, 471, 475,    |                        |
|                         | 489, 503, 518, 528,    |                        |
|                         | 536, 547, 594, 679,    |                        |
|                         | 758, 794, 796, 916,    |                        |
|                         | 985, 1123, 1460,       |                        |
|                         | 1462, 1468, 1470,      |                        |
|                         | 1580, 1581, 1634,      |                        |
|                         | 1658, 1709, 1727,      |                        |
|                         | 1748, 1757, 1767,      |                        |
|                         | 1768, 1788, 1793,      |                        |
|                         | 1796, 1800, 1806,      |                        |
|                         | 1809, 1812, 1815,      |                        |
|                         | 1818, 1821, 1824,      |                        |
|                         | 1828, 1832, 1843,      |                        |
|                         | 1899, 2088, 2089,      |                        |
|                         | 2106, 2242, 2289,      |                        |
|                         | 2327, 2353, 2378,      |                        |
|                         | 2504, 2532, 2631,      |                        |
|                         | 2641, 2642, 2643,      |                        |
|                         | 2644, 2647, 2650,      |                        |
|                         | 2652, 2654, 2656,      |                        |
|                         | 2659, 2691, 2694,      |                        |
|                         | 2695, 2696, 2697,      |                        |
|                         | 2700, 2703, 2706,      |                        |
|                         | 2738, 2740, 2763,      |                        |
|                         | 2797, 2854, 2876,      |                        |
|                         | 2877, 2879, 2881,      |                        |
|                         | 2897, 2907, 2909,      |                        |
|                         | 2912, 2940, 3058,      |                        |
|                         |                        |                        |
|                         |                        | <b>S</b>               |
| \savebox .....          | 2856                   |                        |
| screenonly (env.) ..... | 23                     |                        |
| \scriptsize .....       | 2227, 2859, 2863       |                        |
| \scshape .....          | 3273, 3364             |                        |
| \section .....          | 279,                   |                        |
|                         | 2251, 2253, 2257,      |                        |

```

2259, 2261, 2263,      \sffamily ..... 18
2783, 2791, 3197, 3448   2354, 2356, 2358,
\section@raggedright     2360, 2362, 2364,
..... 3222,             2368, 2372, 2374,
3226, 3227, 3235,       2529, 2534, 2538,
3236, 3238, 3239,       2559, 2925, 3087,
3241, 3242, 3244,       3226, 3227, 3228,
3245, 3247, 3248,       3235, 3236, 3238,
3249, 3254, 3255,       3239, 3244, 3245,
3258, 3259, 3261, 3262  3254, 3255, 3258, 3259
\Sectionformat .....      \shortauthors 19, 1494,
..... 3170, 3174, 3176, 3187 1495, 1502, 1503,
\SelectFootnoteRule ..... 1505, 1508, 1509,
..... 775, 777,          1511, 2202, 2204, 2924
\selectlanguage 1551, 2787 \shortcite ..... 636, 639
\set@ACM@acmcbox ..      \shorttitle 2944, 2952,
..... 2215, 2220,          2962, 2973, 2980, 3004
\setbox ..... 514, 569, \showeprint ..... 3470
980, 2224, 2278, \sidebar ..... 940
2414, 2433, 2461, sidebar (env.) ..... 33
2472, 2624, 2634, \skip ..... 785
2689, 2769, 2781, 2789 \small ..... 558, 945,
\setcctype ..... 17, 1838 952, 960, 1704,
\setcitestyle ..... 25, 283, 357, 363 2243, 2245, 2247,
\setcopyright ... 16, 1836 2249, 2535, 2560,
\setcounter 2083, 2170, 2781, 2789, 2805, 3099
..... 2272, 2907, 2909, \smallskipamount ... 1024
3230, 3253, 3257, 3268 \space ..... 493, 1467,
\setengagemetadata ..... 1536, 1663, 2198,
..... 19, 2062 2498, 3044, 3163,
3455, 3494, 3497, 3505 \specialcomment ... 3446
\setkeys . 38, 174, 180, \standardpagestyle . 2926
1421, 1675, 1723, \startPage ..... 15, 1627
1836, 2609, 2610, \state . 11, 1530, 2476, 2749
2615, 2616, 2677, \stepcounter 1559, 1561,
2678, 2682, 2683, 1568, 1571, 1578, 1747
2722, 2723, 2727, 2728 \StrDel ..... 2485
\setlength 755, 756, 762, \streetaddress .....
..... 771, 1003, 1004, . 11, 1528, 2476, 2743
1009, 1015, 1018, \string ..... .
1019, 1020, 1021, 420, 421, 424, 426,
1613, 1616, 2225, 2858 646, 1467, 1536,
\setmonofont ... 847, 852 1629, 1663, 2801,
\settopmatter ..... 2802, 3494, 3497, 3505
..... 18, 98, 1663, \strut 2438, 2453, 3038, 3157
1675, 1676, 1678, \strutbox ..... 565, 578
1681, 1683, 1686, 2813 \subsection ..... 3201
\setTrue ..... 540 \subsubsection ..... 3205
\SetWatermarkColor . \subtitle ..... 10, 1457
..... 661, 670 \subtitlenote .. 14, 1564
\SetWatermarkFontSize \text{T}
..... 660, 669 \teaserfigure ..... 2042
\SetWatermarkText 662, 671
\sfdefault ..... 864

```

|                            |                                                                                                                                                                                                            |                                 |                                                                                                                                                                                                                                                                                                                                                                           |                            |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| \trivlist . . . . .        | 3384                                                                                                                                                                                                       | \urlstyle . . . . .             | 592, 601, 604                                                                                                                                                                                                                                                                                                                                                             | Y                          |
| \tw@ . . . . .             | 322                                                                                                                                                                                                        | \usebox . . . . .               | 2870, 2900                                                                                                                                                                                                                                                                                                                                                                | \year . . . . . 1595, 2915 |
| \two@digits . . . . .      | 2915, 2916                                                                                                                                                                                                 | \usepackage . . . . .           |                                                                                                                                                                                                                                                                                                                                                                           |                            |
| \twocolumn . . . . .       | 2296, 2298,<br>2300, 2302, 2304, 2320                                                                                                                                                                      | . . . . . 9, 10, 11, 12, 13, 14 |                                                                                                                                                                                                                                                                                                                                                                           | Z                          |
|                            |                                                                                                                                                                                                            | V                               |                                                                                                                                                                                                                                                                                                                                                                           |                            |
| U                          |                                                                                                                                                                                                            | \value . . . . .                | 1764                                                                                                                                                                                                                                                                                                                                                                      |                            |
| \unskip . . . . .          | 517, 587,<br>783, 1527, 1533,<br>1540, 2473, 2476,<br>2477, 2479, 2481,<br>2482, 2483, 2484,<br>2498, 2567, 2743,<br>2744, 2745, 2747,<br>2748, 2749, 2750,<br>2751, 2752, 2754,<br>2799, 2807, 2824, 2837 | \vbox . . . . .                 | 569,<br>980, 2414, 2433,<br>2461, 2624, 2689, 2769                                                                                                                                                                                                                                                                                                                        |                            |
| \unvbox . . . . .          | 570, 787, 792,<br>2280, 2624, 2690, 2769                                                                                                                                                                   | \vfill                          | 2228, 2230, 2233, 2235                                                                                                                                                                                                                                                                                                                                                    |                            |
| \upshape . . . . .         | 1041                                                                                                                                                                                                       | \vskip                          | 506, 541, 785, 793, 975                                                                                                                                                                                                                                                                                                                                                   |                            |
| \url . . . . .             | 1733, 1735, 1881, 3455                                                                                                                                                                                     | \vspace . . . . .               | 3492                                                                                                                                                                                                                                                                                                                                                                      |                            |
| \UrlBreakPenalty . . . . . | 2670, 2673                                                                                                                                                                                                 | \vsplit . . . . .               | 2278                                                                                                                                                                                                                                                                                                                                                                      |                            |
|                            |                                                                                                                                                                                                            | \vtop . . . . .                 | 2224, 2634                                                                                                                                                                                                                                                                                                                                                                |                            |
|                            |                                                                                                                                                                                                            | W                               |                                                                                                                                                                                                                                                                                                                                                                           |                            |
|                            |                                                                                                                                                                                                            | \wd . . . . .                   | 982, 2473                                                                                                                                                                                                                                                                                                                                                                 |                            |
|                            |                                                                                                                                                                                                            | \write . . . . .                | 646                                                                                                                                                                                                                                                                                                                                                                       |                            |
|                            |                                                                                                                                                                                                            | X                               |                                                                                                                                                                                                                                                                                                                                                                           |                            |
|                            |                                                                                                                                                                                                            | \xdef . . . . .                 | 333,<br>335, 337, 339, 341, 343                                                                                                                                                                                                                                                                                                                                           |                            |
|                            |                                                                                                                                                                                                            | \z@skip                         | 541, 975, 1032, 3224                                                                                                                                                                                                                                                                                                                                                      |                            |
|                            |                                                                                                                                                                                                            | Z                               |                                                                                                                                                                                                                                                                                                                                                                           |                            |
|                            |                                                                                                                                                                                                            | \z@ . . . . .                   | 312, 316, 452,<br>472, 504, 514, 529,<br>542, 565, 578, 756,<br>793, 910, 914, 925,<br>1009, 1015, 1027,<br>2093, 2100, 2113,<br>2117, 2208, 2210,<br>2225, 2416, 2428,<br>2440, 2455, 2734,<br>2781, 2789, 2929,<br>2930, 3035, 3040,<br>3051, 3053, 3055,<br>3081, 3083, 3093,<br>3094, 3154, 3159,<br>3197, 3201, 3205,<br>3213, 3218, 3225,<br>3284, 3316, 3485, 3488 |                            |