

# L<sup>A</sup>T<sub>E</sub>X Class for the *Association for Computing Machinery*\*

Boris Veytsman<sup>†</sup>

2023/03/25, v1.89

## 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                                      | 20       |
| 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               | 24       |
| 2.12     | Note about anonymous mode                           | 24       |
| 2.13     | Acknowledgments                                     | 24       |
| 2.14     | Bibliography  | 25       |
| 2.14.1   | Processing using BibT <sub>E</sub> X                | 25       |
| 2.14.2   | Processing using BibL <sup>A</sup> T <sub>E</sub> X | 28       |
| 2.15     | Colors  | 29       |
| 2.15.1   | Manual bibliography                                 | 30       |
| 2.16     | Other notable packages and typographic remarks      | 30       |
| 2.17     | Counting words                                      | 30       |
| 2.18     | Creative Commons licenses for ACM publications      | 31       |
| 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                        | 34       |

---

\*©2016–2023, Association for Computing Machinery

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

|          |                                    |           |
|----------|------------------------------------|-----------|
| <b>3</b> | <b>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                              | 54        |
| 3.13     | Image descriptions                 | 55        |
| 3.14     | Floats                             | 56        |
| 3.15     | Lists                              | 58        |
| 3.16     | Top-matter data                    | 59        |
| 3.17     | Concepts system                    | 76        |
| 3.18     | Copyright system                   | 76        |
| 3.19     | Maketitle hook                     | 82        |
| 3.20     | ACM Engage top matter              | 83        |
| 3.21     | Typesetting top matter             | 83        |
| 3.22     | Headers and Footers                | 99        |
| 3.23     | Sectioning                         | 106       |
| 3.24     | TOC lists                          | 108       |
| 3.25     | Theorems                           | 108       |
| 3.26     | Balancing columns                  | 111       |
| 3.27     | Acknowledgments                    | 113       |
| 3.28     | Conditional typesetting            | 113       |
| 3.29     | Additional bibliography commands   | 113       |
| 3.30     | Index                              | 114       |
| 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 customizatón 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`, `acm-jdslogo.png`, and `ACM-Reference-Format.bst` in places where  $\text{\TeX}$  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 ( $\text{\TeX}$ 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:

- *amscs*, <http://www.ctan.org/pkg/amscs>
- *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 `acmcp` 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 BibTeX 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  |
|------------|--|
| manuscript | A manuscript. This is the default.   |
| acmsmall   | Small single-column format. Used for ACMJCSS, CIE, CSUR, DLT, FAC, GAMES, JACM, JATS, JDIQ, JDS, JEA, JERIC, JETC, JRC, PACM-CGIT, PACMHCI, PACMMOD, PACMNET, PACMPL, TAAS, TAC-CESS, 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, TOPML, TOPS, TORS TOS, TOSEM, TOSN, TQC, TRETS, TSAS, TSC, TSLP and TWEB, including special issues. |
| acmlarge   | Large single-column format. Used for DTRAP, HEALTH, IMWUT, JOCCH, POMACS and TAP, including special issues.  |
| acmtog     | Large double-column format. Used for TOG, including annual conference Technical Papers.  |
| sigconf    | Proceedings format for most ACM conferences (with the exception of SIGPLAN) and all ICPS volumes.  |
| sigplan    | Proceedings format for SIGPLAN conferences.  |
| acmengage  | ACM EngageCSEdu Course materials.  |
| acmcp      | 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 natbib 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 enter them in this order:

```

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

```

Do *not* use the  $\TeX$  `\and` macro or commas, or `\\` 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.

ACM strongly encourages that you include ORCIDs for all authors before compiling or submitting for review and/or production processing.

If you do not have an ORCID, you may get one for free by registering at <http://www.orcid.org/>.

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{ö}rv{a}ld Group}
  \streetaddress{1 Th{ö}rv{a}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 Thørvæld Group.

The `\affiliation` and `\additionalaffiliation` commands are further structured to interact with the metadata extraction tools. Inside these commands you should use the `\position`, `\institution`, `\department`, `\city`, `\streetaddress`, `\state`, `\postcode`, `\country`

and `\country` macros to indicate the corresponding parts of the affiliation. Note that in some cases (for example, journals) these parts are not printed in the resulting copy, but they *are* necessary since they are used by the XML metadata extraction programs. Do *not* put commas or `\\` between the elements of `\affiliation`. They will be provided 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 insitution. 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  $\text{\LaTeX}$ ), 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  $\TeX$  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 correspond-  
ing 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` correspondingly. The arguments of all these commands, including `\acmMonth`, is numer-  
`\acmYear` ical. 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.

`\acmBadge` Some conference articles get special distinctions, for example, the artifact evaluation for PPOPP 2016 (see <http://ctuning.org/ae/ppopp2016.html>). These articles display special badges supplied by the conference organizers. This class provides command to add these badges: `\acmBadge[<url>]{<graphics>}`. 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}
```

The command can be repeated, if a paper has several badges.

`\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



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, <i>doclicense</i> images are used to typeset the license. See also <code>\setcctype</code> command. Note that at present this license can be used only for <code>acmengage</code> format or for <code>nonacm</code> publications. |

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 `\begin{document}`. Additional information about ACM copyright rules is discussed in Section 2.18.

`\setcctype` 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 `\setcctype[<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  $\text{\TeX}$  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  $\LaTeX$ . 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).

Table 4: Settings for the `\settopmatter` command

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

`\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,

```
\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*.

`\setengagemetadadata` These items are set with the command `\setengagemetadadata{⟨name⟩}{⟨value⟩}`, for example,

```
\setengagemetadadata{Course}{CS1}
\setengagemetadadata{Programming Language}{Python}
\setengagemetadadata{Knowledge Unit}{Programming Concepts}
\setengagemetadadata{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{<type>}` sets the article type, for example

```
\acmArticleType{Review}
```

`\acmCodeLink` The commands `\acmCodeDataLink{<link>}` and `\acmDataLink{<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 use 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}
```

The design of the cover page may require additional runs of latex to make the elements of the page align.

## 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{<language>}title`, `\translatedsubtitle{<language>}subtitle`  
`\translatedsubtitle`    and `\translatedkeywordslanguagekeywords` are used to set title, subtitle and key-  
`\translatedkeywords`    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-ACCNOISE\\
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  $0.5V$  with most
measurements between  $0.2V$  and  $0.8V$ }
\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. 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,  $\text{\TeX}$  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[<substitute>]{<suppressed-text>}`. By default [*<substitute>*] 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{\sponsorID}{\name}{\url}
\grantnum[\url]{\sponsorID}{\number}.
```

Here `{\sponsorID}` is the unique ID used to match grants to sponsors, `{\name}` is the name of the sponsor, `{\url}` is its URL, and `{\number}` is the grant number. The `{\sponsorID}` of the `\grantnum` command must correspond to the `{\sponsorID}` 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 `{\sponsorID}` 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}{https://doi.org/10.13039/501100001809} under Grant
No.: ~\grantnum{GS501100001809}{61273304}
and~\grantnum[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  $\text{\LaTeX}$  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.

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

```
\citestyle{acmauthoryear}
```

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

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

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

One of the more common versions is

```
\setcitestyle{nosort}
```

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

If you use natbib, then commands like `\citep` 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 B<sub>B</sub>T<sub>E</sub>X 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://wwtug.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>). 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 included, so you can use strings like `journal = taccess` for *ACM Transactions on Accessible Computing*.

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

You will find in this package two sets of style files for Bib<sub>La</sub>T<sub>E</sub>X, `acmnumeric` and `acmauthoryear`, that mimic the behaviour of the `ACM-Reference-Format.bst` Bib<sub>T</sub>E<sub>X</sub> style. They provide you access to all the power of Bib<sub>La</sub>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  $\LaTeX$  sources are set up when using Bib $\LaTeX$  instead of Bib $\TeX$ , that we summarize briefly here (please refer to the official Bib $\LaTeX$  documentation for more details).

In the preamble of your document you need to load the Bib $\LaTeX$  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 $\LaTeX$  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]: `ACMBlue`, `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.

### 2.15.1 Manual bibliography

Some people create bibliographies manually, writing down `\bibitem` commands explicitly. This approach is *not* recommended for ACM styles. The reason is, ACM submissions, besides being typeset, are also processed by special programs that extract metadata and references. Bibliographies created automatically with ACM styles contain customized macros for these programs, for example,

```
\bibitem[Ablamowicz and Fauser(2007)]%
    {Ablamowicz07}
\bibfield{author}{\bibinfo{person}{Rafal Ablamowicz} {and}
    \bibinfo{person}{Bertfried Fauser}.} \bibinfo{year}{2007}\natexlab{}.
\newblock \bibinfo{booktitle}{\emph{CLIFFORD: a Maple 11 Package for Clifford
    Algebra Computations, version 11}}.
\newblock
\urldef\tempurl%
\url{http://math.tntech.edu/rafal/cliff11/index.html}
\showURL{%
Retrieved February 28, 2008 from \tempurl}
```

Manual bibliographies without these macros may slow down the publication process, and thus are not recommended for ACM submissions.

### 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 `nomencl` [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
\brokenpenalty=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 \citep [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 Commons 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/357265/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                       |



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

| Abbreviation | Publication  |
|--------------|--|
| JDS          | ACM/IMS Journal of Data Science  |
| JEA          | ACM Journal of Experimental Algorithmics                                   |
| 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   |
| PACMOD       | PACM on Management of Data   |
| PACMNET      | PACM on Networking   |
| 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                         |
| 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  |

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

| Abbreviation | Publication  |
|--------------|--|
| 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                        |
| TOPML        | ACM Transactions on Probabilistic Machine Learning                           |
| 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.*) **sidebar:** textual information in the margin,

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

**marginfigure:** 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 [2023/03/25 v1.89 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, acmcp}[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{acmcp}
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@printfoliostrue}%
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@acmcp ACM cover page formatting
168 \newif\if@ACM@acmcp
169 \@ACM@acmcpfalse

```

#### 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 % acmcp
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 num-
ber
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@acmcp
274 \RequirePackage{framed}
275 \RequirePackage{zref-savepos, zref-user}
276 \fi

```

\@ACM@acmcp@delta We need to store the dimen to store the insert length of amcp box

```

277 \newdimen\@ACM@acmcp@delta
278 \@ACM@acmcp@delta=0pt\relax

```

### 3.6 Citations

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

```

279 \if@ACM@natbib
280 \RequirePackage{natbib}
281 \renewcommand{\bibsection}{%

```

```

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

```

```

336 \xdef\NAT@open{\@tempc}\fi
337 \def\@tempb{close}\ifx\@tempa\@tempb
338 \xdef\NAT@close{\@tempc}\fi
339 \def\@tempb{aysep}\ifx\@tempa\@tempb
340 \xdef\NAT@aysep{\@tempc}\fi
341 \def\@tempb{yysep}\ifx\@tempa\@tempb
342 \xdef\NAT@yrsep{\@tempc}\fi
343 \def\@tempb{notesep}\ifx\@tempa\@tempb
344 \xdef\NAT@cmt{\@tempc}\fi
345 \def\@tempb{citesep}\ifx\@tempa\@tempb
346 \xdef\NAT@sep{\@tempc}\fi
347 \fi
348 }%
349 \NAT@setcites
350 }
351 \renewcommand\citestyle[1]{%
352 \ifcsname bibstyle@#1\endcsname%
353 \csname bibstyle@#1\endcsname\let\bibstyle\@gobble%
354 \else%
355 \@latex@error{Undefined ‘#1’ citestyle}%
356 \fi
357 }%
358 \fi

```

`\bibstyle@acmauthoryear` The default author-year format:

```

359 \newcommand{\bibstyle@acmauthoryear}{%
360 \setcitestyle{%
361 authoryear,%
362 open={},close={},citesep={;},%
363 aysep={},yysep={},,%
364 notesep={, }}%

```

`\bibstyle@acmnumeric` The default numeric format:

```

365 \newcommand{\bibstyle@acmnumeric}{%
366 \setcitestyle{%
367 numbers,sort&compress,%
368 open={},close={},citesep={,},%
369 notesep={, }}%

```

The default is numeric:

```

370 \if@ACM@natbib
371 \citestyle{acmnumeric}
372 \fi

```

### 3.7 Internationalization

```

373 \if@ACM@journal
374 \renewcommand\keywordsname{Additional Key Words and Phrases}%
375 \else
376 \renewcommand\keywordsname{Keywords}%
377 \fi
378 \if@ACM@engage
379 \renewcommand\abstractname{Synopsis}%
380 \fi

```

```

381 \ifx\ACM@languages\empty
382 \else
383   \RequirePackage[\ACM@languages]{babel}%
384   \addto\captionsenglish{%
385     \if@ACM@journal
386       \renewcommand\keywordsname{Additional Key Words and Phrases}%
387     \else
388       \renewcommand\keywordsname{Keywords}%
389     \fi
390     \renewcommand\acksname{Acknowledgements}%
391     \if@ACM@engage
392       \renewcommand\abstractname{Synopsis}%
393     \fi
394   }%
395   \addto\captionsfrench{%
396     \if@ACM@journal
397       \renewcommand\keywordsname{Mots Clés et Phrases Supplémentaires}%
398     \else
399       \renewcommand\keywordsname{Mots clés}%
400     \fi
401     \renewcommand\acksname{Remerciements}%
402   }%
403   \addto\captionsgerman{%
404     \if@ACM@journal
405       \renewcommand\keywordsname{Zusätzliche Schlagwörter und Phrasen}%
406     \else
407       \renewcommand\keywordsname{Schlagwörter}%
408     \fi
409     \renewcommand\acksname{Danksagungen}%
410   }%
411   \addto\captionsspanish{%
412     \if@ACM@journal
413       \renewcommand\keywordsname{Palabras y Frases Claves Adicionales}%
414     \else
415       \renewcommand\keywordsname{Palabras claves}%
416     \fi
417     \renewcommand\acksname{Expresiones de gratitud}%
418   }%
419 \fi

```

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

```

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

```

```

\@translatedtitle
433 \def\@translatedtitle{}

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

\@translatedsubtitle
436 \def\@translatedsubtitle{}

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

\@translatedkeywords
439 \def\@translatedkeywords{}

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

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

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

\@savetranslatedabstract And saving the abstract
445 \long\def\@savetranslatedabstract#1{\if@ACM@maketitle@typeset
446 \ClassError{\@classname}{Abstract must be defined before maketitle
447 command. Please move it!}\fi
448 \ACM@lang@check{translatedabstract}%
449 \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:

```

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

```

```

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

```

```

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

```

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

```

542 \def\@starttoc#1#2{\begingroup\makeatletter
543   \setTrue{#1}%
544   \par\removelastskip\vskip\z@skip
545   \@startsection{section}\@M\z@{\linespacing\@plus\linespacing}%
546   {.5\linespacing}{\centering\contentsnamefont}{#2}%
547   \@input{\jobname.#1}%
548   \if@filesw
549     \xp\newwrite\csname tf@#1\endcsname
550     \immediate\xp\openout\csname tf@#1\endcsname \jobname.#1\relax
551   \fi
552   \global\@nobreakfalse \endgroup
553   \addvspace{32\p@\@plus14\p@}%
554 }

```

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

```

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

```

\l@subsection The spacing in amsart is too large

```

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

```

\l@subsubsection The spacing in amsart is too large

```

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

```

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

```
\@makefnmark We do not use indentation for footnotes
558 \def\@makefnmark{\noindent\@makefnmark}
```

```
\@footnotetext In sigchi-a mode our footnotes are in the margin!
559 \if@ACM@sigchiamode
560 \long\def\@footnotetext#1{\marginpar{%
561   \reset@font\small
562   \interlinepenalty\interfootnotelinepenalty
563   \protected@edef\@currentlabel{%
564     \csname p@footnote\endcsname\@thefnmark
565   }}%
566   \color@begingroup
567   \@makefnmark{%
568     \rule{z@footnotesep}{\ignorespaces#1\@finalstrut\strutbox}}%
569   \color@endgroup}}%
570 \fi
```

```
\@mpfootnotetext We want the footnotes in minipages centered:
571 \long\def\@mpfootnotetext#1{%
572   \global\setbox\@mpfootins\vbox{%
573     \unvbox\@mpfootins
574     \reset@font\footnotesize
575     \hsize\columnwidth
576     \parboxrestore
577     \protected@edef\@currentlabel
578       {\csname p@mpfootnote\endcsname\@thefnmark}%
579     \color@begingroup\centering
580     \@makefnmark{%
581       \rule{z@footnotesep}{\ignorespaces#1\@finalstrut\strutbox}}%
582     \color@endgroup}}
```

```
\@makefnmark AMS classes use a buggy definition of \@makefnmark. We revert to the standard one.
583 \def\@makefnmark{\hbox{\@textsuperscript{\normalfont\@thefnmark}}}
```

### 3.9 Hyperxmp and hyperref

Adding hyperxmp

```
584 \RequirePackage{hyperxmp}

And now, hyperref
585 \let\@footnotemark@nolink\@footnotemark
586 \let\@footnotetext@nolink\@footnotetext
587 \RequirePackage[bookmarksnumbered,unicode]{hyperref}
588 \pdfstringdefDisableCommands{%
589   \def\addtocounter#1#2{}%
590   \def\unskip{}%
591   \def\textbullet{- }%
592   \def\texttrightarrow{ -> }%
593   \def\footnotemark{}%
594 }
595 \urlstyle{rm}
596 \ifcase\ACM@format@nr
597 \relax % manuscript
```



```

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

```

644 \def\bibliographystyle#1{%
645   \ifx\@begindocumenthook\@undefined\else
646     \expandafter\AtBeginDocument

```

```

647 \fi
648 {\if@filesw
649 \immediate\write\@auxout{\string\bibstyle{#1}}}%
650 \fi}}

```

### 3.10 Other packages

Graphics and color.

```

651 \RequirePackage{graphicx}
652 \RequirePackage[prologue]{xcolor}

```

We define ACM colors according to [8]:

```

653 \definecolor[named]{ACMBlue}{cmyk}{1,0.1,0,0.1}
654 \definecolor[named]{ACMYellow}{cmyk}{0,0.16,1,0}
655 \definecolor[named]{ACMOrange}{cmyk}{0,0.42,1,0.01}
656 \definecolor[named]{ACMRed}{cmyk}{0,0.90,0.86,0}
657 \definecolor[named]{ACMLightBlue}{cmyk}{0.49,0.01,0,0}
658 \definecolor[named]{ACMGreen}{cmyk}{0.20,0,1,0.19}
659 \definecolor[named]{ACMPurple}{cmyk}{0.55,1,0,0.15}
660 \definecolor[named]{ACMDarkBlue}{cmyk}{1,0.58,0,0.21}

```

Author-draft mode or sigchi-a mode

```

661 \if@ACM@authordraft
662 \RequirePackage{draftwatermark}
663 \SetWatermarkFontSize{0.5in}
664 \SetWatermarkColor[gray]{.9}
665 \SetWatermarkText{\parbox{12em}{\centering
666 Unpublished working draft.\\
667 Not for distribution.}}
668 \else
669 \if@ACM@sigchiamode
670 \if@ACM@nonacm\else
671 \RequirePackage{draftwatermark}
672 \SetWatermarkFontSize{0.5in}
673 \SetWatermarkColor[gray]{.9}
674 \SetWatermarkText{\parbox{12em}{\centering
675 Legacy document. \\
676 Not for publication in an ACM venue}}
677 \fi
678 \fi
679 \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>.

```

680 \RequirePackage{geometry}
681 \ifcase\ACM@format@nr
682 \relax % manuscript
683 \geometry{letterpaper,head=13pt,
684 marginparwidth=6pc,heightrounded}%
685 \or % acmsmall
686 \geometry{twoside=true,

```

```

687     includeheadfoot, head=13pt, foot=2pc,
688     paperwidth=6.75in, paperheight=10in,
689     top=58pt, bottom=44pt, inner=46pt, outer=46pt,
690     marginparwidth=2pc,heightrounded
691 }%
692 \or % acmlarge
693 \geometry{twoside=true, head=13pt, foot=2pc,
694     paperwidth=8.5in, paperheight=11in,
695     includeheadfoot,
696     top=78pt, bottom=114pt, inner=81pt, outer=81pt,
697     marginparwidth=4pc,heightrounded
698 }%
699 \or % acmtog
700 \geometry{twoside=true, head=13pt, foot=2pc,
701     paperwidth=8.5in, paperheight=11in,
702     includeheadfoot, columnsep=24pt,
703     top=52pt, bottom=75pt, inner=52pt, outer=52pt,
704     marginparwidth=2pc,heightrounded
705 }%
706 \or % sigconf
707 \geometry{twoside=true, head=13pt,
708     paperwidth=8.5in, paperheight=11in,
709     includeheadfoot, columnsep=2pc,
710     top=57pt, bottom=73pt, inner=54pt, outer=54pt,
711     marginparwidth=2pc,heightrounded
712 }%
713 \or % siggraph
714 \geometry{twoside=true, head=13pt,
715     paperwidth=8.5in, paperheight=11in,
716     includeheadfoot, columnsep=2pc,
717     top=57pt, bottom=73pt, inner=54pt, outer=54pt,
718     marginparwidth=2pc,heightrounded
719 }%
720 \or % sigplan
721 \geometry{twoside=true, head=13pt,
722     paperwidth=8.5in, paperheight=11in,
723     includeheadfoot=false, columnsep=2pc,
724     top=1in, bottom=1in, inner=0.75in, outer=0.75in,
725     marginparwidth=2pc,heightrounded
726 }%
727 \or % sigchi
728 \geometry{twoside=true, head=13pt,
729     paperwidth=8.5in, paperheight=11in,
730     includeheadfoot, columnsep=2pc,
731     top=66pt, bottom=73pt, inner=54pt, outer=54pt,
732     marginparwidth=2pc,heightrounded
733 }%
734 \or % sigchi-a
735 \geometry{twoside=false, head=13pt,
736     paperwidth=11in, paperheight=8.5in,
737     includeheadfoot, marginparsep=72pt,
738     marginparwidth=170pt, columnsep=20pt,
739     top=72pt, bottom=72pt, left=314pt, right=72pt
740 }%

```

```

741 \mparswitchfalse
742 \reversemarginpar
743 \or % acmengage
744 \geometry{twoside=true, head=13pt,
745   paperwidth=8.5in, paperheight=11in,
746   includeheadfoot, columnsep=2pc,
747   top=57pt, bottom=73pt, inner=54pt, outer=54pt,
748   marginparwidth=2pc,heightrounded
749   }%
750 \or % acmcp
751 \geometry{twoside=true,
752   includeheadfoot, head=13pt, foot=2pc,
753   paperwidth=6.75in, paperheight=10in,
754   top=58pt, bottom=44pt, inner=46pt, outer=46pt,
755   marginparwidth=2pc,heightrounded
756   }%
757 \fi

```

#### \parindent Paragraphing

```

\parskip 758 \setlength\parindent{10\p@}
759 \setlength\parskip{\z@}
760 \ifcase\ACM@format@nr
761 \relax % manuscript
762 \or % acmsmall
763 \or % acmlarge
764 \or % acmtog
765 \setlength\parindent{9\p@}%
766 \or % sigconf
767 \or % siggraph
768 \or % sigplan
769 \or % sigchi
770 \or % sigchi-a
771 \or % acmengage
772 \or % acmcp
773 \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.

```
774 \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.

```

775 \def\copyrightpermissionfootnoterule{\kern-3\p@
776   \hrule \@width \columnwidth \kern 2.6\p@}

```

```

777 \RequirePackage{manyfoot}
778 \SelectFootnoteRule[2]{copyrightpermission}
779 \DeclareNewFootnote{authorsaddresses}
780 \SelectFootnoteRule[2]{copyrightpermission}
781 \DeclareNewFootnote{copyrightpermission}

```

\footnoterule Tschichold's rules:

```

782 \def\footnoterule{\kern-3\p@
783   \hrule \@width 4pc \kern 2.6\p@}

```

\endminipage We do not use footnote rules in minipages

```

784 \def\endminipage{%
785   \par
786   \unskip
787   \ifvoid\@mpfootins\else
788     \vskip\skip\@mpfootins
789     \normalcolor
790     \unvbox\@mpfootins
791   \fi
792   \@minipagefalse
793   \color@endgroup
794   \egroup
795   \expandafter\@iiiparbox\@mpargs{\unvbox\@tempboxa}}

```

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

```

796 \def\@textbottom{\vskip \z@ \@plus 1pt}
797 \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.

```

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

```

### 3.12 Fonts

Somehow PDF $\TeX$  and Xe $\TeX$  require different incantations to make a PDF compliant with the current Acrobat bugs. Xpdf is much better.

The code below is by Ross Moore.

```
818 \ifPDF $\TeX$ 
819 \input{glyptounicode}
820 \pdfglyptounicode{f_f}{FB00}
821 \pdfglyptounicode{f_f_i}{FB03}
822 \pdfglyptounicode{f_f_l}{FB04}
823 \pdfglyptounicode{f_i}{FB01}
824 \pdfglyptounicode{t_t}{0074 0074}
825 \pdfglyptounicode{f_t}{0066 0074}
826 \pdfglyptounicode{T_h}{0054 0068}
827 \pdfgentounicode=1
828 \RequirePackage{cmap}
829 \fi
```

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

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

We use Libertine throughout.

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

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

```
863 \let\liningnums\@undefined
864 \AtEndPreamble{%
865   \DeclareTextFontCommand{\liningnums}{\libertineLF}}
```

The SIGCHI extended abstracts are sans serif:

```
866 \ifACM@sigchiamode
867   \renewcommand{\familydefault}{\sfdefault}
868 \fi
```

### 3.13 Image descriptions

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

```
869 \newif\if@Description@present
870 \@Description@presenttrue
```

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

```
871 \newif\if@undescrbed@images
872 \@undescrbed@imagesfalse
```

`\Description` The `Description` macro right now just sets switches

```
873 \newcommand\Description[2][\global\@Description@presenttrue\ignorespaces]
```

The global warning

```
874 \AtEndDocument{\if@undescrbed@images
875   \ClassWarningNoLine{\@classname}{Some images may lack descriptions}\fi}
```

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

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

```

899 \let\@vspacer\@vspacer@orig}
900 \AtBeginEnvironment{minted}{\let\@vspace\@vspace@orig
901 \let\@vspacer\@vspacer@orig}
902 \AtBeginEnvironment{minted*}{\let\@vspace\@vspace@orig
903 \let\@vspacer\@vspacer@orig}
904 \AtBeginEnvironment{listing}{\let\@vspace\@vspace@orig
905 \let\@vspacer\@vspacer@orig}
906 \AtBeginEnvironment{listing*}{\let\@vspace\@vspace@orig
907 \let\@vspacer\@vspacer@orig}
908

```

### 3.14 Floats

We use the caption package

```

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

```

sidebar The sidebar environment:

```

943 \newfloat{sidebar}{}{sbar}
944 \floatname{sidebar}{Sidebar}
945 \renewenvironment{sidebar}{\Collect@Body\@sidebar}{}

```



```

\@sidebar The processing of the saved text
946 \long\def\@sidebar#1{\bgroup\let\@vspace\@vspace@orig
947 \let\@vspacer\@vspacer@orig\captionsetup{type=sidebar}%
948 \marginpar{\small#1}\egroup}

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

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

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

\@margintable The processing of the saved text
961 \long\def\@margintable#1{\bgroup\let\@vspace\@vspace@orig
962 \let\@vspacer\@vspacer@orig\captionsetup{type=table}%
963 \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
964 \newdimen\fulltextwidth
965 \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)
966 \if@ACM@sigchiamode
967 \def\@dblfloat{\bgroup\let\@vspace\@vspace@orig
968 \let\@vspacer\@vspacer@orig\columnwidth=\fulltextwidth
969 \let\@endfloatbox\@endwidefloatbox
970 \def\@fpsadddefault{\def\@fps{tp}}%
971 \@float}
972 \fi

\end@dblfloat And the end. Just adding a \bgroup.
973 \if@ACM@sigchiamode
974 \def\end@dblfloat{%
975 \end@float\egroup}
976 \fi

```

`\@endwidefloatbox` This is the end of a wide box—we basically move everything to the left

```

977 \def\@endwidefloatbox{%
978   \par\vskip\z@skip
979   \@minipagefalse
980   \outer@nobreak
981   \egroup
982   \color@endbox
983   \global\setbox\@currbox=\vbox{\moveleft
984     \dimexpr(\fulltextwidth-\textwidth)\box\@currbox}%
985   \wd\@currbox=\textwidth
986 }

```

### 3.15 Lists

```

987 \ifcase\ACM@format@nr
988 \relax % manuscript
989 \or % acmsmall
990 \or % acmlarge
991 \or % acmtog
992 \or % sigconf
993 \or % siggraph
994 \or % sigplan
995 \def\labelenumi{\theenumi.}
996 \def\labelenumii{\theenumii.}
997 \def\labelenumiii{\theenumiii.}
998 \def\labelenumiv{\theenumiv.}
999 \or % sigchi
1000 \or % sigchi-a
1001 \or % acmengage
1002 \or % acmcp
1003 \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`.

```

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

```

```

1020 \addtolength\leftmarginii{\@ACM@labelwidth}
1021 \setlength\leftmarginiii{\leftmarginii}
1022 \setlength\leftmarginiv{\leftmarginiii}
1023 \setlength\leftmarginv{\leftmarginiv}
1024 \setlength\leftmarginvi{\leftmarginv}
1025 \@listi}
1026 \newskip\listisep
1027 \listisep\smallskipamount
1028 \def\@listI{\leftmargin\leftmargini
1029 \labelwidth\leftmargini \advance\labelwidth-\labelsep
1030 \listparindent\z@
1031 \topsep\listisep}
1032 \let\@listi\@listI
1033 \def\@listii{\leftmargin\leftmarginii
1034 \labelwidth\leftmarginii \advance\labelwidth-\labelsep
1035 \topsep\z@skip}
1036 \def\@listiii{\leftmargin\leftmarginiii
1037 \labelwidth\leftmarginiii \advance\labelwidth-\labelsep}
1038 \def\@listiv{\leftmargin\leftmarginiv
1039 \labelwidth\leftmarginiv \advance\labelwidth-\labelsep}
1040 \def\@listv{\leftmargin\leftmarginv
1041 \labelwidth\leftmarginv \advance\labelwidth-\labelsep}
1042 \def\@listvi{\leftmargin\leftmarginvi
1043 \labelwidth\leftmarginvi \advance\labelwidth-\labelsep}

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

1044 \renewcommand{\descriptionlabel}[1]{\upshape\bfseries #1}

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

1045 \renewenvironment{description}{\list{}}{%
1046 \labelwidth\@ACM@labelwidth
1047 \let\makelabel\descriptionlabel}%
1048 }{
1049 \endlist
1050 }
1051 \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.

```

1052 \newif\if@ACM@maketitle@typeset
1053 \@ACM@maketitle@typesetfalse

```

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

```

1054 \define@choicekey*+{ACM}{acmJournal}[\@journalCode\@journalCode@nr]{%
1055 ACMJCSS,%
1056 CIE,%
1057 CSUR,%
1058 DGOV,%
1059 DLT,%
1060 DTRAP,%
1061 FAC,%

```

1062 GAMES,%  
1063 HEALTH,%  
1064 IMWUT,%  
1065 JACM,%  
1066 JATS,%  
1067 JDIQ,%  
1068 JDS,%  
1069 JEA,%  
1070 JERIC,%  
1071 JETC,%  
1072 JOCCH,%  
1073 JRC,%  
1074 PACMCGIT,%  
1075 PACMHCI,%  
1076 PACMMOD,%  
1077 PACMNET,%  
1078 PACMPL,%  
1079 POMACS,%  
1080 TAAS,%  
1081 TACCESS,%  
1082 TACO,%  
1083 TALG,%  
1084 TALLIP,%  
1085 TAP,%  
1086 TCPS,%  
1087 TDS,%  
1088 TEAC,%  
1089 TECS,%  
1090 TELO,%  
1091 THRI,%  
1092 TIIS,%  
1093 TIOT,%  
1094 TISSEC,%  
1095 TIST,%  
1096 TKDD,%  
1097 TMIS,%  
1098 TOCE,%  
1099 TOCHI,%  
1100 TOCL,%  
1101 TOCS,%  
1102 TOCT,%  
1103 TODAES,%  
1104 TODS,%  
1105 TOG,%  
1106 TOIS,%  
1107 TOIT,%  
1108 TOMACS,%  
1109 TOMM,%  
1110 TOMPECS,%  
1111 TOMS,%  
1112 TOPC,%  
1113 TOPS,%  
1114 TOPLAS,%  
1115 TOPML,%

```

1116 TORS,%
1117 TOS,%
1118 TOSEM,%
1119 TOSN,%
1120 TQC,%
1121 TRETs,%
1122 TSAS,%
1123 TSC,%
1124 TSLP,%
1125 TWEB,%
1126 FACMP%
1127 }{%
1128 \ifcase\@journalCode@nr
1129 \relax % ACMJCSS
1130 \def\@journalName{ACM Journal on Computing and Sustainable Societies}%
1131 \def\@journalNameShort{ACM J. Comput. Sustain. Soc.}%
1132 \def\@permissionCodeOne{2834-5533}%
1133 \or % CIE
1134 \def\@journalName{ACM Computers in Entertainment}%
1135 \def\@journalNameShort{ACM Comput. Entertain.}%
1136 \def\@permissionCodeOne{1544-3574}%
1137 \or % CSUR
1138 \def\@journalName{ACM Computing Surveys}%
1139 \def\@journalNameShort{ACM Comput. Surv.}%
1140 \def\@permissionCodeOne{0360-0300}%
1141 \or % DGOV
1142 \def\@journalName{Digital Government: Research and Practice}%
1143 \def\@journalNameShort{Digit. Gov. Res. Pract.}%
1144 \def\@permissionCodeOne{2639-0175}%
1145 \or % DLT
1146 \def\@journalName{Distributed Ledger Technologies: Research and Practice}%
1147 \def\@journalNameShort{Distrib. Ledger Technol.}%
1148 \def\@permissionCodeOne{2769-6472}%
1149 \or % DTRAP
1150 \def\@journalName{Digital Threats: Research and Practice}%
1151 \def\@journalNameShort{Digit. Threat. Res. Pract.}%
1152 \def\@permissionCodeOne{2576-5337}%
1153 \or % FAC
1154 \def\@journalName{Formal Aspects of Computing}%
1155 \def\@journalNameShort{Form. Asp. Comput.}%
1156 \def\@permissionCodeOne{0934-5043}%
1157 \def\@permissionCodeTwo{1433-299X}%
1158 \or % GAMES
1159 \def\@journalName{ACM Games: Research and Practice}%
1160 \def\@journalNameShort{ACM Games}%
1161 \def\@permissionCodeOne{2832-5516}%
1162 \or % HEALTH
1163 \def\@journalName{ACM Transactions on Computing for Healthcare}%
1164 \def\@journalNameShort{ACM Trans. Comput. Healthcare}%
1165 \def\@permissionCodeOne{2637-8051}%
1166 \or % IMWUT
1167 \def\@journalName{Proceedings of the ACM on Interactive, Mobile,
1168 Wearable and Ubiquitous Technologies}%
1169 \def\@journalNameShort{Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.}%

```

```

1170 \def\@permissionCodeOne{2474-9567}%
1171 \@ACM@screentru
1172 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
1173 \or % JACM
1174 \def\@journalName{Journal of the ACM}%
1175 \def\@journalNameShort{J. ACM}%
1176 \def\@permissionCodeOne{0004-5411}%
1177 \or % JATS
1178 \def\@journalName{Journal on Autonomous Transportation Systems}%
1179 \def\@journalNameShort{ACM J. Auton. Transport. Syst.}%
1180 \def\@permissionCodeOne{2833-0528}%
1181 \or % JDIQ
1182 \def\@journalName{ACM Journal of Data and Information Quality}%
1183 \def\@journalNameShort{ACM J. Data Inform. Quality}%
1184 \def\@permissionCodeOne{1936-1955}%
1185 \or % JDS
1186 \def\@journalName{ACM/JMS Journal of Data Science}%
1187 \def\@journalNameShort{ACM/IMS J. Data Sci.}%
1188 \def\@permissionCodeOne{2831-3194}%
1189 \def\@permissionCodeTwo{2831-3194}%
1190 \or % JEA
1191 \def\@journalName{ACM Journal of Experimental Algorithmics}%
1192 \def\@journalNameShort{ACM J. Exp. Algor.}%
1193 \def\@permissionCodeOne{1084-6654}%
1194 \or % JERIC
1195 \def\@journalName{ACM Journal of Educational Resources in Computing}%
1196 \def\@journalNameShort{ACM J. Edu. Resources in Comput.}%
1197 \def\@permissionCodeOne{1073-0516}%
1198 \or % JETC
1199 \def\@journalName{ACM Journal on Emerging Technologies in Computing Systems}%
1200 \def\@journalNameShort{ACM J. Emerg. Technol. Comput. Syst.}%
1201 \def\@permissionCodeOne{1550-4832}%
1202 \or % JOCCH
1203 \def\@journalName{ACM Journal on Computing and Cultural Heritage}%
1204 \def\@journalNameShort{ACM J. Comput. Cult. Herit.}%
1205 \def\@permissionCodeOne{1556-4673}%
1206 \def\@permissionCodeTwo{1556-4711}%
1207 \or % JRC
1208 \def\@journalName{ACM Journal on Responsible Computing}%
1209 \def\@journalNameShort{ACM J. Responsib. Comput.}%
1210 \def\@permissionCodeOne{2832-0565}%
1211 \or % PACMCGIT
1212 \def\@journalName{Proceedings of the ACM on Computer Graphics and Interactive Techniques}%
1213 \def\@journalNameShort{Proc. ACM Comput. Graph. Interact. Tech.}%
1214 \def\@permissionCodeOne{2577-6193}%
1215 \@ACM@screentru
1216 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
1217 \or % PACMHCI
1218 \def\@journalName{Proceedings of the ACM on Human-Computer Interaction}%
1219 \def\@journalNameShort{Proc. ACM Hum.-Comput. Interact.}%
1220 \def\@permissionCodeOne{2573-0142}%
1221 \@ACM@screentru
1222 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
1223 \or % PACMMOD

```

```

1224 \def\@journalName{Proceedings of the ACM on Management of Data}%
1225 \def\@journalNameShort{Proc. ACM Manag. Data}%
1226 \def\@permissionCodeOne{2836-6573}%
1227 \or % PACMNET
1228 \def\@journalName{Proceedings of the ACM on Networkng}%
1229 \def\@journalNameShort{Proc. ACM Netw.}%
1230 \def\@permissionCodeOne{2834-5509}%
1231 \or % PACMPL
1232 \def\@journalName{Proceedings of the ACM on Programming Languages}%
1233 \def\@journalNameShort{Proc. ACM Program. Lang.}%
1234 \def\@permissionCodeOne{2475-1421}%
1235 \@ACM@screentru
1236 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
1237 \or % POMACS
1238 \def\@journalName{Proceedings of the ACM on Measurement and Analysis of Computing Systems}%
1239 \def\@journalNameShort{Proc. ACM Meas. Anal. Comput. Syst.}%
1240 \def\@permissionCodeOne{2476-1249}%
1241 \@ACM@screentru
1242 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
1243 \or % TAAS
1244 \def\@journalName{ACM Transactions on Autonomous and Adaptive Systems}%
1245 \def\@journalNameShort{ACM Trans. Autonom. Adapt. Syst.}%
1246 \def\@permissionCodeOne{1556-4665}%
1247 \or % TACCESS
1248 \def\@journalName{ACM Transactions on Accessible Computing}%
1249 \def\@journalNameShort{ACM Trans. Access. Comput.}%
1250 \def\@permissionCodeOne{1936-7228}%
1251 \or % TACO
1252 \def\@journalName{ACM Transactions on Architecture and Code Optimization}%
1253 \def\@journalNameShort{ACM Trans. Arch. Code Optim.}%
1254 \def\@permissionCodeOne{1544-3566}%
1255 \def\@permissionCodeTwo{1544-3973}%
1256 \or % TALG
1257 \def\@journalName{ACM Transactions on Algorithms}%
1258 \def\@journalNameShort{ACM Trans. Algor.}%
1259 \def\@permissionCodeOne{1549-6325}%
1260 \or % TALLIP
1261 \def\@journalName{ACM Transactions on Asian and Low-Resource Language Information Processing}%
1262 \def\@journalNameShort{ACM Trans. Asian Low-Resour. Lang. Inf. Process.}%
1263 \def\@permissionCodeOne{2375-4699}%
1264 \or % TAP
1265 \def\@journalName{ACM Transactions on Applied Perception}%
1266 \def\@journalNameShort{ACM Trans. Appl. Percept.}%
1267 \def\@permissionCodeOne{1544-3558}%
1268 \or % TCPS
1269 \def\@journalName{ACM Transactions on Cyber-Physical Systems}%
1270 \def\@journalNameShort{ACM Trans. Cyber-Phys. Syst.}%
1271 \def\@permissionCodeOne{2378-962X}%
1272 \or % TDS
1273 \def\@journalName{ACM/IMS Transactions on Data Science}%
1274 \def\@journalNameShort{ACM/IMS Trans. Data Sci.}%
1275 \def\@permissionCodeOne{2577-3224}%
1276 \or % TEAC
1277 \def\@journalName{ACM Transactions on Economics and Computation}%

```

```

1278 \def\@journalNameShort{ACM Trans. Econ. Comput.}%
1279 \def\@permissionCodeOne{2167-8375}%
1280 \or % TECS
1281 \def\@journalName{ACM Transactions on Embedded Computing Systems}%
1282 \def\@journalNameShort{ACM Trans. Embedd. Comput. Syst.}%
1283 \def\@permissionCodeOne{1539-9087}%
1284 \or % TELO
1285 \def\@journalName{ACM Transactions on Evolutionary Learning}%
1286 \def\@journalNameShort{ACM Trans. Evol. Learn.}%
1287 \def\@permissionCodeOne{2688-3007}%
1288 \or % THRI
1289 \def\@journalName{ACM Transactions on Human-Robot Interaction}%
1290 \def\@journalNameShort{ACM Trans. Hum.-Robot Interact.}%
1291 \def\@permissionCodeOne{2573-9522}%
1292 \or % TIIS
1293 \def\@journalName{ACM Transactions on Interactive Intelligent Systems}%
1294 \def\@journalNameShort{ACM Trans. Interact. Intell. Syst.}%
1295 \def\@permissionCodeOne{2160-6455}%
1296 \or % TIOT
1297 \def\@journalName{ACM Transactions on Internet of Things}%
1298 \def\@journalNameShort{ACM Trans. Internet Things}%
1299 \def\@permissionCodeOne{2577-6207}%
1300 \or % TISSEC
1301 \def\@journalName{ACM Transactions on Information and System Security}%
1302 \def\@journalNameShort{ACM Trans. Info. Syst. Sec.}%
1303 \def\@permissionCodeOne{1094-9224}%
1304 \or % TIST
1305 \def\@journalName{ACM Transactions on Intelligent Systems and Technology}%
1306 \def\@journalNameShort{ACM Trans. Intell. Syst. Technol.}%
1307 \def\@permissionCodeOne{2157-6904}%
1308 \or % TKDD
1309 \def\@journalName{ACM Transactions on Knowledge Discovery from Data}%
1310 \def\@journalNameShort{ACM Trans. Knowl. Discov. Data.}%
1311 \def\@permissionCodeOne{1556-4681}%
1312 \or % TMIS
1313 \def\@journalName{ACM Transactions on Management Information Systems}%
1314 \def\@journalNameShort{ACM Trans. Manag. Inform. Syst.}%
1315 \def\@permissionCodeOne{2158-656X}%
1316 \or % TOCE
1317 \def\@journalName{ACM Transactions on Computing Education}%
1318 \def\@journalNameShort{ACM Trans. Comput. Educ.}%
1319 \def\@permissionCodeOne{1946-6226}%
1320 \or % TOCHI
1321 \def\@journalName{ACM Transactions on Computer-Human Interaction}%
1322 \def\@journalNameShort{ACM Trans. Comput.-Hum. Interact.}%
1323 \def\@permissionCodeOne{1073-0516}%
1324 \or % TOCL
1325 \def\@journalName{ACM Transactions on Computational Logic}%
1326 \def\@journalNameShort{ACM Trans. Comput. Logic}%
1327 \def\@permissionCodeOne{1529-3785}%
1328 \or % TOCS
1329 \def\@journalName{ACM Transactions on Computer Systems}%
1330 \def\@journalNameShort{ACM Trans. Comput. Syst.}%
1331 \def\@permissionCodeOne{0734-2071}%

```



```

1332 \or % TOCT
1333 \def\@journalName{ACM Transactions on Computation Theory}%
1334 \def\@journalNameShort{ACM Trans. Comput. Theory}%
1335 \def\@permissionCodeOne{1942-3454}%
1336 \or % TODAES
1337 \def\@journalName{ACM Transactions on Design Automation of Electronic Systems}%
1338 \def\@journalNameShort{ACM Trans. Des. Autom. Electron. Syst.}%
1339 \def\@permissionCodeOne{1084-4309}%
1340 \or % TODS
1341 \def\@journalName{ACM Transactions on Database Systems}%
1342 \def\@journalNameShort{ACM Trans. Datab. Syst.}%
1343 \def\@permissionCodeOne{0362-5915}%
1344 \or % TOG
1345 \def\@journalName{ACM Transactions on Graphics}%
1346 \def\@journalNameShort{ACM Trans. Graph.}%
1347 \def\@permissionCodeOne{0730-0301}%
1348 \or % TOIS
1349 \def\@journalName{ACM Transactions on Information Systems}%
1350 \def\@journalNameShort{ACM Trans. Inf. Syst.}%
1351 \def\@permissionCodeOne{1046-8188}%
1352 \or % TOIT
1353 \def\@journalName{ACM Transactions on Internet Technology}%
1354 \def\@journalNameShort{ACM Trans. Internet Technol.}%
1355 \def\@permissionCodeOne{1533-5399}%
1356 \or % TOMACS
1357 \def\@journalName{ACM Transactions on Modeling and Computer Simulation}%
1358 \def\@journalNameShort{ACM Trans. Model. Comput. Simul.}%
1359 \def\@permissionCodeOne{1049-3301}%
1360 \def\@permissionCodeTwo{1558-1195}%
1361 \or % TOMM
1362 \def\@journalName{ACM Transactions on Multimedia Computing, Communications and Applications}%
1363 \def\@journalNameShort{ACM Trans. Multimedia Comput. Commun. Appl.}%
1364 \def\@permissionCodeOne{1551-6857}%
1365 \def\@permissionCodeTwo{1551-6865}%
1366 \or % TOMPECS
1367 \def\@journalName{ACM Transactions on Modeling and Performance Evaluation of Computing Systems}%
1368 \def\@journalNameShort{ACM Trans. Model. Perform. Eval. Comput. Syst.}%
1369 \def\@permissionCodeOne{2376-3639}%
1370 \or % TOMS
1371 \def\@journalName{ACM Transactions on Mathematical Software}%
1372 \def\@journalNameShort{ACM Trans. Math. Softw.}%
1373 \def\@permissionCodeOne{0098-3500}%
1374 \or % TOPC
1375 \def\@journalName{ACM Transactions on Parallel Computing}%
1376 \def\@journalNameShort{ACM Trans. Parallel Comput.}%
1377 \def\@permissionCodeOne{2329-4949}%
1378 \def\@permissionCodeTwo{2329-4957}%
1379 \or % TOPS
1380 \def\@journalName{ACM Transactions on Privacy and Security}%
1381 \def\@journalNameShort{ACM Trans. Priv. Sec.}%
1382 \def\@permissionCodeOne{2471-2566}%
1383 \or % TOPLAS
1384 \def\@journalName{ACM Transactions on Programming Languages and Systems}%
1385 \def\@journalNameShort{ACM Trans. Program. Lang. Syst.}%

```

```

1386 \def\@permissionCodeOne{0164-0925}%
1387 \or % TOPML
1388 \def\@journalName{ACM Transactions on Probabilistic Machine Learning}%
1389 \def\@journalNameShort{ACM Trans. Probab. Mach. Learn.}%
1390 \def\@permissionCodeOne{}%
1391 \or % TORS
1392 \def\@journalName{ACM Transactions on Recommender Systems}%
1393 \def\@journalNameShort{ACM Trans. Recomm. Syst.}%
1394 \def\@permissionCodeOne{2770-6699}%
1395 \or % TOS
1396 \def\@journalName{ACM Transactions on Storage}%
1397 \def\@journalNameShort{ACM Trans. Storage}%
1398 \def\@permissionCodeOne{1553-3077}%
1399 \or % TOSEM
1400 \def\@journalName{ACM Transactions on Software Engineering and Methodology}%
1401 \def\@journalNameShort{ACM Trans. Softw. Eng. Methodol.}%
1402 \def\@permissionCodeOne{1049-331X}%
1403 \or % TOSN
1404 \def\@journalName{ACM Transactions on Sensor Networks}%
1405 \def\@journalNameShort{ACM Trans. Sensor Netw.}%
1406 \def\@permissionCodeOne{1550-4859}%
1407 \or % TQC
1408 \def\@journalName{ACM Transactions on Quantum Computing}%
1409 \def\@journalNameShort{ACM Trans. Quantum Comput.}%
1410 \def\@permissionCodeOne{2643-6817}%
1411 \or % TRET
1412 \def\@journalName{ACM Transactions on Reconfigurable Technology and Systems}%
1413 \def\@journalNameShort{ACM Trans. Reconfig. Technol. Syst.}%
1414 \def\@permissionCodeOne{1936-7406}%
1415 \or % TSAS
1416 \def\@journalName{ACM Transactions on Spatial Algorithms and Systems}%
1417 \def\@journalNameShort{ACM Trans. Spatial Algorithms Syst.}%
1418 \def\@permissionCodeOne{2374-0353}%
1419 \or % TSC
1420 \def\@journalName{ACM Transactions on Social Computing}%
1421 \def\@journalNameShort{ACM Trans. Soc. Comput.}%
1422 \def\@permissionCodeOne{2469-7818}%
1423 \or % TSLP
1424 \def\@journalName{ACM Transactions on Speech and Language Processing}%
1425 \def\@journalNameShort{ACM Trans. Speech Lang. Process.}%
1426 \def\@permissionCodeOne{1550-4875}%
1427 \or % TWEB
1428 \def\@journalName{ACM Transactions on the Web}%
1429 \def\@journalNameShort{ACM Trans. Web}%
1430 \def\@permissionCodeOne{1559-1131}%
1431 \else % FACMP, a dummy journal
1432 \def\@journalName{ACM Just Accepted}%
1433 \def\@journalNameShort{ACM Accepted}%
1434 \def\@permissionCodeOne{XXXX-XXXX}%
1435 \fi
1436 \ClassInfo{\@classname}{Using journal code \@journalCode}%
1437 }{%
1438 \ClassError{\@classname}{Incorrect journal #1}%
1439 }%

```

`\acmJournal` And the syntactic sugar around it

```
1440 \def\acmJournal#1{\setkeys{ACM}{acmJournal=#1}%
1441 \global\@ACM@journal@bibstriptrue}
```

The defaults:

```
1442 \def\@journalCode@nr{0}
1443 \def\@journalName{}%
1444 \def\@journalNameShort{\@journalName}%
1445 \def\@permissionCodeOne{XXXX-XXXX}%
1446 \def\@permissionCodeTwo{}%
```

`\acmConference` This is the conference command

```
1447 \newcommand\acmConference[4][{}]{%
1448 \gdef\acmConference@shortname{#1}%
1449 \gdef\acmConference@name{#2}%
1450 \gdef\acmConference@date{#3}%
1451 \gdef\acmConference@venue{#4}%
1452 \ifx\acmConference@shortname\@empty
1453 \gdef\acmConference@shortname{#2}%
1454 \fi
1455 \global\@ACM@journal@bibstripfalse
1456 }
1457 \if@ACM@journal\else
1458 \acmConference[Conference'17]{ACM Conference}{July 2017}{Washington,
1459 DC, USA}%
1460 \fi
```

`\acmBooktitle` The book title of the conference:

```
\@acmBooktitle 1461 \def\acmBooktitle#1{\gdef\@acmBooktitle{#1}}
1462 \acmBooktitle{}
1463 \ifx\acmConference@name\undefined\else
1464 \acmBooktitle{Proceedings of \acmConference@name
1465 \ifx\acmConference@name\acmConference@shortname\else
1466 \ (\acmConference@shortname)\fi}
1467 \fi
```

`\@editorsAbbrev` How to abbreviate editors

```
1468 \def\@editorsAbbrev{(Ed.)}
```

`\@acmEditors` The list of editors

```
1469 \def\@acmEditors{}
```

`\editor` Add a new editor to the list

```
1470 \def\editor#1{\ifx\@acmEditors\@empty
1471 \gdef\@acmEditors{#1}%
1472 \else
1473 \gdef\@editorsAbbrev{(Eds.)}%
1474 \g@addto@macro\@acmEditors{\and#1}%
1475 \fi}
```

`\subtitle` The subtitle macro

```
1476 \def\subtitle#1{\def\@subtitle{#1}}
1477 \subtitle{}
```

`\num@authorgroups` The total number of “groups”. Each group is several authors with the same affiliations(s)

```
1478 \newcount\num@authorgroups
1479 \num@authorgroups=0\relax
```

`\num@authors` The total number of authors

```
1480 \newcount\num@authors
1481 \num@authors=0\relax
```

`\if@insideauthorgroup` Whether we are continuing an author group

```
1482 \newif\if@insideauthorgroup
1483 \@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.

```
1484 \renewcommand\author[2][{}%
1485 \IfSubStr{\detokenize{#2}}{,}{\ClassWarning{\@classname}{Do not put several
1486   authors in the same \string\author\space macro!}}{}%
1487 \global\advance\num@authors by 1\relax
1488 \if@insideauthorgroup\else
1489   \global\advance\num@authorgroups by 1\relax
1490   \global\@insideauthorgrouptrue
1491 \fi
1492 \ifx\addresses\@empty
1493   \if@ACM@anonymous
1494     \gdef\addresses{\@author{Anonymous Author(s)}%
1495       \ifx\@acmSubmissionID\@empty\else\Submission Id:
1496         \@acmSubmissionID\fi}%
1497     \gdef\authors{Anonymous Author(s)}%
1498   \else
1499     \expandafter\gdef\expandafter\addresses\expandafter{%
1500       \expandafter\@author\expandafter{%
1501         \csname typeset@author\the\num@authors\endcsname{#2}}}%
1502     \gdef\authors{#2}%
1503   \fi
1504 \else
1505   \if@ACM@anonymous\else
1506     \expandafter\g@addto@macro\expandafter\addresses\expandafter{%
1507       \expandafter\and\expandafter\@author\expandafter{%
1508         \csname typeset@author\the\num@authors\endcsname{#2}}}%
1509     \g@addto@macro\authors{\and#2}%
1510   \fi
1511 \fi
1512 \if@ACM@anonymous
1513   \ifx\shortauthors\@empty
1514     \gdef\shortauthors{Anon.
1515       \ifx\@acmSubmissionID\@empty\else Submission Id:
1516         \@acmSubmissionID\fi}%
1517   \fi
1518 \else
```

```

1519 \def\@tempa{#1}%
1520 \ifx\@tempa\@empty
1521 \ifx\shortauthors\@empty
1522 \gdef\shortauthors{#2}%
1523 \else
1524 \g@addto@macro\shortauthors{\and#2}%
1525 \fi
1526 \else
1527 \ifx\shortauthors\@empty
1528 \gdef\shortauthors{#1}%
1529 \else
1530 \g@addto@macro\shortauthors{\and#1}%
1531 \fi
1532 \fi
1533 \fi}

```

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

```

1534 \newcommand{\affiliation}[2][{}]{%
1535 \global\@insideauthorgroupfalse
1536 \if@ACM@anonymous\else
1537 \g@addto@macro\addresses{\affiliation{#1}{#2}}%
1538 \fi}

```

**ACM@affiliation@obeypunctuation** Whether to use the author's punctuation (false by default, which adds American-style address punctuation)

```

1539 \define@boolkey+{@ACM@affiliation@}{@ACM@affiliation@}{obeypunctuation}%
1540 [true]{\ClassError{\@classname}{The option obeypunctuation can be either true or false}}

```

**\additionalaffiliation** Additional affiliations go to footnotes

```

1541 \def\additionalaffiliation#1{\authornote{\@additionalaffiliation{#1}}}

```

**\@additionalaffiliation** Process `\additionalaffiliation` inside `\authornote`

```

1542 \def\@additionalaffiliation#1{\bgroup
1543 \def\position##1{\ignorespaces}%
1544 \def\institution##1{##1\ignorespaces}%
1545 \def\department{\@ifnextchar[{\@department}{\@department[]}}%
1546 \def\@department[##1]##2{\unskip, ##2\ignorespaces}%
1547 \let\streetaddress\position
1548 \let\city\position
1549 \let\state\position
1550 \let\postcode\position
1551 \let\country\position
1552 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.

```

1553 \renewcommand{\email}[2][{}]{%
1554 \IfSubStr{#2}{,}{\ClassWarning{\@classname}{Do not put several
1555 addresses in the same \string\email\space macro!}}{}%
1556 \if@ACM@anonymous\else
1557 \g@addto@macro\addresses{\email{#1}{#2}}%
1558 \fi}

```

`\orcid` We redefine the command to typeset the current author

```
1559 \def\orcid#1{\unskip\ignorespaces%
1560   \IfBeginWith{#1}{http}{%
1561     \expandafter\gdef\csname
1562       typeset@author\the\num@authors\endcsname##1{%
1563       \href{#1}{##1}}}%
1564   \expandafter\gdef\csname
1565     typeset@author\the\num@authors\endcsname##1{%
1566     \href{https://orcid.org/#1}{##1}}}
```

`\authorsaddresses` Setting up authors' addresses

```
1567 \def\authorsaddresses#1{\def\@authorsaddresses{#1}}
1568 \authorsaddresses{\mkauthorsaddresses}
```

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

```
1569 \newcommand\mktranslatedkeywords[2]{\bgroup
1570   \selectlanguage{#1}%
1571   {\@specialsection{keywordsname}%
1572     \noindent#2\par}\egroup}
```

`\@titlenotes` The title notes

```
1573 \def\@titlenotes{}
```

`\titlenote` Adding a note to the title

```
1574 \def\titlenote#1{%
1575   \g@addto@macro\@title{\footnotemark}%
1576   \if@ACM@anonymous
1577     \g@addto@macro\@titlenotes{%
1578       \stepcounter{footnote}\footnotetext{Title note}}%
1579   \else
1580     \g@addto@macro\@titlenotes{\stepcounter{footnote}\footnotetext{#1}}%
1581   \fi}
```

`\@subtitlenotes` The subtitle notes

```
1582 \def\@subtitlenotes{}
```

`\subtitlenote` Adding a note to the subtitle

```
1583 \def\subtitlenote#1{%
1584   \g@addto@macro\@subtitle{\footnotemark}%
1585   \if@ACM@anonymous
1586     \g@addto@macro\@subtitlenotes{%
1587       \stepcounter{footnote}\footnotetext{Subtitle note}}%
1588   \else
1589     \g@addto@macro\@subtitlenotes{%
1590       \stepcounter{footnote}\footnotetext{#1}}%
1591   \fi}
```

`\@authornotes` The author notes

```
1592 \def\@authornotes{}
```

`\authornote` Adding a note to the author

```
1593 \def\authornote#1{%
1594   \if@ACM@anonymous\else
```

```

1595 \g@addto@macro\addresses{\@authornotemark}%
1596 \g@addto@macro\authornotes{%
1597 \stepcounter{footnote}\footnotetext{#1}}%
1598 \fi}

\authornotemark Adding a footnote mark to the authors
1599 \newcommand\authornotemark[1][\relax]{%
1600 \ifx#1\relax\relax\relax
1601 \g@addto@macro\addresses{\@authornotemark}%
1602 \else
1603 \g@addto@macro\addresses{\@authornotemark{#1}}%
1604 \fi}

\acmVolume The current volume
1605 \def\acmVolume#1{\def\@acmVolume{#1}}
1606 \acmVolume{1}

\acmNumber The current number
1607 \def\acmNumber#1{\def\@acmNumber{#1}}
1608 \acmNumber{1}

\acmArticle The current article
1609 \def\acmArticle#1{\def\@acmArticle{#1}}
1610 \acmArticle{}

\acmArticleSeq The sequence number
1611 \def\acmArticleSeq#1{\def\@acmArticleSeq{#1}}
1612 \acmArticleSeq{\@acmArticle}

\acmYear The current year
1613 \def\acmYear#1{\def\@acmYear{#1}}
1614 \acmYear{\the\year}

\acmMonth The current month
1615 \def\acmMonth#1{\def\@acmMonth{#1}}
1616 \acmMonth{\the\month}

\@acmPubDate The publication date
1617 \def\@acmPubDate{\ifcase\@acmMonth\or
1618 January\or February\or March\or April\or May\or June\or
1619 July\or August\or September\or October\or November\or
1620 December\fi~\@acmYear}

\acmPrice The price
1621 \def\acmPrice#1{\def\@acmPrice{#1}}
1622 \acmPrice{15.00}

\acmSubmissionID The submission ID
1623 \def\acmSubmissionID#1{\def\@acmSubmissionID{#1}}
1624 \acmSubmissionID{}

\acmISBN The book ISBN
1625 \def\acmISBN#1{\def\@acmISBN{#1}}
1626 \acmISBN{978-x-xxxx-xxxx-x/YY/MM}

```

```

\acmDOI The paper DOI
1627 \def\acmDOI#1{\def\@acmDOI{#1}}
1628 \acmDOI{10.1145/nnnnnnn.nnnnnnn}

\if@ACM@badge

\@ACM@badge@width The width of the badge
1629 \newlength\@ACM@badge@width
1630 \setlength\@ACM@badge@width{3pc}

\@ACM@title@width The width of the title
1631 \newlength\@ACM@title@width

\@ACM@badge@skip The spacing between badges
1632 \newlength\@ACM@badge@skip
1633 \setlength\@ACM@badge@skip{1pt}

\@acmBadgeR
1634 \def\@acmBadgeR{}

\@acmBadgeL
1635 \def\@acmBadgeL{}

\acmBadgeR Setting the right badge
1636 \newcommand\acmBadgeR[2][{}]{%
1637   \ifx\@acmBadgeR\@empty
1638     \gdef\@acmBadgeR{%
1639       \smash{%
1640         \raisebox{0.5\height}{%
1641           \href{#1}{\includegraphics[width=\@ACM@badge@width]{#2}}}}}%
1642   \else
1643     \g@addto@macro{\@acmBadgeR}{%
1644       \hspace{\@ACM@badge@skip}%
1645       \smash{%
1646         \raisebox{0.5\height}{%
1647           \href{#1}{\includegraphics[width=\@ACM@badge@width]{#2}}}}}%
1648   \fi}

\acmBadgeL Setting the left badge
1649 \newcommand\acmBadgeL[2][{}]{%
1650   \ifx\@acmBadgeL\@empty
1651     \gdef\@acmBadgeL{%
1652       \smash{%
1653         \raisebox{0.5\height}{%
1654           \href{#1}{\includegraphics[width=\@ACM@badge@width]{#2}}}}}%
1655   \else
1656     \g@addto@macro{\@acmBadgeL}{%
1657       \hspace{\@ACM@badge@skip}%
1658       \smash{%
1659         \raisebox{0.5\height}{%
1660           \href{#1}{\includegraphics[width=\@ACM@badge@width]{#2}}}}}%
1661   \fi}

```



```

\acmBadge Just a syntax sugar for \acmBadgeR
1662 \let\acmBadge=\acmBadgeR

\startPage The start page of the paper
1663 \def\startPage#1{\def\@startPage{#1}}
1664 \startPage{}

\terms Terms are obsolete. We use CCS now.
1665 \def\terms#1{\ClassWarning{\@classname}{The command \string\terms{} is
1666   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.
1667 \def\keywords#1{\def\@keywords{#1}}
1668 \let\@keywords\@empty

1669 \AtEndDocument{\if@ACM@nonacm\else\ifx\@keywords\@empty
1670   \ifnum\getrefnumber{TotPages}>2\relax
1671   \ClassWarningNoLine{\@classname}{ACM keywords are mandatory
1672     for papers over two pages}%
1673   \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
1674 \renewenvironment{abstract}{\Collect@Body\@saveabstract}{\}

\@saveabstract And saving the abstract
1675 \long\def\@saveabstract#1{\if@ACM@maketitle@typeset
1676   \ClassError{\@classname}{Abstract must be defined before maketitle
1677     command. Please move it!}\fi
1678   \long\gdef\@abstract{#1}}
1679 \@saveabstract{}

\@empty The long version of \@empty (to compare with \@abstract)
1680 \long\def\@empty{}

\if@ACM@printccs Whether to print CCS
1681 \define@boolkey+{@ACM@topmatter@}[@ACM@]{printccs}[true]{%
1682   \if@ACM@printccs
1683     \ClassInfo{\@classname}{Printing CCS}%
1684   \else
1685     \ClassInfo{\@classname}{Suppressing CCS}%
1686   \fi}{\ClassError{\@classname}{The option printccs can be either true or false}}

\if@ACM@printacmref Whether to print the ACM bibstrip
1687 \define@boolkey+{@ACM@topmatter@}[@ACM@]{printacmref}[true]{%
1688   \if@ACM@printacmref
1689     \ClassInfo{\@classname}{Printing bibformat}%
1690   \else
1691     \ClassInfo{\@classname}{Suppressing bibformat}%
1692   \fi}{\ClassError{\@classname}{The option printacmref can be either true or false}}

```

```

1693 \AtEndDocument{\if@ACM@nonacm\else\if@ACM@printacmref\else
1694 \ifnum\getrefnumber{TotPages}>1\relax
1695 \ClassWarningNoLine{\@classname}{%
1696   ACM reference format is mandatory \MessageBreak
1697   for papers over one page. \MessageBreak
1698   Please add printacmref=true to the \MessageBreak
1699   \string\settopmatter\space command.}%
1700 \fi\fi\fi}

\if@ACM@printfolios Whether to print folios
1701 \define@boolkey+{@ACM@topmatter@}[@ACM@]{printfolios}[true]{%
1702 \if@ACM@printfolios
1703 \ClassInfo{\@classname}{Printing folios}%
1704 \else
1705 \ClassInfo{\@classname}{Suppressing folios}%
1706 \fi}{\ClassError{\@classname}{The option printfolios can be either true or false}}

\@ACM@authorsperrrow The number of authors per row. 0 means use the default algorithm.
1707 \define@cmdkey{@ACM@topmatter@}[@ACM@]{authorsperrrow}[0]{%
1708 \IfInteger{#1}{\ClassInfo{\@classname}{Setting authorsperrrow to
1709   #1}}{\ClassWarning{\@classname}{The parameter authorsperrrow must be
1710   numerical. Ignoring the input #1}}\gdef\@ACM@authorsperrrow{0}}

\settopmatter The usual syntactic sugar
1711 \def\settopmatter#1{\setkeys{@ACM@topmatter@}{#1}}

Now the settings
1712 \settopmatter{printccs=true, printacmref=true}
1713 \if@ACM@manuscript
1714 \settopmatter{printfolios=true}
1715 \else
1716 \if@ACM@journal
1717 \settopmatter{printfolios=true}
1718 \else
1719 \settopmatter{printfolios=false}
1720 \fi
1721 \fi
1722 \settopmatter{authorsperrrow=0}

\@received The container for the paper history
1723 \def\@received{}

\received The \received command
1724 \newcommand\received[2][\def\@tempa{#1}%
1725 \ifx\@tempa\@empty
1726 \ifx\@received\@empty
1727 \gdef\@received{Received #2}%
1728 \else
1729 \g@addto@macro{\@received}{; revised #2}%
1730 \fi
1731 \else
1732 \ifx\@received\@empty
1733 \gdef\@received{#1 #2}%

```

```

1734 \else
1735 \g@addto@macro{\@received}{; #1 #2}%
1736 \fi
1737 \fi}
1738 \AtEndDocument{%
1739 \ifx\@received\@empty\else
1740 \par\bigskip\noindent\small\normalfont\@received\par
1741 \fi}

```

`\acmArticleType` Article type. We set up the color.

```

1742 \define@choicekey+{ACM}{articletype}[\ACM@ArticleType\ACM@ArticleType@nr]{%
1743 Research,Review,Discussion,Invited,Position}[Review]{%
1744 \ifcase\ACM@ArticleType@nr
1745 \relax % Research
1746 \colorlet{@ACM@Article@color}{ACMBlue}%
1747 \or % Review
1748 \colorlet{@ACM@Article@color}{ACMOrange}%
1749 \or % Discussion
1750 \colorlet{@ACM@Article@color}{ACMGreen}%
1751 \or % Invited
1752 \colorlet{@ACM@Article@color}{ACMPurple}%
1753 \or % Position
1754 \colorlet{@ACM@Article@color}{ACMRed}%
1755 \fi
1756 }{%
1757 \ClassError{\@classname}{Article Type must be Research, Review,\MessageBreak
1758 Discussion, Invited, or Position}}
1759 \def\acmArticleType#1{\setkeys{ACM}{articletype=#1}}
1760 \if@ACM@acmcp
1761 \acmArticleType{Research}%
1762 \fi
1763

```

`\@ACM@color@frame` The colored frame for the acmcp

```

1764 \newenvironment{@ACM@color@frame}{%
1765 \def\FrameCommand{\hspace*{-6.5pc}%
1766 \colorbox{@ACM@Article@color!10!white}}%
1767 \MakeFramed {\advance\hsize
1768 -6.5pc\relax\FrameRestore}}{\zsavaposy{@ACM@acmcpframe@y}%
1769 \endMakeFramed}

```

`\acmCodeLink` The code link

```

1770 \def\acmCodeLink#1{%
1771 \ifx\@acmCodeDataLink\@empty
1772 \gdef\@acmCodeDataLink{\url{#1}}%
1773 \else
1774 \g@addto@macro{\@acmCodeDataLink}{\ \url{#1}}%
1775 \fi}
1776 \def\@acmCodeDataLink{}

```

`\acmDataLink` The code link

```

1777 \let\acmDataLink\acmCodeLink

```

### 3.17 Concepts system

We exclude CCSXML stuff generated by the ACM system:

```
1778 \RequirePackage{comment}
1779 \excludecomment{CCSXML}
```

\@concepts This is the storage macro and counter for concepts

```
1780 \let\@concepts\@empty
1781 \newcounter{@concepts}
```

\ccsdesc The first argument is the significance, the second is the concept(s)

```
1782 \newcommand\ccsdesc[2][100]{%
1783   \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!

```
1784 \def\textrightarrow{$\rightarrow$}
1785 \def\ccsdesc@parse#1~#2~#3~{%
1786   \stepcounter{@concepts}%
1787   \expandafter\ifx\csname CCS@General@#2\endcsname\relax
1788     \expandafter\gdef\csname CCS@General@#2\endcsname{\textbullet\
1789       \textbf{#2}}%
1790     \expandafter\gdef\csname CCS@Punctuation@#2\endcsname{;}%
1791     \expandafter\gdef\csname CCS@Specific@#2\endcsname{}%
1792     \g@addto@macro{\@concepts}{\csname CCS@General@#2\endcsname
1793       \csname CCS@Punctuation@#2\endcsname
1794       \csname CCS@Specific@#2\endcsname}%
1795     \fi
1796     \ifx#3\relax\relax\else
1797       \expandafter\gdef\csname CCS@Punctuation@#2\endcsname{
1798         \textrightarrow\ }%
1799       \expandafter\g@addto@macro\expandafter{\csname CCS@Specific@#2\endcsname}{%
1800         \addtocounter{@concepts}{-1}%
1801         \ifnum#1>499\textbf{#3}\else
1802         \ifnum#1>299\textit{#3}\else
1803         #3\fi\fi\ifnum\value{@concepts}=0.\else; \fi}%
1804       \fi
1805 \ccsdesc@parse@finish}

1806 \AtEndDocument{\if@ACM@nonacm\else\ifx\@concepts\@empty\relax
1807   \ifnum\getrefnumber{TotPages}>2\relax
1808   \ClassWarningNoLine{\@classname}{CCS concepts are mandatory
1809     for papers over two pages}%
1810   \fi\fi\fi}
```

\ccdesc@parse@finish Gobble everything to \ccsdesc@parse@end

```
1811 \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

```
1812 \newif\if@printcopyright
1813 \@printcopyrighttrue
```

\if@printpermission Whether to print the permission block

```
1814 \newif\if@printpermission
1815 \@printpermissiontrue
```

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

```
1816 \newif\if@acmowned
1817 \@acmownedtrue
```

Keys:

```
1818 \define@choicekey*{ACM@}{acmcopyrightmode}[%
1819 \acm@copyrightinput\acm@copyrightmode]{none,%
1820 acmcopyright,acmlicensed,rightsretained,%
1821 usgov,usgovmixed,cagov,cagovmixed,licensedusgovmixed,%
1822 licensedcagov,licensedcagovmixed,othergov,licensedothergov,%
1823 iw3c2w3,iw3c2w3g,cc}{%
1824 \@printpermissiontrue
1825 \@printcopyrighttrue
1826 \@acmownedtrue
1827 \ifnum\acm@copyrightmode=0\relax % none
1828 \@printpermissionfalse
1829 \@printcopyrightfalse
1830 \@acmownedfalse
1831 \fi
1832 \ifnum\acm@copyrightmode=2\relax % acmlicensed
1833 \@acmownedfalse
1834 \fi
1835 \ifnum\acm@copyrightmode=3\relax % rightsretained
1836 \@acmownedfalse
1837 \AtBeginDocument{\acmPrice{}}%
1838 \fi
1839 \ifnum\acm@copyrightmode=4\relax % usgov
1840 \@printpermissiontrue
1841 \@printcopyrightfalse
1842 \@acmownedfalse
1843 \AtBeginDocument{\acmPrice{}}%
1844 \fi
1845 \ifnum\acm@copyrightmode=6\relax % cagov
1846 \@acmownedfalse
1847 \fi
1848 \ifnum\acm@copyrightmode=8\relax % licensedusgovmixed
1849 \@acmownedfalse
1850 \fi
1851 \ifnum\acm@copyrightmode=9\relax % licensedcagov
1852 \@acmownedfalse
1853 \fi
1854 \ifnum\acm@copyrightmode=10\relax % licensedcagovmixed
1855 \@acmownedfalse
1856 \fi
1857 \ifnum\acm@copyrightmode=11\relax % othergov
1858 \@acmownedtrue
1859 \fi
1860 \ifnum\acm@copyrightmode=12\relax % licensedothergov
1861 \@acmownedfalse
1862 \fi
```

```

1863 \ifnum\acm@copyrightmode=13\relax % iw3c2w3
1864 \@acmownedfalse
1865 \AtBeginDocument{\acmPrice{}}%
1866 \fi
1867 \ifnum\acm@copyrightmode=14\relax % iw3c2w3g
1868 \@acmownedfalse
1869 \AtBeginDocument{\acmPrice{}}%
1870 \fi
1871 \ifnum\acm@copyrightmode=15\relax % cc
1872 \@acmownedfalse
1873 \AtBeginDocument{\acmPrice{}}%
1874 \fi}

```

\setcopyright This is the syntactic sugar around setting keys.

```

1875 \def\setcopyright#1{\setkeys{ACM@}{acmcopyrightmode=#1}}
1876 \setcopyright{acmcopyright}

```

\setcctype The type of Creative Commons license used

```

1877 \newcommand\setcctype[2][4.0]{%
1878 \def\ACM@cc@version{#1}%
1879 \def\ACM@cc@type{#2}}
1880 \setcctype{by}

```

\@copyrightowner Here is the owner of the copyright

```

1881 \def\@copyrightowner{%
1882 \ifcase\acm@copyrightmode\relax % none
1883 \or % acmcopyright
1884 Association for Computing Machinery.
1885 \or % acmlicensed
1886 Copyright held by the owner/author(s). Publication rights licensed to
1887 ACM\@.
1888 \or % rightsretained
1889 Copyright held by the owner/author(s).
1890 \or % usgov
1891 \or % usgovmixed
1892 Association for Computing Machinery.
1893 \or % cagov
1894 Crown in Right of Canada.
1895 \or %cagovmixed
1896 Association for Computing Machinery.
1897 \or %licensedusgovmixed
1898 Copyright held by the owner/author(s). Publication rights licensed to
1899 ACM\@.
1900 \or % licensedcagov
1901 Crown in Right of Canada. Publication rights licensed to
1902 ACM\@.
1903 \or %licensedcagovmixed
1904 Copyright held by the owner/author(s). Publication rights licensed to
1905 ACM\@.
1906 \or % othergov
1907 Association for Computing Machinery.
1908 \or % licensedothergov
1909 Copyright held by the owner/author(s). Publication rights licensed to
1910 ACM\@.

```

```

1911 \or % ic2w3www
1912 IW3C2 (International World Wide Web Conference Committee), published
1913 under Creative Commons CC-BY~4.0 License.
1914 \or % ic2w3wwwgoogle
1915 IW3C2 (International World Wide Web Conference Committee), published
1916 under Creative Commons CC-BY-NC-ND~4.0 License.
1917 \or % cc
1918 Copyright held by the owner/author(s).
1919 \fi}

```

\@formatdoi Print a clickable DOI

```

1920 \def\@formatdoi#1{\url{https://doi.org/#1}}

```

\@ACM@copyright@check@cc At present cC licenses can be used only for acmengage format or for non-acm stuff. This macro checks whether the CC license is applicable and generates an error if not.

```

1921 \def\@ACM@copyright@check@cc{%
1922   \if@ACM@nonacm
1923     \ClassInfo{\@classname}{Using CC license with a non-acm
1924       material}%
1925   \else
1926     \if@ACM@engage
1927       \ClassInfo{\@classname}{Using CC license with ACM Enage
1928         material}%
1929     \else
1930       \ClassError{\@classname}{%
1931         Sorry, Creative Commons licenses are\MessageBreak
1932         currently not used with ACM publications\MessageBreak
1933         typeset by the authors}{Please use nonacm
1934         option or ACM Engage class to enable CC licenses}%
1935     \fi
1936   \fi}

```

\@copyrightpermission The canned permission block.

```

1937 \def\@copyrightpermission{%
1938   \ifcase\acm@copyrightmode\relax % none
1939   \or % acmcopyright
1940     Permission to make digital or hard copies of all or part of this
1941     work for personal or classroom use is granted without fee provided
1942     that copies are not made or distributed for profit or commercial
1943     advantage and that copies bear this notice and the full citation on
1944     the first page. Copyrights for components of this work owned by
1945     others than ACM must be honored. Abstracting with credit is
1946     permitted. To copy otherwise, or republish, to post on servers or to
1947     redistribute to lists, requires prior specific permission
1948     and\hspace*{.5pt}/or a fee. Request permissions from
1949     permissions@acm.org.
1950   \or % acmlicensed
1951     Permission to make digital or hard copies of all or part of this
1952     work for personal or classroom use is granted without fee provided
1953     that copies are not made or distributed for profit or commercial
1954     advantage and that copies bear this notice and the full citation on
1955     the first page. Copyrights for components of this work owned by
1956     others than the author(s) must be honored. Abstracting with credit
1957     is permitted. To copy otherwise, or republish, to post on servers

```

1958 or to redistribute to lists, requires prior specific permission  
 1959 and\hspace\*{.5pt}/or a fee. Request permissions from  
 1960 permissions@acm.org.  
 1961 \or % rightsretained  
 1962 Permission to make digital or hard copies of part or all of this work  
 1963 for personal or classroom use is granted without fee provided that  
 1964 copies are not made or distributed for profit or commercial advantage  
 1965 and that copies bear this notice and the full citation on the first  
 1966 page. Copyrights for third-party components of this work must be  
 1967 honored. For all other uses, contact the  
 1968 owner\hspace\*{.5pt}/author(s).  
 1969 \or % usgov  
 1970 This paper is authored by an employee(s) of the United States  
 1971 Government and is in the public domain. Non-exclusive copying or  
 1972 redistribution is allowed, provided that the article citation is  
 1973 given and the authors and agency are clearly identified as its  
 1974 source.  
 1975 \or % usgovmixed  
 1976 ACM acknowledges that this contribution was authored or co-authored  
 1977 by an employee, contractor, or affiliate of the United States  
 1978 government. As such, the United States government retains a  
 1979 nonexclusive, royalty-free right to publish or reproduce this  
 1980 article, or to allow others to do so, for government purposes only.  
 1981 \or % cagov  
 1982 This article was authored by employees of the Government of Canada.  
 1983 As such, the Canadian government retains all interest in the  
 1984 copyright to this work and grants to ACM a nonexclusive,  
 1985 royalty-free right to publish or reproduce this article, or to allow  
 1986 others to do so, provided that clear attribution is given both to  
 1987 the authors and the Canadian government agency employing them.  
 1988 Permission to make digital or hard copies for personal or classroom  
 1989 use is granted. Copies must bear this notice and the full citation  
 1990 on the first page. Copyrights for components of this work owned by  
 1991 others than the Canadian Government must be honored. To copy  
 1992 otherwise, distribute, republish, or post, requires prior specific  
 1993 permission and\hspace\*{.5pt}/or a fee. Request permissions from  
 1994 permissions@acm.org.  
 1995 \or % cagovmixed  
 1996 ACM acknowledges that this contribution was co-authored by an  
 1997 affiliate of the national government of Canada. As such, the Crown  
 1998 in Right of Canada retains an equal interest in the copyright.  
 1999 Reprints must include clear attribution to ACM and the author's  
 2000 government agency affiliation. Permission to make digital or hard  
 2001 copies for personal or classroom use is granted. Copies must bear  
 2002 this notice and the full citation on the first page. Copyrights for  
 2003 components of this work owned by others than ACM must be honored.  
 2004 To copy otherwise, distribute, republish, or post, requires prior  
 2005 specific permission and\hspace\*{.5pt}/or a fee. Request permissions  
 2006 from permissions@acm.org.  
 2007 \or % licensedusgovmixed  
 2008 Publication rights licensed to ACM\@. ACM acknowledges that this  
 2009 contribution was authored or co-authored by an employee, contractor  
 2010 or affiliate of the United States government. As such, the  
 2011 Government retains a nonexclusive, royalty-free right to publish or



2012 reproduce this article, or to allow others to do so, for Government  
 2013 purposes only.  
 2014 \or % licensedcagov  
 2015 This article was authored by employees of the Government of Canada.  
 2016 As such, the Canadian government retains all interest in the  
 2017 copyright to this work and grants to ACM a nonexclusive,  
 2018 royalty-free right to publish or reproduce this article, or to allow  
 2019 others to do so, provided that clear attribution is given both to  
 2020 the authors and the Canadian government agency employing them.  
 2021 Permission to make digital or hard copies for personal or classroom  
 2022 use is granted. Copies must bear this notice and the full citation  
 2023 on the first page. Copyrights for components of this work owned by  
 2024 others than the Canadian Government must be honored. To copy  
 2025 otherwise, distribute, republish, or post, requires prior specific  
 2026 permission and\hspace\*{.5pt}/or a fee. Request permissions from  
 2027 permissions@acm.org.  
 2028 \or % licensedcagovmixed  
 2029 Publication rights licensed to ACM\@. ACM acknowledges that this  
 2030 contribution was authored or co-authored by an employee, contractor  
 2031 or affiliate of the national government of Canada. As such, the  
 2032 Government retains a nonexclusive, royalty-free right to publish or  
 2033 reproduce this article, or to allow others to do so, for Government  
 2034 purposes only.  
 2035 \or % othergov  
 2036 ACM acknowledges that this contribution was authored or co-authored  
 2037 by an employee, contractor or affiliate of a national government. As  
 2038 such, the Government retains a nonexclusive, royalty-free right to  
 2039 publish or reproduce this article, or to allow others to do so, for  
 2040 Government purposes only.  
 2041 \or % licensedothergov  
 2042 Publication rights licensed to ACM\@. ACM acknowledges that this  
 2043 contribution was authored or co-authored by an employee, contractor  
 2044 or affiliate of a national government. As such, the Government  
 2045 retains a nonexclusive, royalty-free right to publish or reproduce  
 2046 this article, or to allow others to do so, for Government purposes  
 2047 only.  
 2048 \or % iw3c2w3  
 2049 This paper is published under the Creative Commons Attribution~4.0  
 2050 International (CC-BY~4.0) license. Authors reserve their rights to  
 2051 disseminate the work on their personal and corporate Web sites with  
 2052 the appropriate attribution.  
 2053 \or % iw3c2w3g  
 2054 This paper is published under the Creative Commons  
 2055 Attribution-NonCommercial-NoDerivs~4.0 International  
 2056 (CC-BY-NC-ND~4.0) license. Authors reserve their rights to  
 2057 disseminate the work on their personal and corporate Web sites with  
 2058 the appropriate attribution.  
 2059 \or % CC  
 2060 \@ACM@copyright@check@cc  
 2061 \IfEq{\ACM@cc@type}{zero}{%  
 2062 \def\ACM@CC@Url{https://creativecommons.org/publicdomain/zero/1.0/legalcode}}{%  
 2063 \edef\ACM@CC@Url{https://creativecommons.org/licenses/\ACM@cc@type/\ACM@cc@version/legalcode}}%  
 2064 \href{\ACM@CC@Url}{\includegraphics[height=5ex]{doclicense-CC-\ACM@cc@type-88x31}}\%  
 2065 \href{\ACM@CC@Url}{%

```

2066 This work is licensed under a Creative Commons
2067 \IfEq{\ACM@cc@type}{zero}{CC0 1.0 Universal}{%
2068   \IfEq{\ACM@cc@type}{by}{Attribution}{}%
2069   \IfEq{\ACM@cc@type}{by-sa}{Attribution-ShareAlike}{}%
2070   \IfEq{\ACM@cc@type}{by-nd}{Attribution-NoDerivatives}{}%
2071   \IfEq{\ACM@cc@type}{by-nc}{Attribution-NonCommercial}{}%
2072   \IfEq{\ACM@cc@type}{by-nc-sa}{Attribution-NonCommercial-ShareAlike}{}%
2073   \IfEq{\ACM@cc@type}{by-nc-nd}{Attribution-NonCommercial-NoDerivatives}{}%
2074   ~\IfEq{\ACM@cc@version}{4.0}{4.0 International}{3.0 Unported}%
2075 }
2076 License.}%
2077 \fi}

```

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

```

2078 \def\copyrightyear#1{\def\@copyrightyear{#1}}
2079 \copyrightyear{\@acmYear}

```

`\@teaserfigures` The teaser figures container

```

2080 \def\@teaserfigures{}

```

`teaserfigure` The teaser figure

```

2081 \newenvironment{teaserfigure}{\Collect@Body\@saveteaser}{}

```

`\@saveteaser` Saving the teaser

```

2082 \long\def\@saveteaser#1{\g@addto@macro\@teaserfigures{\@teaser{#1}}}

```

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

```

2083 \renewcommand{\thanks}[1]{%
2084   \@ifnotempty{#1}{%
2085     \if@ACM@anonymous
2086       \g@addto@macro\thankses{\thanks{A note}}%
2087     \else
2088       \g@addto@macro\thankses{\thanks{#1}}%
2089     \fi}}

```

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

```

2090 \newcommand{\anon}[2][ANONYMIZED]{%
2091   \if@ACM@anonymous%
2092     {\color{ACMOrange}#1}%
2093   \else%
2094     #2%
2095   \fi}

```

### 3.19 Maketitle hook

The current  $\LaTeX$  provides a nice `lthooks` mechanism. However, since it is relatively new, we will use oldfashioned approach—at least for now.

`\@beginmaketitlehook` The hook

```

2096 \ifx\@beginmaketitlehook\undefined
2097   \let\@beginmaketitlehook\empty
2098 \fi

```

\AtBeginMaketitle Adding to the hook

```
2099 \def\AtBeginMaketitle{\g@addto@macro\@beginmaketitlehook}
```

### 3.20 ACM Engage top matter

\@acmengagemetadate The special metadata for ACM engage course materials

```
2100 \def\@acmengagemetadate{}
```

\setengagemetadate Adding topic to engage metadata

```
2101 \def\setengagemetadate#1#2{%
2102   \g@addto@macro{\@acmengagemetadate}{%
2103     \@setengagemetadate{#1}{#2}}}
```

### 3.21 Typesetting top matter

\mktitle@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 \@twocolumn[*<box>*].

```
2104 \newbox\mktitle@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.

```
2105 \def\maketitle{\@beginmaketitlehook
2106   \@ACM@maketitle@typesettrue
2107   \if@ACM@anonymous
2108     % Anonymize omission of \author-s
2109     \ifnum\num@authorgroups=0\author{}\fi
2110   \fi
2111   \begingroup
2112   \let\@vspace\@vspace@orig
2113   \let\@vspacer\@vspacer@orig
2114   \let\@footnotemark\@footnotemark@nolink
2115   \let\@footnotetext\@footnotetext@nolink
2116   \renewcommand\thefootnote{\@fnsymbol\c@footnote}%
2117   \hsize=\textwidth
2118   \def\@makefnmark{\hbox{\@textsuperscript{\@thefnmark}}}%
2119   \@mktitle\if@ACM@sigchiamode\else\@mkauthors\fi\@mkteasers
2120   \@printtopmatter
2121   \if@ACM@sigchiamode\@mkauthors\fi
2122   \setcounter{footnote}{0}%
2123   \def\@makefnmark{\hbox{\@textsuperscript{\normalfont\@thefnmark}}}%
2124   \@titlenotes
2125   \@subtitlenotes
2126   \@authornotes
2127   \let\@makefnmark\relax
2128   \let\@thefnmark\relax
2129   \let\@makefntext\noindent
2130   \ifx\@empty\thankses\else
2131     \footnotetextauthorsaddresses{%
```

```

2132     \def\par{\let\par\@par}\parindent\z@\@setthanks}%
2133 \fi
2134 \if@ACM@acmcp\else
2135     \ifx\@empty\@authorsaddresses\else
2136         \if@ACM@anonymous\else
2137             \if@ACM@journal@bibstrip
2138                 \footnotetextauthorsaddresses{%
2139                     \def\par{\let\par\@par}\parindent\z@\@setauthorsaddresses}%
2140             \fi
2141         \fi
2142     \fi
2143 \fi
2144 \if@ACM@nonacm
2145     \ifnum\acm@copyrightmode=15\relax % cc
2146         \footnotetextcopyrightpermission{\@copyrightpermission}%
2147     \fi
2148 \else
2149     \if@ACM@acmcp\else
2150         \footnotetextcopyrightpermission{%
2151             \if@ACM@authordraft
2152                 \raisebox{-2ex}[\z@][\z@]{\makebox[0pt][l]{\large\bfseries
2153                     Unpublished working draft. Not for distribution.}}%
2154                 \color[gray]{0.9}%
2155             \fi
2156             \parindent\z@\parskip0.1\baselineskip
2157             \if@ACM@authorversion\else
2158                 \if@printpermission\@copyrightpermission\par\fi
2159             \fi
2160             \if@ACM@manuscript\else
2161                 \if@ACM@journal@bibstrip\else % Print the conference information
2162                     \if@ACM@engage
2163                         {\itshape \@acmBooktitle, \@acmYear.}\par
2164                     \else
2165                         {\itshape \acmConference@shortname, \acmConference@date, \acmConference@venue}\par
2166                     \fi
2167                 \fi
2168             \fi
2169             \if@printcopyright
2170                 \copyright\ \@copyrightyear\ \@copyrightowner\
2171             \else
2172                 \@copyrightyear.\
2173             \fi
2174             \if@ACM@manuscript
2175                 Manuscript submitted to ACM\
2176             \else
2177                 \if@ACM@authorversion
2178                     This is the author's version of the work. It is posted here for
2179                     your personal use. Not for redistribution. The definitive Version
2180                     of Record was published in
2181                     \if@ACM@journal@bibstrip
2182                         \emph{\@journalName}%
2183                     \else
2184                         \emph{\@acmBooktitle}%
2185                     \fi

```

```

2186         \ifx\@acmDOI\@empty
2187         .
2188         \else
2189         , \@formatdoi{\@acmDOI}.
2190         \fi\\
2191     \else
2192     \if@ACM@nonacm\else
2193     \if@ACM@journal@bibstrip
2194     \@permissionCodeOne/\@acmYear/\@acmMonth-ART\@acmArticle
2195     \ifx\@acmPrice\@empty\else\ $\@acmPrice\fi\\
2196     \@formatdoi{\@acmDOI}%
2197     \else % Conference
2198     \ifx\@acmISBN\@empty\else ACM~ISBN~\@acmISBN
2199     \ifx\@acmPrice\@empty.\else\dots\$\@acmPrice\fi\\fi
2200     \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi%
2201     \fi
2202     \fi
2203     \fi
2204     \fi}%
2205     \fi
2206     \fi
2207 \endgroup
2208 \if@ACM@engage\@typesetengagemetadata\fi
2209 \setcounter{footnote}{0}%
2210 \@mkabstract
2211 \ifx\@translatedabstracts\@empty\else
2212 \@translatedabstracts\fi
2213 \if@ACM@printccs
2214 \ifx\@concepts\@empty\else\bgroup
2215     {\@specialsection{CCS Concepts}%
2216     \noindent\@concepts\par}\egroup
2217     \fi
2218     \fi
2219     \if@ACM@acmcp\else
2220     \ifx\@keywords\@empty\else\bgroup
2221     {\@specialsection{\keywordsname}%
2222     \noindent\@keywords\par}\egroup
2223     \fi
2224     \ifx\@translatedkeywords\@empty\else
2225     \@translatedkeywords
2226     \fi
2227     \fi
2228     \let\metadata@authors=\authors
2229     \nxandlist{, }, {, }, \metadata@authors
2230     \def\@ACM@checkaffil{}%
2231     \hypersetup{%
2232         pdfauthor={\metadata@authors},
2233         pdftitle={\@title},
2234         pdfsubject={\@concepts},
2235         pdfkeywords={\@keywords},
2236         pdfcreator={LaTeX with acmart
2237             \csname ver@acmart.cls\endcsname\space
2238             and hyperref
2239             \csname ver@hyperref.sty\endcsname}}%

```

```

2240 \andify\authors
2241 \andify\shortauthors
2242 \global\let\authors=\authors
2243 \global\let\shortauthors=\shortauthors
2244 \if@ACM@printacmref
2245   \mkbibcitation
2246 \fi
2247 \global\@topnum\z@ % this prevents floats from falling
2248                   % at the top of page 1
2249 \global\@botnum\z@ % we do not want them to be on the bottom either
2250 \@printendtopmatter
2251 \@afterindentfalse
2252 \@afterheading
2253 \if@ACM@acmcp
2254   \set@ACM@acmcpbox
2255   \AtEndDocument{\end@ACM@color@frame}%
2256   \@ACM@color@frame
2257 \fi
2258 }

```

\set@ACM@acmcpbox Setting infobox for acmcp

```

2259 \newbox\@ACM@acmcpbox
2260 \def\set@ACM@acmcpbox{%
2261   \bgroup
2262   \hsize=5pc
2263   \global\setbox\@ACM@acmcpbox=\vbox{%
2264     \setlength{\parindent}{\z@}%
2265     {\includegraphics[width=\hsize]{acm-jdslogo}\par}%
2266     \scriptsize
2267     \ifnum\getrefnumber{TotPages}>1\else
2268       \zrefused{@ACM@acmcpbox@y}%
2269       \zrefused{@ACM@acmcpframe@y}%
2270       \@tempdima=\dimexpr\zposy{@ACM@acmcpbox@y}sp -
2271       \zposy{@ACM@acmcpframe@y}sp+0.3\FrameSep+
2272       \@ACM@acmcp@delta\relax
2273       \ifdim\@tempdima>0pt\relax
2274         \vspace*{\@tempdima}%
2275         \protected@write\@auxout{%
2276           {\string\global\@ACM@acmcp@delta=\the\@tempdima\relax}%
2277         \fi
2278       \fi
2279       \ifx\@acmCodeDataLink\@empty\else\bigskip
2280       Code and data links:\\ \@acmCodeDataLink\par\bigskip
2281       \fi
2282       \ifx\@keywords\@empty\else\bigskip
2283       Keywords: \@keywords\par
2284       \fi
2285       \ifx\@empty\@authorsaddresses\else\bigskip\@setauthorsaddresses\fi
2286       \zsaveposy{@ACM@acmcpbox@y}%
2287   }
2288 \egroup}

```

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

```

2289 \def\@specialsection#1{%

```

```

2290 \let\@vspace\@vspace@orig
2291 \let\@vspacer\@vspacer@orig
2292 \ifcase\ACM@format@nr
2293 \relax % manuscript
2294 \par\medskip\small\noindent#1: %
2295 \or % acmsmall
2296 \par\medskip\small\noindent#1: %
2297 \or % acmlarge
2298 \par\medskip\small\noindent#1: %
2299 \or % acmtog
2300 \par\medskip\small\noindent#1: %
2301 \or % sigconf
2302 \section*{#1}%
2303 \or % siggraph
2304 \section*{#1}%
2305 \or % sigplan
2306 \noindentparagraph*{#1:~}%
2307 \or % sigchi
2308 \section*{#1}%
2309 \or % sigchi-a
2310 \section*{#1}%
2311 \or % acmengage
2312 \section*{#1}%
2313 \or % acmcp
2314 \section*{#1}%
2315 \fi
2316 \let\@vspace\@vspace@acm
2317 \let\@vspacer\@vspacer@acm
2318 }

```

\@printtopmatter The printing of top matter starts a new page and uses the given title box.

Note that if there are too many authors, \mktitle@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.

```

2319 \def\@printtopmatter{%
2320 \ifx\@startPage\@empty
2321 \gdef\@startPage{1}%
2322 \else
2323 \setcounter{page}{\@startPage}%
2324 \fi
2325 \@tempdima=\ht\mktitle@bx
2326 \advance\@tempdima by \dp\mktitle@bx
2327 \ifdim\@tempdima>0.9\textheight
2328 \loop
2329 \setbox\@tempboxa=\vsplit \mktitle@bx to 0.9\textheight
2330 \thispagestyle{firstpagestyle}%
2331 \noindent\unvbox\@tempboxa
2332 \clearpage
2333 \@tempdima=\ht\mktitle@bx
2334 \advance\@tempdima by \dp\mktitle@bx
2335 \ifdim\@tempdima>0.9\textheight\repeat
2336 \fi
2337 \thispagestyle{firstpagestyle}%
2338 \noindent

```

```

2339 \ifcase\ACM@format@nr
2340 \relax % manuscript
2341 \box\mktitle@bx\par
2342 \or % acmsmall
2343 \box\mktitle@bx\par
2344 \or % acmlarge
2345 \box\mktitle@bx\par
2346 \or % acmtog
2347 \twocolumn[\box\mktitle@bx]%
2348 \or % sigconf
2349 \twocolumn[\box\mktitle@bx]%
2350 \or % siggraph
2351 \twocolumn[\box\mktitle@bx]%
2352 \or % sigplan
2353 \twocolumn[\box\mktitle@bx]%
2354 \or % sigchi
2355 \twocolumn[\box\mktitle@bx]%
2356 \or % sigchi-a
2357 \par\box\mktitle@bx\par\bigskip
2358 \or % acmengage
2359 \twocolumn[\box\mktitle@bx]%
2360 \or % acmcp
2361 \box\mktitle@bx\par
2362 \fi
2363 }

```

\@mktitle The title of the article

```

2364 \def\@mktitle{%
2365 \ifcase\ACM@format@nr
2366 \relax % manuscript
2367 \@mktitle@i
2368 \or % acmsmall
2369 \@mktitle@i
2370 \or % acmlarge
2371 \@mktitle@i
2372 \or % acmtog
2373 \@mktitle@i
2374 \or % sigconf
2375 \@mktitle@iii
2376 \or % siggraph
2377 \@mktitle@iii
2378 \or % sigplan
2379 \@mktitle@iii
2380 \or % sigchi
2381 \@mktitle@iii
2382 \or % sigchi-a
2383 \@mktitle@iv
2384 \or % acmengage
2385 \@mktitle@iii
2386 \or % acmcp
2387 \@mktitle@i
2388 \fi
2389 }

```



\@titlefont The font to typeset the title

```
2390 \def\@titlefont{%
2391   \ifcase\ACM@format@nr
2392   \relax % manuscript
2393   \LARGE\sffamily\bfseries
2394   \or % acmsmall
2395   \LARGE\sffamily\bfseries
2396   \or % acmlarge
2397   \LARGE\sffamily\bfseries
2398   \or % acmtog
2399   \Huge\sffamily
2400   \or % sigconf
2401   \Huge\sffamily\bfseries
2402   \or % siggraph
2403   \Huge\sffamily\bfseries
2404   \or % sigplan
2405   \Huge\bfseries
2406   \or % sigchi
2407   \Huge\sffamily\bfseries
2408   \or % sigchi-a
2409   \Huge\bfseries
2410   \or % acmengage
2411   \Huge\sffamily\bfseries
2412   \or % acmcp
2413   \LARGE\sffamily\bfseries
2414   \fi}
```

\@subtitlefont The font to typeset the subtitle

```
2415 \def\@subtitlefont{\normalsize
2416   \ifcase\ACM@format@nr
2417   \relax % manuscript
2418   \mdseries
2419   \or % acmsmall
2420   \mdseries
2421   \or % acmlarge
2422   \mdseries
2423   \or % acmtog
2424   \LARGE
2425   \or % sigconf
2426   \LARGE\mdseries
2427   \or % siggraph
2428   \LARGE\mdseries
2429   \or % sigplan
2430   \LARGE\mdseries
2431   \or % sigchi
2432   \LARGE\mdseries
2433   \or % sigchi-a
2434   \mdseries
2435   \or % acmengage
2436   \LARGE\mdseries
2437   \or % acmcp
2438   \mdseries
2439   \fi}
```

`\mktitle@i` The version of `\mktitle` for most journals

```
2440 \def\mktitle@i{\hsize=\textwidth
2441   \if@ACM@acmcp
2442     \advance\hsize by -6pc%
2443   \fi
2444   \@ACM@title@width=\hsize
2445   \setbox\mktitle@bx=\vbox{\noindent\@titlefont
2446     \parbox[t]{\@ACM@title@width}{\raggedright
2447       \@titlefont\noindent
2448       \@title\@translatedtitle%
2449   \ifx\@subtitle\@empty\else
2450     \par\noindent{\@subtitlefont\@subtitle\@translatedsubtitle}%
2451   \fi}%
2452   \par\bigskip}}%
```

`\mktitle@ii` The version of `\mktitle` for TOG. Since v1.06, this is subsumed by the `\mktitle@i` macro

`\mktitle@iii` The version of `\mktitle` for SIG proceedings.

```
2453 \def\mktitle@iii{\hsize=\textwidth
2454   \setbox\mktitle@bx=\vbox{\@titlefont\centering
2455     \@ACM@title@width=\hsize
2456     \parbox[t]{\@ACM@title@width}{\centering\@titlefont
2457       \@title\@translatedtitle%
2458     \ifx\@subtitle\@empty\else
2459       \par\noindent{\@subtitlefont\@subtitle\@translatedsubtitle}
2460     \fi
2461   }%
2462   \par\bigskip}}%
```

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

```
2463 \def\mktitle@iv{\hsize=\textwidth
2464   \setbox\mktitle@bx=\vbox{\raggedright\leftskip5pc\@titlefont
2465     \noindent\leavevmode\leaders\hrule height 2pt\hfill\kern0pt\par
2466     \noindent\@title\@translatedtitle%
2467   \ifx\@subtitle\@empty\else
2468     \par\noindent\@subtitlefont\@subtitle\@translatedsubtitle%
2469   \fi
2470   \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.

```
2471 \newbox\@ACM@commabox
2472 \def\ACM@addtoaddress#1{%
2473   \ifvmode\else
2474     \if@ACM@affiliation@obeypunctuation\else
2475       \setbox\@ACM@commabox=\hbox{, }%
2476       \unskip\cleaders\copy\@ACM@commabox\hskip\wd\@ACM@commabox
```

```

2477 \fi\fi
2478 #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 2479 \def\streetaddress#1{\unskip\ignorespaces}
\city 2480 \def\postcode#1{\unskip\ignorespaces}
\state 2481 \if@ACM@journal
\postcode 2482 \def\position#1{\unskip\ignorespaces}
\country 2483 \def\institution#1{\global\@ACM@instpresenttrue
2484 \unskip~#1\ignorespaces}
2485 \def\city#1{\global\@ACM@citypresenttrue\unskip\ignorespaces}
2486 \def\state#1{\unskip\ignorespaces}
2487 \newcommand\department[2][0]{\unskip\ignorespaces}
2488 \def\country#1{\StrDel{#1}{ }[\@tempa]}%
2489 \ifx\@tempa@empty\else
2490 \global\@ACM@countrypresenttrue\fi
2491 \if@ACM@affiliation@obeypunctuation\else, \fi#1\ignorespaces}
2492 \else
2493 \def\position#1{\if@ACM@affiliation@obeypunctuation#1\else#1\par\fi}%
2494 \def\institution#1{\global\@ACM@instpresenttrue
2495 \if@ACM@affiliation@obeypunctuation#1\else#1\par\fi}%
2496 \newcommand\department[2][0]{\if@ACM@affiliation@obeypunctuation
2497 #2\else#2\par\fi}%
2498 % \def\streetaddress#1{\if@ACM@affiliation@obeypunctuation#1\else#1\par\fi}%
2499 \def\city#1{\global\@ACM@citypresenttrue\@ACM@addtoaddress{#1}}%
2500 \let\state\@ACM@addtoaddress
2501 % \def\postcode#1{\if@ACM@affiliation@obeypunctuation#1\else\unskip\space#1\fi}%
2502 \def\country#1{\global\@ACM@countrypresenttrue\@ACM@addtoaddress{#1}}%
2503 \fi

\mkauthors Typesetting the authors
2504 \def\mkauthors{\begingroup
2505 \hsize=\textwidth
2506 \ifcase\ACM@format@nr
2507 \relax % manuscript
2508 \mkauthors@i
2509 \or % acmsmall
2510 \mkauthors@i
2511 \or % acmlarge
2512 \mkauthors@i
2513 \or % acmtog
2514 \mkauthors@i
2515 \or % sigconf
2516 \mkauthors@iii
2517 \or % siggraph
2518 \mkauthors@iii
2519 \or % sigplan
2520 \mkauthors@iii
2521 \or % sigchi
2522 \mkauthors@iii
2523 \or % sigchi-a
2524 \mkauthors@iv

```

```

2525 \or % acmengage
2526 \mkauthors@iii
2527 \or % acmcp
2528 \mkauthors@i
2529 \fi
2530 \endgroup
2531 }

```

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

```

2532 \def\@authorfont{\Large\sffamily}

```

\@affiliationfont Font for affiliations

```

2533 \def\@affiliationfont{\normalsize\normalfont}

```

Adjusting fonts for different formats

```

2534 \ifcase\ACM@format@nr
2535 \relax % manuscript
2536 \or % acmsmall
2537 \def\@authorfont{\large\sffamily}
2538 \def\@affiliationfont{\small\normalfont}
2539 \or % acmlarge
2540 \or % acmtog
2541 \def\@authorfont{\LARGE\sffamily}
2542 \def\@affiliationfont{\large}
2543 \or % sigconf
2544 \def\@authorfont{\LARGE}
2545 \def\@affiliationfont{\large}
2546 \or % siggraph
2547 \def\@authorfont{\normalsize\normalfont}
2548 \def\@affiliationfont{\normalsize\normalfont}
2549 \or % sigplan
2550 \def\@authorfont{\Large\normalfont}
2551 \def\@affiliationfont{\normalsize\normalfont}
2552 \or % sigchi
2553 \def\@authorfont{\bfseries}
2554 \def\@affiliationfont{\mdseries}
2555 \or % sigchi-a
2556 \def\@authorfont{\bfseries}
2557 \def\@affiliationfont{\mdseries}
2558 \or % acmengage
2559 \def\@authorfont{\LARGE}
2560 \def\@affiliationfont{\large}
2561 \or % acmcp
2562 \def\@authorfont{\large\sffamily}
2563 \def\@affiliationfont{\small\normalfont}
2564 \fi

```

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

```

2565 \def\@typeset@author@line{%
2566 \andify\@currentauthors\par\noindent
2567 \@currentauthors\def\@currentauthors{}%
2568 \ifx\@currentaffiliations\empty\else
2569 \andify\@currentaffiliations

```

```

2570      \unskip, {\@currentaffiliations}\par
2571    \fi
2572    \def\@currentaffiliations{}}

\if@ACM@instpresent Whether the given affiliation has institution
2573 \newif\if@ACM@instpresent
2574 \@ACM@instpresenttrue

\if@ACM@citypresent Whether the given affiliation has city
2575 \newif\if@ACM@citypresent
2576 \@ACM@citypresenttrue

\if@ACM@countrypresent Whether the given affiliation has country
2577 \newif\if@ACM@countrypresent
2578 \@ACM@countrypresenttrue

\@ACM@resetaffil Reset affiliation flags
2579 \def\@ACM@resetaffil{%
2580   \global\@ACM@instpresentfalse
2581   \global\@ACM@citypresentfalse
2582   \global\@ACM@countrypresentfalse
2583 }

\@ACM@checkaffil Check affiliation flags
2584 \def\@ACM@checkaffil{%
2585   \if@ACM@instpresent\else
2586     \ClassWarningNoLine{\@classname}{No institution present for an affiliation}%
2587   \fi
2588   \if@ACM@citypresent\else
2589     \ClassWarningNoLine{\@classname}{No city present for an affiliation}%
2590   \fi
2591   \if@ACM@countrypresent\else
2592     \ClassError{\@classname}{No country present for an affiliation}{ACM
2593       requires each author to indicate their country using country macro.}%
2594   \fi
2595 }

\@mkauthors@i This version is used in most journal formats. Note that \and between authors with the
same affiliation becomes _and_.
2596 \def\@mkauthors@i{%
2597   \def\@currentauthors{}%
2598   \def\@currentaffiliations{}%
2599   \global\let\and\@typeset@author@line
2600   \def\@author##1{%
2601     \ifx\@currentauthors\@empty
2602       \gdef\@currentauthors{\@authorfont\MakeTextUppercase{##1}}%
2603     \else
2604       \g@addto@macro{\@currentauthors}{\and\MakeTextUppercase{##1}}%
2605     \fi
2606     \gdef\and{}}%
2607   \def\email##1##2{}%
2608   \def\affiliation##1##2{%
2609     \def\@tempa{##2}\ifx\@tempa\@empty\else

```

```

2610 \ifx\@currentaffiliations\@empty
2611 \gdef\@currentaffiliations{%
2612 \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2613 \setkeys{@ACM@affiliation@}{##1}%
2614 \@ACM@resetaffil
2615 \@affiliationfont##2\@ACM@checkaffil}%
2616 \else
2617 \g@addto@macro{\@currentaffiliations}{\and
2618 \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2619 \setkeys{@ACM@affiliation@}{##1}\@ACM@resetaffil
2620 ##2\@ACM@checkaffil}%
2621 \fi
2622 \fi
2623 \global\let\and\@typeset@author@line}%
2624 \if@ACM@acmcp
2625 \advance\hsize by -6pc%
2626 \fi
2627 \global\setbox\mktitle@bx=\vbox{\noindent\unvbox\mktitle@bx\par\medskip
2628 \noindent\addresses\@typeset@author@line
2629 \par\medskip}%
2630 }

```

\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

```
2631 \newbox\author@bx
```

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

```
2632 \newdimen\author@bx@wd
```

\author@bx@sep The separation between author boxes

```
2633 \newskip\author@bx@sep
2634 \author@bx@sep=1pc\relax
```

\@typeset@author@bx Typesetting the box with authors. Note that in sigchi-a the box is not centered.

```

2635 \def\@typeset@author@bx{\bgroup\hsize=\author@bx@wd
2636 \def\and{\par}\normalbaselines
2637 \global\setbox\author@bx=\vtop{\if@ACM@sigchiamode\else\centering\fi
2638 \@authorfont\@currentauthors\par\@affiliationfont
2639 \@currentaffiliation}\egroup
2640 \box\author@bx\hspace{\author@bx@sep}%
2641 \gdef\@currentauthors{}}%
2642 \gdef\@currentaffiliation{}}

```

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

```
2643 \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  $(\text{textwidth} - \text{author@bx@sep})/N - \text{author@bx@sep}$ , where  $N$  is the number of boxes per row.

```

2644 \author@bx@wd=\textwidth\relax
2645 \advance\author@bx@wd by -\author@bx@sep\relax

```

```

2646 \ifnum\@ACM@authorsperrrow>0\relax
2647   \divide\author@bx@wd by \@ACM@authorsperrrow\relax
2648 \else
2649   \ifcase\num@authorgroups
2650   \relax % 0?
2651   \or % 1=one author per row
2652   \or % 2=two authors per row
2653   \divide\author@bx@wd by \num@authorgroups\relax
2654   \or % 3=three authors per row
2655   \divide\author@bx@wd by \num@authorgroups\relax
2656   \or % 4=two authors per row (!)
2657   \divide\author@bx@wd by 2\relax
2658   \else % three authors per row
2659   \divide\author@bx@wd by 3\relax
2660   \fi
2661 \fi
2662 \advance\author@bx@wd by -\author@bx@sep\relax

```

Now, parsing of \addresses:

```

2663 \gdef\@currentauthors{}%
2664 \gdef\@currentaffiliation{}%
2665 \def\author##1{\ifx\@currentauthors\@empty
2666   \gdef\@currentauthors{\par##1}%
2667 \else
2668   \g@addto@macro\@currentauthors{\par##1}%
2669 \fi
2670 \gdef\and{}}%
2671 \def\email##1##2{\ifx\@currentaffiliation\@empty
2672   \gdef\@currentaffiliation{\bgroup
2673     \mathchardef\UrbreakPenalty=10000\nolinkurl{##2}\egroup}%
2674 \else
2675   \g@addto@macro\@currentaffiliation{\par\bgroup
2676     \mathchardef\UrbreakPenalty=10000\nolinkurl{##2}\egroup}%
2677 \fi}%
2678 \def\affiliation##1##2{\ifx\@currentaffiliation\@empty
2679   \gdef\@currentaffiliation{%
2680     \setkeys{@ACM@affiliation@}{obexpunctuation=false}%
2681     \setkeys{@ACM@affiliation@}{##1}\@ACM@resetaffil
2682     ##2\@ACM@checkaffil}%
2683 \else
2684   \g@addto@macro\@currentaffiliation{\par
2685     \setkeys{@ACM@affiliation@}{obexpunctuation=false}%
2686     \setkeys{@ACM@affiliation@}{##1}\@ACM@resetaffil
2687     ##2\@ACM@checkaffil}%
2688 \fi
2689 \global\let\and\@typeset@author@bx
2690 }%

```

Actual typesetting is done by the \and macro:

```

2691 \hsize=\textwidth
2692 \global\setbox\mktitle@bx=\vbox{\noindent
2693   \unvbox\mktitle@bx\par\medskip\leavevmode
2694   \lineskip=1pc\relax\centering\hspace*{-1em}%
2695   \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.

```
2696 \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  $(\text{textwidth} - \text{author@bx@sep})/N - \text{author@bx@sep}$ , where  $N$  is the number of boxes per row.

```
2697 \author@bx@wd=\columnwidth\relax
2698 \advance\author@bx@wd by -\author@bx@sep\relax
2699 \ifnum\@ACM@authorsperrow>0\relax
2700 \divide\author@bx@wd by \@ACM@authorsperrow\relax
2701 \else
2702 \ifcase\@num@authorgroups
2703 \relax % 0?
2704 \or % 1=one author per row
2705 \else % 2=two authors per row
2706 \divide\author@bx@wd by 2\relax
2707 \fi
2708 \fi
2709 \advance\author@bx@wd by -\author@bx@sep\relax
```

Now, parsing of \addresses:

```
2710 \gdef\@currentauthors{}%
2711 \gdef\@currentaffiliation{}%
2712 \def\@author##1{\ifx\@currentauthors\@empty
2713 \gdef\@currentauthors{\par##1}%
2714 \else
2715 \g@addto@macro\@currentauthors{\par##1}%
2716 \fi
2717 \gdef\and{}}%
2718 \def\email##1##2{\ifx\@currentaffiliation\@empty
2719 \gdef\@currentaffiliation{\nolinkurl{##2}}%
2720 \else
2721 \g@addto@macro\@currentaffiliation{\par\nolinkurl{##2}}%
2722 \fi}%
2723 \def\affiliation##1##2{\ifx\@currentaffiliation\@empty
2724 \gdef\@currentaffiliation{%
2725 \setkeys{@ACM@affiliation@}{obexpunctuation=false}%
2726 \setkeys{@ACM@affiliation@}{##1}\@ACM@resetaffil
2727 ##2\@ACM@checkaffil}%
2728 \else
2729 \g@addto@macro\@currentaffiliation{\par
2730 \setkeys{@ACM@affiliation@}{obexpunctuation=false}%
2731 \setkeys{@ACM@affiliation@}{##1}\@ACM@resetaffil
2732 ##2\@ACM@checkaffil}%
2733 \fi
2734 \global\let\and\@typeset@author@bx}%
2735 %
```

Actual typesetting is done by the \and macro

```
2736 \bgroup\hsize=\columnwidth
2737 \par\raggedright\leftskip=\z@
2738 \lineskip=1pc\noindent
2739 \addresses\let\and\@typeset@author@bx\and\par\bigskip\egroup}
```



`\mkauthorsaddresses` Typesetting authors' addresses in the footnote style

```
2740 \def\mkauthorsaddresses{%
2741   \ifnum\num@authors>1\relax
2742   Authors' \else Author's \fi
2743   \ifnum\num@authorgroups>1\relax
2744   addresses: \else address: \fi
2745   \bgroup
2746   \def\streetaddress##1{\unskip, ##1}%
2747   \def\postcode##1{\unskip, ##1}%
2748   \def\position##1{\unskip\ignorespaces}%
2749   \gdef\@ACM@institution@separator{, }%
2750   \def\institution##1{\unskip\@ACM@institution@separator ##1\gdef\@ACM@institution@separator{ and }}
2751   \def\city##1{\unskip, ##1}%
2752   \def\state##1{\unskip, ##1}%
2753   \renewcommand\department[2][0]{\unskip\@addpunct, ##2}%
2754   \def\country##1{\unskip, ##1}%
2755   \def\and{\unskip; \gdef\@ACM@institution@separator{, }}%
2756   \def\@author##1{##1}%
2757   \def\email##1##2{\unskip, \nolinkurl{##2}}%
2758   \addresses
2759   \egroup}

2760 \AtEndDocument{\if@ACM@nonacm\else\if@ACM@journal
2761   \ifx\@authorsaddresses\@empty
2762   \ClassWarningNoLine{\@classname}{Authors'
2763     addresses are mandatory for ACM journals}%
2764   \fi\fi\fi}
```

`\setaddresses` This is an amsart macro that we do not need.

```
2765 \def\setaddresses{}
```

`\@authornotemark` Adding a footnote mark to authors. This version adds a “normal” footnote mark.

```
2766 \def\@authornotemark{\g@addto@macro\@currentauthors{\footnotemark\relax}}
```

`\@@authornotemark` Adding a footnote mark to authors with a given number

```
2767 \def\@@authornotemark#1{\g@addto@macro\@currentauthors{\footnotemark[#1]}}
```

`\mkteasers` Typesetting the teasers

```
2768 \def\mkteasers{%
2769   \ifx\@teaserfigures\@empty\else
2770     \def\@teaser##1{\par\bigskip\bgroup
2771       \captionsetup{type=figure}##1\egroup\par}
2772     \global\setbox\mktitle@bx=\vbox{\noindent\unvbox\mktitle@bx\par
2773       \noindent\@Description@presentfalse
2774       \@teaserfigures\par\if@Description@present\else
2775         \global\@undescrbed@imagestrue
2776         \ClassWarning{\@classname}{A possible image without
2777           description}\fi
2778       \medskip}%
2779   \fi}
```

`\mkabstract` Typesetting the abstract

```
2780 \def\mkabstract{\bgroup
```

```

2781 \ifx\@abstract\@empty\else
2782 {\phantomsection\addcontentsline{toc}{section}{\abstractname}%
2783 \if@ACM@journal
2784 \everypar{\setbox\z@\lastbox\everypar{}}\small
2785 \else
2786 \section*{\abstractname}%
2787 \fi
2788 \ignorespaces\@abstract\par}%
2789 \fi\egroup}

```

\@mktranslatedabstract Typesetting a translated abstract

```

2790 \def\@mktranslatedabstract#1{\selectlanguage{#1}%
2791 \if@ACM@journal
2792 \everypar{\setbox\z@\lastbox\everypar{}}\small
2793 \else
2794 \section*{\abstractname}%
2795 \fi
2796 \ignorespaces}

```

\@mkbibcitation Print the bibcitation format

```

2797 \def\@mkbibcitation{\bgroup
2798 \let\@vspace\@vspace@orig
2799 \let\@vspacer\@vspacer@orig
2800 \def\@pages@word{\ifnum\getrefnumber{TotPages}=1\relax page\else pages\fi}%
2801 \def\footnotemark{}%
2802 \def\@unskip{\ignorespaces}%
2803 \def\footnote{\ClassError{\@classname}{Please do not use footnotes
2804 inside a \string\title{} or \string\author{} command! Use
2805 \string\titlenote{} or \string\authornote{} instead!}}%
2806 \def\@article@string{\ifx\@acmArticle\@empty{\ } \else,
2807 Article~\@acmArticle\ } \fi}%
2808 \par\medskip\small\noindent{\bfseries ACM Reference Format:}\par\nobreak
2809 \noindent\bgroup
2810 \def\@unskip{\ignorespaces}\authors\egroup. \@acmYear. \@title
2811 \ifx\@subtitle\@empty. \else: \@subtitle. \fi
2812 \if@ACM@nonacm\else
2813 % The 'nonacm' option disables 'printacmref' by default,
2814 % and the present \@mkbibcitation definition is never used
2815 % in this case. The conditional remains useful if the user
2816 % explicitly sets \settopmatter{printacmref=true}.
2817 \if@ACM@journal@bibstrip
2818 \textit{\@journalNameShort}
2819 \@acmVolume, \@acmNumber \@article@string (\@acmPubDate),
2820 \ref{TotPages}~\@pages@word.
2821 \else
2822 In \textit{\@acmBooktitle}%
2823 \ifx\@acmEditors\@empty\textit{.}\else
2824 \andify\@acmEditors\textit{, }\@acmEditors~\@editorsAbbrev.%
2825 \fi\
2826 ACM, New York, NY, USA%
2827 \@article@string\unskip, \ref{TotPages}~\@pages@word.
2828 \fi
2829 \fi
2830 \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi

```

```

2831 \par\egroup}

\@printendtopmatter End the top matter
2832 \def\@printendtopmatter{%
2833   \let\@vspace\@vspace@orig
2834   \let\@vspacer\@vspacer@orig
2835   \par\bigskip
2836   \let\@vspace\@vspace@acm
2837   \let\@vspacer\@vspacer@acm
2838 }

\@setthanks We redefine \setthanks using \long
2839 \def\@setthanks{\long\def\thanks##1{\par##1\@addpunct.}\thankses}

\@setauthorsaddresses
2840 \def\@setauthorsaddresses{\@authorsaddresses\unskip\@addpunct.}

\@typesetengagemetadata Typesetting special metadata for ACM Engage
2841 \def\@typesetengagemetadata{%
2842   \def\@setengagemetadata##1##2{\par\noindent\textbf{##1} ##2\par}%
2843   \@acmengagemetadata}

```

### 3.22 Headers and Footers

We use fancyhdr for our headers and footers:

```

2844 \RequirePackage{fancyhdr}

\ACM@restore@pagestyle The following code by Ross Moore protects against changes by the totpages package:
2845 \let\ACM@ps@plain\ps@plain
2846 \let\ACM@ps@myheadings\ps@myheadings
2847 \let\ACM@ps@headings\ps@headings
2848 \def\ACM@restore@pagestyle{%
2849   \let\ps@plain\ACM@ps@plain
2850   \let\ps@myheadings\ACM@ps@myheadings
2851   \let\ps@headings\ACM@ps@headings}
2852 \AtBeginDocument{\ACM@restore@pagestyle}

\ACM@linecount@bx This is the box displayed in review mode
2853 \if@ACM@review
2854   \newsavebox{\ACM@linecount@bx}
2855   \newlength\ACM@linecount@bxht
2856   \newcount\ACM@linecount
2857   \ACM@linecount\@ne\relax
2858   \def\ACM@mk@linecount{%
2859     \savebox{\ACM@linecount@bx}[4em][t]{\parbox[t]{4em}{\normalfont
2860       \normalsize
2861       \setlength{\ACM@linecount@bxht}{0pt}%
2862       \loop{\color{red}\scriptsize\the\ACM@linecount}\@
2863       \global\advance\ACM@linecount by \@ne
2864       \addtolength{\ACM@linecount@bxht}{\baselineskip}%
2865       \ifdim\ACM@linecount@bxht<\textheight\repeat
2866       {\color{red}\scriptsize\the\ACM@linecount}\hfill
2867       \global\advance\ACM@linecount by \@ne}}
2868 \fi

```

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

```
2869 \def\ACM@linecountL{%
2870   \if@ACM@review
2871   \ACM@mk@linecount
2872   \begin{picture}(0,0)%
2873     \put(-26,-22){\usebox{\ACM@linecount@bx}}%
2874   \end{picture}%
2875 \fi}
```

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

```
2876 \def\ACM@linecountR{%
2877   \if@ACM@review
2878     \ifcase\ACM@format@nr
2879     \relax % manuscript
2880     \relax
2881     \or % acmsmall
2882     \relax
2883     \or % acmlarge
2884     \relax
2885     \or % acmtog
2886     \ACM@mk@linecount
2887     \or % sigconf
2888     \ACM@mk@linecount
2889     \or % siggraph
2890     \ACM@mk@linecount
2891     \or % sigplan
2892     \ACM@mk@linecount
2893     \or % sigchi
2894     \ACM@mk@linecount
2895     \or % sigchi-a
2896     \ACM@mk@linecount
2897     \or % acmengage
2898     \ACM@mk@linecount
2899     \or % acmcp
2900     \relax
2901   \fi
2902   \begin{picture}(0,0)%
2903     \put(20,-22){\usebox{\ACM@linecount@bx}}%
2904   \end{picture}%
2905 \fi}
```

\ACM@timestamp The timestamp system

```
2906 \if@ACM@timestamp
2907 % Subtracting 30 from \time gives us the effect of rounding down despite
2908 % \numexpr rounding to nearest
2909 \newcounter{ACM@time@hours}
2910 \setcounter{ACM@time@hours}{\numexpr (\time - 30) / 60 \relax}
2911 \newcounter{ACM@time@minutes}
2912 \setcounter{ACM@time@minutes}{\numexpr \time - \theACM@time@hours * 60 \relax}
2913 \newcommand\ACM@timestamp{%
2914   \footnotesize%
2915   \ifx\@acmSubmissionID\empty\relax\else
2916     Submission ID: \@acmSubmissionID.{ }%
2917   \fi}
```

```

2918 \the\year-\two@digits{\the\month}-\two@digits{\the\day}{ }%
2919 \two@digits{\theACM@time@hours}:\two@digits{\theACM@time@minutes}{. }%
2920 Page \thepage\ of \@startPage--\pageref*{TotPages}.%
2921 }
2922 \fi

```

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

```

2923 \def\@shortauthors{%
2924 \if@ACM@anonymous
2925 Anon.
2926 \ifx\@acmSubmissionID\empty\else Submission Id: \@acmSubmissionID\fi
2927 \else\@shortauthors\fi}

```

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

```

2928 \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

```

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

```

```

2964 \fancyhead[RO]{\@headfootfont
2965 \shorttitle\quad\textbullet\quad\@acmArticlePage}%
2966 \if@ACM@nonacm\else%
2967 \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
2968 \@acmNumber, Article \@acmArticle. Publication date: \@acmPubDate.}%
2969 \fi
2970 \or % acmtog
2971 \fancyhead[LE]{\ACM@linecountL\@headfootfont
2972 \@acmArticlePage\quad\textbullet\quad\@shortauthors}%
2973 \fancyhead[LO]{\ACM@linecountL}%
2974 \fancyhead[RE]{\ACM@linecountR}%
2975 \fancyhead[RO]{\@headfootfont
2976 \shorttitle\quad\textbullet\quad\@acmArticlePage\ACM@linecountR}%
2977 \if@ACM@nonacm\else%
2978 \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
2979 \@acmNumber, Article \@acmArticle. Publication date: \@acmPubDate.}%
2980 \fi
2981 \else % Proceedings
2982 \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
2983 \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
2984 \fancyhead[RE]{\@headfootfont\@shortauthors\ACM@linecountR}%
2985 \if@ACM@nonacm
2986 \fancyhead[LE]{\ACM@linecountL}%
2987 \fancyhead[RO]{\ACM@linecountR}%
2988 \else%
2989 \if@ACM@engage
2990 \fancyhead[LE]{\ACM@linecountL\@headfootfont\footnotesize
2991 EngageCSEdu. \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi}%
2992 \fancyhead[RO]{\@headfootfont
2993 EngageCSEdu. \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi
2994 \ACM@linecountR}%
2995 \else
2996 \fancyhead[LE]{\ACM@linecountL\@headfootfont\footnotesize
2997 \acmConference@shortname,
2998 \acmConference@date, \acmConference@venue}%
2999 \fancyhead[RO]{\@headfootfont
3000 \acmConference@shortname,
3001 \acmConference@date, \acmConference@venue\ACM@linecountR}%
3002 \fi
3003 \fi
3004 \fi
3005 \else % Proceedings
3006 \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
3007 \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
3008 \fancyhead[RE]{\@headfootfont\@shortauthors\ACM@linecountR}%
3009 \if@ACM@nonacm
3010 \fancyhead[LE]{\ACM@linecountL}%
3011 \fancyhead[RO]{\ACM@linecountR}%
3012 \else%
3013 \if@ACM@engage
3014 \fancyhead[LE]{\ACM@linecountL\@headfootfont
3015 EngageCSEdu. \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi}%
3016 \fancyhead[RO]{\@headfootfont
3017 EngageCSEdu. \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi

```

```

3018         \ACM@linecountR}%
3019     \else
3020         \fancyhead[LE]{\ACM@linecountL\@headfootfont
3021             \acmConference@shortname,
3022             \acmConference@date, \acmConference@venue}%
3023         \fancyhead[RO]{\@headfootfont
3024             \acmConference@shortname,
3025             \acmConference@date, \acmConference@venue\ACM@linecountR}%
3026     \fi
3027 \fi
3028 \fi
3029 \if@ACM@sigchiamode
3030     \fancyheadoffset[L]{\dimexpr(\marginparsep+\marginparwidth)}%
3031 \fi
3032 \if@ACM@timestamp
3033     \fancyfoot[LO,RE]{\ACM@timestamp}
3034 \fi
3035 \if@ACM@acmcp
3036     \renewcommand{\footrulewidth}{0.1\p@}%
3037     \fancyheadoffset[L]{46pt}%
3038     \fancyhead[L]{\makebox[\z@][l]{%
3039         \raisebox{-\dimexpr(0.25\textheight*\ACM@ArticleType@nr)}{%
3040             \rotatebox{90}{\colorbox{@ACM@Article@color}{\color{white}%
3041                 \strut\ACM@ArticleType~Article}}}%
3042         \ACM@linecountL}%
3043     \fancyhead[R]{\makebox[\z@][r]{\box\@ACM@acmcpbox}}%
3044     \fancyfoot[L,C]{}%
3045     \fancyfoot[R]{\footnotesize
3046         \@journalName, Volume~\@acmVolume, Issue~\@acmNumber,
3047         \ifx\@acmArticle\@empty\else Article~\@acmArticle\fi\space
3048         (\@acmPubDate)\ifx\@acmDOI\@empty\else\\@formatdoi{\@acmDOI}\fi}
3049 \fi
3050 }%
3051 \pagestyle{standardpagestyle}
3052 }

```

\@folio@wd Folio blob width, height, offsets and max number

```

\@folio@ht 3053 \newdimen\@folio@wd
\@folio@voffset 3054 \@folio@wd=\z@
\@folio@max 3055 \newdimen\@folio@ht
3056 \@folio@ht=\z@
3057 \newdimen\@folio@voffset
3058 \@folio@voffset=\z@
3059 \def\@folio@max{1}
3060 \ifcase\ACM@format@nr
3061 \relax % manuscript
3062 \or % acmsmall
3063     \@folio@wd=45.75pt\relax
3064     \@folio@ht=1.25in\relax
3065     \@folio@voffset=.2in\relax
3066     \def\@folio@max{8}
3067 \or % acmlarge
3068     \@folio@wd=43.25pt\relax
3069     \@folio@ht=79pt\relax

```

```

3070 \@folio@voffset=.55in\relax
3071 \def\@folio@max{10}
3072 \fi

```

`\@folioblob` The macro to typeset the folio blob.

```

3073 \def\@folioblob{\@tempcnta=0\@acmArticleSeq\relax
3074 \ifnum\@tempcnta=0\relax\else
First, we calculate \@acmArticleSeq modulo \@folio@max
3075 \loop
3076 \ifnum\@tempcnta>\@folio@max\relax
3077 \advance\@tempcnta by - \@folio@max
3078 \repeat
3079 \advance\@tempcnta by -1\relax
3080 \@tempdima=\@folio@ht\relax
3081 \multiply\@tempdima by \the\@tempcnta\relax
3082 \advance\@tempdima by -\@folio@voffset\relax
3083 \begin{picture}(0,0)
3084 \makebox[\z@]{\raisebox{-\@tempdima}{%
3085 \rlap{%
3086 \raisebox{-0.45\@folio@ht}{\z@}\z@}{%
3087 \rule{\@folio@wd}{\@folio@ht}}}%
3088 \parbox{\@folio@wd}{%
3089 \centering
3090 \textcolor{white}{\LARGE\sffamily\bfseries\@acmArticle}}}}
3091 \end{picture}\fi}
3092

```

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

```

3093 \AtBeginDocument{%
3094 \fancypagestyle{firstpagestyle}{%
3095 \fancyhf{}%
3096 \renewcommand{\headrulewidth}{\z@}%
3097 \renewcommand{\footrulewidth}{\z@}%
3098 \if@ACM@journal@bibstrip
3099 \ifcase\ACM@format@nr
3100 \relax % manuscript
3101 \fancyhead[L]{\ACM@linecountL\@acmBadgel}%
3102 \fancyhead[R]{\@acmBadger}%
3103 \fancyfoot[RO,LE]{\if@ACM@printfolios\small\thepage\fi}%
3104 \if@ACM@nonacm\else%
3105 \fancyfoot[RE,LO]{\footnotesize Manuscript submitted to ACM}%
3106 \fi%
3107 \or % acmsmall
3108 \if@ACM@nonacm\else%
3109 \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
3110 \@acmNumber, Article \@acmArticle. Publication date:
3111 \@acmPubDate.}%
3112 \fi%
3113 \fancyhead[LE]{\ACM@linecountL\@folioblob\@acmBadgel}%
3114 \fancyhead[LO]{\ACM@linecountL\@acmBadgel}%
3115 \fancyhead[RO]{\@acmBadger\@folioblob}%
3116 \fancyhead[RE]{\@acmBadger}%
3117 \fancyheadoffset[RO,LE]{0.6\@folio@wd}%

```



```

3118 \or % acmlarge
3119 \if@ACM@nonacm\else%
3120 \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
3121 \@acmNumber, Article \@acmArticle. Publication date:
3122 \@acmPubDate.}%
3123 \fi%
3124 \fancyhead[RO]{\@acmBadgeR\@folioblob}%
3125 \fancyhead[RE]{\@acmBadgeR}%
3126 \fancyhead[LE]{\ACM@linecountL\@folioblob\@acmBadgeL}%
3127 \fancyhead[LO]{\ACM@linecountL\@acmBadgeL}%
3128 \fancyheadoffset[RO,LE]{1.4\@folio@wd}%
3129 \or % acmtog
3130 \if@ACM@nonacm\else%
3131 \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
3132 \@acmNumber, Article \@acmArticle. Publication date:
3133 \@acmPubDate.}%
3134 \fi%
3135 \fancyhead[L]{\ACM@linecountL\@acmBadgeL}%
3136 \fancyhead[R]{\@acmBadgeR\ACM@linecountR}%
3137 \else % Conference proceedings
3138 \fancyhead[L]{\ACM@linecountL\@acmBadgeL}%
3139 \fancyhead[R]{\@acmBadgeR\ACM@linecountR}%
3140 \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
3141 \fi
3142 \else
3143 \fancyhead[L]{\ACM@linecountL\@acmBadgeL}%
3144 \fancyhead[R]{\@acmBadgeR\ACM@linecountR}%
3145 \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
3146 \fi
3147 \if@ACM@timestamp
3148 \ifnum\ACM@format@nr=0\relax % Manuscript
3149 \fancyfoot[LO,RE]{\ACM@timestamp\quad
3150 \if@ACM@nonacm\else
3151 \footnotesize Manuscript submitted to ACM
3152 \fi}
3153 \else
3154 \fancyfoot[LO,RE]{\ACM@timestamp}
3155 \fi
3156 \fi
3157 \if@ACM@acmcp
3158 \renewcommand{\footrulewidth}{0.1\p@}%
3159 \fancyheadoffset[L]{46pt}%
3160 \fancyhead[L]{\makebox[\z@][l]{%
3161 \raisebox{-\dimexpr(0.25\textheight*\ACM@ArticleType@nr)}{%
3162 \rotatebox{90}{\colorbox{@ACM@Article@color}{\color{white}%
3163 \strut\ACM@ArticleType~Article}}}%
3164 \ACM@linecountL\@acmBadgeL}%
3165 \fancyhead[R]{\@acmBadgeR\makebox[\z@][r]{\box\@ACM@acmcpbox}}%
3166 \fancyfoot[L,C]{}%
3167 \fancyfoot[R]{\footnotesize
3168 \@journalName, Volume~\@acmVolume, Issue~\@acmNumber,
3169 \ifx\@acmArticle\@empty\else Article~\@acmArticle\fi\space
3170 (\@acmPubDate)\ifx\@acmDOI\@empty\else\\\@formatdoi{\@acmDOI}\fi}
3171 \fi

```

3172 }}

### 3.23 Sectioning

\ACM@NRadjust 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@NRadjust 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@NRadjust. 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.

```

3173 \def\ACM@NRadjust#1{%
3174   \begingroup
3175   \expandafter\ifx\csname Sectionformat\endcsname\relax
3176   % do nothing when \Sectionformat is unknown
3177   \def\next{\endgroup #1}%
3178   \else
3179   \def\next{\endgroup
3180     \let\realSectionformat\Sectionformat
3181     \def\ACM@sect@format@{#1}%
3182     \let\Sectionformat\ACM@NR@adjustedSectionformat
3183     %% next lines added 2018-06-17 to ensure section number is styled
3184     \let\real@adddotafter\@adddotafter
3185     \let\@adddotafter\ACM@adddotafter
3186     #1{}% imposes the styles, but nullifies \MakeUppercase
3187     \let\@adddotafter\real@adddotafter
3188   }%
3189   \fi \next
3190 }
```

\ACM@NR@adjustedSectionformat

```

3191 \def\ACM@NR@adjustedSectionformat#1#2{%
3192   \realSectionformat{\ACM@sect@format{#1}}{#2}%
3193   \let\Sectionformat\realSectionformat}
3194 \DeclareRobustCommand{\ACM@sect@format@}{\ACM@sect@format@}
3195 \def\ACM@sect@format@null#1{#1}
3196 \let\ACM@sect@format@\ACM@sect@format@null
3197 \AtBeginDocument{%
3198   \expandafter\ifx\csname LTX@adddotafter\endcsname\relax
```

```

3199 \let\LTX@adddotafter\@adddotafter
3200 \fi
3201 }

```

\ACM@adddotafter

```

3202 \def\ACM@adddotafter#1{\ifx\relax#1\relax\else\LTX@adddotafter{#1}\fi}

```

Sectioning is different for different levels

```

3203 \renewcommand\section{\@startsection{section}{1}{\z@}%
3204 {- .75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
3205 {.25\baselineskip}%
3206 {\ACM@NRadjust\@secfont}}
3207 \renewcommand\subsection{\@startsection{subsection}{2}{\z@}%
3208 {- .75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
3209 {.25\baselineskip}%
3210 {\ACM@NRadjust\@subsecfont}}
3211 \renewcommand\subsubsection{\@startsection{subsubsection}{3}{\z@}%
3212 {- .5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
3213 {-3.5\p@}%
3214 {\ACM@NRadjust{\@subsubsecfont\@adddotafter}}}}
3215 \renewcommand\paragraph{\@startsection{paragraph}{4}{\parindent}%
3216 {- .5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
3217 {-3.5\p@}%
3218 {\ACM@NRadjust{\@parfont\@adddotafter}}}}
3219 \newcommand\noindentparagraph{\@startsection{paragraph}{4}{\z@}%
3220 {- .5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
3221 {-3.5\p@}%
3222 {\ACM@NRadjust{\@parfont}}}}
3223
3224 \renewcommand\part{\@startsection{part}{9}{\z@}%
3225 {-10\p@ \@plus -4\p@ \@minus -2\p@}%
3226 {4\p@}%
3227 {\ACM@NRadjust\@parfont}}

```

\section@raggedright Special version of \raggedright compatible with \MakeUppercase

```

3228 \def\section@raggedright{\@rightskip\@flushglue
3229 \rightskip\@rightskip
3230 \leftskip\z@skip
3231 \parindent\z@}

```

\@secfont Fonts for sections etc. are different for different formats.

```

\@subsecfont 3232 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}
\@subsubsecfont 3233 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
\@parfont 3234 \def\@subsubsecfont{\sffamily\itshape}
3235 \def\@parfont{\itshape}
3236 \setcounter{secnumdepth}{3}
3237 \ifcase\ACM@format@nr
3238 \relax % manuscript
3239 \or % acmsmall
3240 \or % acmlarge
3241 \def\@secfont{\sffamily\large\section@raggedright\MakeTextUppercase}
3242 \def\@subsecfont{\sffamily\large\section@raggedright}
3243 \or % acmtog
3244 \def\@secfont{\sffamily\large\section@raggedright\MakeTextUppercase}

```

```

3245 \def\@subsecfont{\sffamily\large\section@raggedright}
3246 \or % sigconf
3247 \def\@secfont{\bfseries\Large\section@raggedright\MakeTextUppercase}
3248 \def\@subsecfont{\bfseries\Large\section@raggedright}
3249 \or % siggraph
3250 \def\@secfont{\sffamily\bfseries\Large\section@raggedright\MakeTextUppercase}
3251 \def\@subsecfont{\sffamily\bfseries\Large\section@raggedright}
3252 \or % sigplan
3253 \def\@secfont{\bfseries\Large\section@raggedright}
3254 \def\@subsecfont{\bfseries\section@raggedright}
3255 \def\@subsubsecfont{\bfseries\section@raggedright}
3256 \def\@parfont{\bfseries\itshape}
3257 \def\@subparfont{\itshape}
3258 \or % sigchi
3259 \setcounter{secnumdepth}{1}
3260 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}
3261 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
3262 \or % sigchi-a
3263 \setcounter{secnumdepth}{0}
3264 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}
3265 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
3266 \or % acmengage
3267 \def\@secfont{\bfseries\Large\section@raggedright\MakeTextUppercase}
3268 \def\@subsecfont{\bfseries\Large\section@raggedright}
3269 \or %acmcp
3270 \fi

```

`\@adddotafter` Add punctuation after a sectioning command

```

3271 \def\@adddotafter#1{#1\@addpunct{.}}

```

`\@addspaceafter` Add space after a sectioning command

```

3272 \def\@addspaceafter#1{#1\@addpunct{\enspace}}

```

```

3273 \if@ACM@acmcp
3274   \setcounter{secnumdepth}{-1}%
3275 \fi

```

### 3.24 TOC lists

`\@dotsep` Related to the `\tableofcontents` are all the horizontal fillers. Base  $\LaTeX$  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.

```

3276 \providecommand*\@dotsep{4.5}

```

### 3.25 Theorems

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

```

3277 \def\@acmplainbodyfont{\itshape}

```

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

```

3278 \def\@acmplainindent{\parindent}

```

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

3279 `\def\@acmplainheadfont{\scshape}`

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

3280 `\def\@acmplainnotefont{\@empty}`

Customization of the acmplain theorem style:

3281 `\ifcase\ACM@format@nr`

3282 `\relax % manuscript`

3283 `\or % acmsmall`

3284 `\or % acmlarge`

3285 `\or % acmtog`

3286 `\or % sigconf`

3287 `\or % siggraph`

3288 `\or % sigplan`

3289 `\def\@acmplainbodyfont{\itshape}`

3290 `\def\@acmplainindent{\z@}`

3291 `\def\@acmplainheadfont{\bfseries}`

3292 `\def\@acmplainnotefont{\normalfont}`

3293 `\or % sigchi`

3294 `\or % sigchi-a`

3295 `\or % acmengage`

3296 `\or % acmcp`

3297 `\fi`

`acmplain` The acmplain theorem style

3298 `\newtheoremstyle{acmplain}%`

3299 `{.5\baselineskip\@plus.2\baselineskip`

3300 `\@minus.2\baselineskip}% space above`

3301 `{.5\baselineskip\@plus.2\baselineskip`

3302 `\@minus.2\baselineskip}% space below`

3303 `{\@acmplainbodyfont}% body font`

3304 `{\@acmplainindent}% indent amount`

3305 `{\@acmplainheadfont}% head font`

3306 `{.}% punctuation after head`

3307 `{.5em}% spacing after head`

3308 `{\thmname{#1}\thmnumber{ #2}\thmnote{ {\@acmplainnotefont(#3)}}}% head spec`

`\@acmdefinitionbodyfont` The font to typeset the body of the acmdefinition theorem style.

3309 `\def\@acmdefinitionbodyfont{\normalfont}`

`\@acmdefinitionindent` The amount to indent the acmdefinition theorem style.

3310 `\def\@acmdefinitionindent{\parindent}`

`\@acmdefinitionheadfont` The font to typeset the head of the acmdefinition theorem style.

3311 `\def\@acmdefinitionheadfont{\itshape}`

`\@acmdefinitionnotefont` The font to typeset the note of the acmdefinition theorem style.

3312 `\def\@acmdefinitionnotefont{\@empty}`

Customization of the acmdefinition theorem style:

3313 `\ifcase\ACM@format@nr`

3314 `\relax % manuscript`

```

3315 \or % acmsmall
3316 \or % acmlarge
3317 \or % acmtog
3318 \or % sigconf
3319 \or % siggraph
3320 \or % sigplan
3321 \def\@acmdefinitionbodyfont{\normalfont}
3322 \def\@acmdefinitionindent{\z@}
3323 \def\@acmdefinitionheadfont{\bfseries}
3324 \def\@acmdefinitionnotefont{\normalfont}
3325 \or % sigchi
3326 \or % sigchi-a
3327 \or % acmengage
3328 \or % acmcp
3329 \fi

```

acmdefinition The acmdefinition theorem style

```

3330 \newtheoremstyle{acmdefinition}%
3331 { .5\baselineskip\@plus.2\baselineskip
3332 \@minus.2\baselineskip}% space above
3333 { .5\baselineskip\@plus.2\baselineskip
3334 \@minus.2\baselineskip}% space below
3335 {\@acmdefinitionbodyfont}% body font
3336 {\@acmdefinitionindent}% indent amount
3337 {\@acmdefinitionheadfont}% head font
3338 { .}% punctuation after head
3339 { .5em}% spacing after head
3340 {\thmname{#1}\thmnumber{ #2}\thmnote{ {\@acmdefinitionnotefont{#3}}}}% head spec

```

Make acmplain the default theorem style.

```

3341 \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.

```

3342 \AtEndPreamble{%
3343 \if@ACM@acmthm
3344 \theoremstyle{acmplain}
3345 \@ifundefined{theorem}{%
3346 \newtheorem{theorem}{Theorem}[section]
3347 }{}
3348 \@ifundefined{conjecture}{%
3349 \newtheorem{conjecture}[theorem]{Conjecture}
3350 }{}
3351 \@ifundefined{proposition}{%
3352 \newtheorem{proposition}[theorem]{Proposition}
3353 }{}
3354 \@ifundefined{lemma}{%
3355 \newtheorem{lemma}[theorem]{Lemma}

```

```

3356   {}
3357   \@ifundefined{corollary}{%
3358     \newtheorem{corollary}[theorem]{Corollary}
3359   }{}
3360   \theoremstyle{acmdefinition}
3361   \@ifundefined{example}{%
3362     \newtheorem{example}[theorem]{Example}
3363   }{}
3364   \@ifundefined{definition}{%
3365     \newtheorem{definition}[theorem]{Definition}
3366   }{}
3367   \fi
3368   \theoremstyle{acmplain}
3369 }

```

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

```

3370 \def\@proofnamefont{\scshape}

```

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

```

3371 \def\@proofindent{\indent}

```

Customization of the proof environment.

```

3372 \ifcase\ACM@format@nr
3373 \relax % manuscript
3374 \or % acmsmall
3375 \or % acmlarge
3376 \or % acmtog
3377 \or % sigconf
3378 \or % siggraph
3379 \or % sigplan
3380 \def\@proofnamefont{\itshape}
3381 \def\@proofindent{\noindent}
3382 \or % sigchi
3383 \or % sigchi-a
3384 \or % acmengage
3385 \or % acmcp
3386 \fi

```

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

```

3387 \renewenvironment{proof}[1][\proofname]{\par
3388   \pushQED{\qed}%
3389   \normalfont \topsep6\p@\plus6\p@\relax
3390   \trivlist
3391     \item[\@proofindent\hskip\labelsep
3392       {\@proofnamefont #1\@addpunct{.}}]\ignorespaces
3393 }{%
3394   \popQED\endtrivlist\endpfalse
3395 }

```

### 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.

```

3396 \AtEndPreamble{%
3397   \if@ACM@pbalance
3398     \global\@ACM@balancefalse
3399     \ifcase\ACM@format@nr
3400       \relax % manuscript
3401       \or % acmsmall
3402       \or % acmlarge
3403       \or % acmtog
3404       \RequirePackage{pbalance}%
3405       \or % sigconf
3406       \RequirePackage{pbalance}%
3407       \or % siggraph
3408       \RequirePackage{pbalance}%
3409       \or % sigplan
3410       \RequirePackage{pbalance}%
3411       \or % sigchi
3412       \RequirePackage{pbalance}%
3413       \or % sigchi-a
3414       \or % acmengage
3415       \RequirePackage{pbalance}%
3416       \or % acmcp
3417     \fi
3418   \fi
3419   \if@ACM@balance
3420     \ifcase\ACM@format@nr
3421       \relax % manuscript
3422       \global\@ACM@balancefalse
3423       \or % acmsmall
3424       \global\@ACM@balancefalse
3425       \or % acmlarge
3426       \global\@ACM@balancefalse
3427       \or % acmtog
3428       \RequirePackage{balance}%
3429       \or % sigconf
3430       \RequirePackage{balance}%
3431       \or % siggraph
3432       \RequirePackage{balance}%
3433       \or % sigplan
3434       \RequirePackage{balance}%
3435       \or % sigchi
3436       \RequirePackage{balance}%
3437       \or % sigchi-a
3438       \global\@ACM@balancefalse
3439       \or % acmengage
3440       \RequirePackage{balance}%
3441       \or % acmcp
3442       \global\@ACM@balancefalse
3443     \fi
3444   \fi
3445 }
3446 \AtEndDocument{%
3447   \if@ACM@balance
3448     \if@twocolumn
3449       \balance

```



```
3450 \fi\fi}
```

### 3.27 Acknowledgments

`\acksname`

```
3451 \newcommand\acksname{Acknowledgments}
```

`\acks` This is a comment-like structure

```
3452 \specialcomment{acks}{%
3453 \beginngroup
3454 \section*{\acksname}
3455 \phantomsection\addcontentsline{toc}{section}{\acksname}
3456 }{%
3457 \endgroup
3458 }
```

`\grantsponsor` We just typeset the name of the sponsor

```
3459 \def\grantsponsor#1#2#3{#2}
```

`\grantnum`

```
3460 \newcommand\grantnum[3][{}]{#3%
3461 \def\@tempa{#1}\ifx\@tempa\@empty\else\space(\url{#1})\fi}
```

### 3.28 Conditional typesetting

We use the comment package for conditional typesetting:

```
3462 \AtEndPreamble{%
3463 \if@ACM@screen
3464 \includecomment{screenonly}
3465 \excludecomment{printonly}
3466 \else
3467 \excludecomment{screenonly}
3468 \includecomment{printonly}
3469 \fi
3470 \if@ACM@anonymous
3471 \excludecomment{anonsuppress}
3472 \excludecomment{acks}
3473 \else
3474 \includecomment{anonsuppress}
3475 \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’.

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

```

3483 \def\@tempb{arXiv}%
3484 \ifx\@tempa\@tempb\relax
3485   arXiv:\href{https://arxiv.org/abs/#2}{#2}%
3486 \else
3487   #1:#2%
3488 \fi
3489 \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.

```

3490 \def\theindex{\@restonecoltrue\if@twocolumn\@restonecolfalse\fi
3491 \columnseprule\z@ \columnsep 35\p@
3492 \@indextitlestyle
3493 \let\item\@idxitem
3494 \parindent\z@ \parskip\z@\@plus.3\p@\relax
3495 \raggedright
3496 \hyphenpenalty\@M
3497 \footnotesize}

```

### 3.31 End of Class

\vspace We do not disable \vspace, but add warning to it

```

3498 \let\@vspace@orig=\@vspace
3499 \let\@vspacer@orig=\@vspacer
3500 \apptocmd{\@vspace}{\ClassWarning{\@classname}{\string\vspace\space should
3501   only be used to provide space above/below surrounding
3502   objects}}{}{}
3503 \apptocmd{\@vspacer}{\ClassWarning{\@classname}{\string\vspace\space should
3504   only be used to provide space above/below surrounding
3505   objects}}{}{}
3506 \let\@vspace@acm=\@vspace
3507 \let\@vspacer@acm=\@vspacer

```

\ACM@origbaselinestretch We produce an error if the user tries to change \baselinestretch

```

3508 \let\ACM@origbaselinestretch\baselinestretch
3509 \AtEndDocument{\ifx\baselinestretch\ACM@origbaselinestretch\else
3510   \ClassError{\@classname}{An attempt to redefine
3511     \string\baselinestretch\space detected. Please do not do this for
3512     ACM submissions!}\fi}

3513 \normalsize\normalfont\frenchspacing
3514 </class>

```

## 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 Schandl, 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  | General: Added prologue option to xcolor . . . . .   | 50 | \ccsdesc@parse: Added warning for missing concepts . . . . .   | 76  |
|       | Bib code cleanup (Zack Weinberg)   | 35 | \if@ACM@printacmref: Added warning for longer papers . . . . . | 74  |
|       | Documentation update (siggraph) .  | 35 | \keywords: Added warning for missing keywords . . . . .        | 73  |
| 1.49  | General: New journal: DTRAP . . . . .  | 35 | 1.69   | \vspace: Added the changed command to avoid grouping . . . . .  |
| 1.53  | General: New journals: PACMCGIT, TIOT, TDSCI . . . . .   | 35 | 1.70   | General: Name change for TDS . . . . .  |
|       | Rearranged docs . . . . .  | 35 | 1.71   | General: Bibliography change: volume for @inproceedings is now in brackets together with series . . . . . |
| 1.54  | General: Moved footnote stuff before hyperref call (Ross Moore) . . . . .  | 35 |  | LuaTeX now uses the OTF versions of fonts . . . . .   |
| 1.56  | General: Documented \Description   | 35 |  | Retired sigchi and sigchi-a . . . . .   |
| 1.57  | General: Booktabs package is now the default . . . . .   | 35 | 1.75   | General: Documentation update . . . . .   |
| 1.58  | General: Changes in samples (Enrico Gregorio) . . . . .  | 35 | 1.78   | General: Documentation update: Word count . . . . .   |
|       | New journal: HEALTH. TDS is renamed to TDSCI . . . . .   | 35 | 1.79   | General: Updated indormation for TAP, TCPS, TEAC . . . . .  |
| 1.60  | General: New option: urlbreakonhyphens . . . . .   | 35 | 1.80   | General: Added DLT and FAC . . . . .  |
|       | \if@ACM@urlbreakonhyphens: introduced macro . . . . .  | 36 | 1.82   | General: Updated abbreviations and codes for several journals . . . . .                                   |
| 1.62  | General: New journal: TELO . . . . .   | 35 | 1.84   | General: New journals: JDS, GAMES . . . . .   |
| 1.63  | General: New journal: FACMP . . . . .  | 35 | 1.85   | General: Added CC licenses . . . . .  |
|       | New journal: TQUANT . . . . .  | 35 |  | Added: acmengage . . . . .  |
| 1.63a | General: Move: TQUANT to TQC . . . . .   | 35 |  | New journal: JRC . . . . .  |
| 1.64  | General: Putting abstract after \maketitle now causes an error .   | 35 |  | \@mkauthors: Added: acmengage . . . . .   |
| 1.65  | General: New journal: DGOV . . . . .   | 35 |  | \@mktitle: Added: acmengage . . . . .   |
| 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 |  | \@parfont: Added: acmengage . . . . .   |
|       | Authors' addresses are mandatory for journal articles . . . . .  | 35 |  | \@printtopmatter: Added: acmengage . . . . .  |
|       | \@mkauthorsaddresses: Added warning for missing addresses . . . . .  | 97 |  | \@specialsection: Added: acmengage . . . . .  |
|       |  |    |  | \@subtitlefont: Added: acmengage . . . . .  |
|       |  |    |  | \@titlefont: Added: acmengage . . . . .   |
|       |  |    |  | \ACM@linecountR: Added: acmengage . . . . .   |
|       |  |    |  | format: New format: acmengage . . . . .   |
|       |  |    |  | \parskip: Added: acmengage . . . . .  |

|       |  |    |  |    |
|-------|--|----|--|----|
| 1.87  | General: New journals: ACMJCSS,<br>JATS, TORS . . . . .  | 59 | \acmArticleSeq: Name change by<br>Matthew Fluet . . . . .  | 71 |
|       | format: New format: acmcp . . . . .  | 36 | \acmDOI: Name change by Matthew<br>Fluet . . . . .   | 72 |
| 1.88  | General: Added ISSN for ACMJCSS . . . . .  | 59 | \acmISBN: Name change by Matthew<br>Fluet . . . . .  | 71 |
|       | Added ISSN for GAMES . . . . .   | 59 | v1.05  |    |
|       | Added PACMNET . . . . .  | 59 | General: Added processing doi<br>numbers for acmsiggraph and doi<br>numbers for sigproc.bib . . . . .  | 35 |
| 1.89  | General: Added PACMMOD . . . . .   | 59 | Patched \setcitestyle command;<br>closes <a href="https://github.com/borisveytsman/acmart/issues/19">https:<br/>//github.com/borisveytsman/<br/>acmart/issues/19</a> . . . . .                                     | 35 |
|       | Added TOPML . . . . .  | 59 |  |    |
|       | \@printtopmatter: Moved badges to<br>top header . . . . .  | 87 |  |    |
| v1.00 |  |    | v1.06  |    |
|       | General: First released version . . . . .  | 35 | \@ACM@badge@skip: Added macro . . . . .  | 72 |
| v1.01 | General: Changed hyperref colors in<br>screen mode (closes <a href="https://github.com/borisveytsman/acmart/issues/1">https:<br/>//github.com/borisveytsman/<br/>acmart/issues/1</a> ) . . . . . | 35 | \@ACM@badge@width: Added macro . . . . .   | 72 |
|       | Defined ACM colors . . . . .   | 35 | \@ACM@title@width: Added macro . . . . .   | 72 |
|       | Explicitly put draft option (closes<br><a href="https://github.com/borisveytsman/acmart/issues/4">https:<br/>//github.com/borisveytsman/<br/>acmart/issues/4</a> ) . . . . .                     | 38 | \@mktitle@i: Added processing<br>badges . . . . .  | 89 |
|       | Set headheight to 1pc for all<br>formats (closes <a href="https://github.com/borisveytsman/acmart/issues/5">https:<br/>//github.com/borisveytsman/<br/>acmart/issues/5</a> ) . . . . .           | 35 | Made generic . . . . .   | 89 |
| v1.02 | General: Added TOPS and TSC (closes<br><a href="https://github.com/borisveytsman/acmart/issues/12">https:<br/>//github.com/borisveytsman/<br/>acmart/issues/12</a> ) . . . . .                   | 35 | \@mktitle@ii: Now this macro is<br>obsolete . . . . .  | 90 |
|       | Documentation changes (closes<br><a href="https://github.com/borisveytsman/acmart/issues/13">https:<br/>//github.com/borisveytsman/<br/>acmart/issues/13</a> ) . . . . .                         | 35 | \@mktitle@iii: Added processing<br>badges . . . . .  | 90 |
| v1.03 | General: Added anonsuppress<br>environment . . . . .   | 35 | Made more generic . . . . .  | 90 |
|       | Added authorversion option (closes<br><a href="https://github.com/borisveytsman/acmart/issues/9">https:<br/>//github.com/borisveytsman/<br/>acmart/issues/9</a> ) . . . . .                      | 35 | \@mktitle@iv: Made more generic . . . . .  | 90 |
|       | \@formatdoi: Added macro . . . . .   | 79 | \@printtopmatter: Added processing<br>badges . . . . .   | 87 |
|       | \if@ACM@authorversion: Added<br>macro . . . . .  | 37 | \@subtitlefont: Added macro . . . . .  | 89 |
|       | \maketitle: Added special case of<br>authorversion . . . . .   | 83 | \@titlefont: Added macro . . . . .   | 88 |
| v1.04 | General: Updated bibliography for<br>siggraph . . . . .  | 35 | \acmBadgeL: Added macro . . . . .  | 72 |
|       |  |    | \acmBadgeR: Added macro . . . . .  | 72 |
|       |  |    | \if@ACM@badge: Added macro . . . . .   | 72 |
|       |  |    | v1.07  |    |
|       |  |    | \maketitle: Corrected a bug with<br>abstract footnotes . . . . .   | 83 |
|       |  |    | Corrected a bug with permssion<br>and footnotes order . . . . .  | 83 |
|       |  |    | v1.08  |    |
|       |  |    | General: SIGPLAN reformatting by<br>Matthew Fluet . . . . .  | 35 |
|       |  |    | Typos corrected (Tobias Pape) . . . . .  | 35 |
|       |  |    | v1.09  |    |
|       |  |    | General: Revert SIGPLAN caption<br>rules . . . . .   | 35 |
|       |  |    | v1.10  |    |
|       |  |    | General: Changes of<br>'licensedothergov' wording . . . . .  | 77 |
|       |  |    | \maketitle: Corrected a bug with doi<br>in manuscript and author version,<br><a href="https://github.com/borisveytsman/acmart/issues/36">https:<br/>//github.com/borisveytsman/<br/>acmart/issues/36</a> . . . . . | 83 |

|  |     |  |     |
|--|-----|--|-----|
| standardpagestyle: Reversed folios location . . . . .  | 101 | \bibstyle@acmnumeric: Moved def of \bibstyle@numeric before use . .    | 43  |
| v1.11  |     | v1.15  |     |
| General: Customization of ACM theorem styles and proof environment by Matthew Fluet . .                    | 35  | \@ACM@addtoaddress: Added macro  | 90  |
| v1.12  |     | \@mkauthors@iii: New authors system . . . . .                          | 94  |
| General: Added graceful behavior when libertine fonts are absent . .                                       | 54  | \@shortauthors: Introduced macro .                                     | 101 |
| Documentation updates . . . . .  | 35  | \@typeset@author@bx: Moved to separate macro . . . . .                 | 94  |
| \@marginfigure: Now centering by default . . . . .   | 57  | \acks: Added macro . . . . .   | 113 |
| \@marginfigure: Now centering by default . . . . .   | 57  | \affiliation: Added code for author groups . . . . .                   | 69  |
| \@parfont: Moved to \section@raggedright . . . . .   | 107 | \author: Added code for author groups . . . . .                        | 68  |
| \copyrightpermissionfootnoterule: Added macro . . . . .  | 52  | \city: Added macro . . . . .   | 91  |
| \descriptionlabel: Redefined . . . .   | 59  | \country: Added macro . . . . .  | 91  |
| \footnoterule: Made shorter . . . . .  | 53  | \department: Added macro . . . . .                                     | 91  |
| \if@ACM@natbib@override: Added macro . . . . .   | 37  | \grantnum: Added macro . . . . .                                       | 113 |
| \if@ACM@newfonts: Added macro . .  | 54  | \grantsponsor: Added macro . . . .                                     | 113 |
| \maketitle: Moved thankses to copyrightpermission box . . . . .  | 83  | \if@insideauthorgroup: Introduced macro . . . . .                      | 68  |
| \section@raggedright: Introduced macro . . . . .   | 107 | \institution: Added macro . . . . .                                    | 91  |
| v1.13  |     | \num@authorgroups: Renamed . . . .                                     | 68  |
| General: Font adjustments for acmsmall . . . . .   | 92  | \orcid: Introduced macro . . . . .                                     | 70  |
| Increased font size for ACM Large Print bibliographic information by default for the proceedings . . . . . | 74  | \position: Added macro . . . . .                                       | 91  |
| \@mpfootnotetext: Made minipage footnotes centered . . . . .   | 48  | \postcode: Added macro . . . . .                                       | 91  |
| \bibliographystyle: Redefined macro . . . . .  | 49  | \state: Added macro . . . . .  | 91  |
| \bibstyle@acmauthoryear: Added macro . . . . .   | 43  | \streetaddress: Added macro . . . .                                    | 91  |
| \bibstyle@acmnumeric: Added macro . . . . .  | 43  | standardpagestyle: Better handling of anonymous mode . . . . .         | 101 |
| \if@ACM@printfolios: Added macro   | 74  | v1.16  |     |
| standardpagestyle: Added headers for sigs . . . . .  | 101 | General: Formatting header/footer (Matthew Fluet) . . . . .            | 35  |
| Expanded headers for sigchi-a . . .  | 101 | \@headfootfont: Added macro . . . .                                    | 101 |
| Suppressed folios if sig . . . . .   | 101 | standardpagestyle: Customize header/footer text font . . . . .         | 101 |
| v1.14  |     | v1.17  |     |
| General: \citestyle updates (Matthew Fluet) . . . . .  | 35  | General: Slightly decreased margins for sigs . . . . .                 | 50  |
| Patched \citestyle . . . . .   | 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  |
|  |     | \@mkauthors@ii: Deleted . . . . .                                      | 94  |
|  |     | \@mkbibcitation: Added \nobreak Changed format for sigs . . . . .      | 98  |
|  |     | \acmArticle: The default is now numerical . . . . .                    | 71  |
|  |     | \acmMonth: The default must be numerical. Closes #50. . . . .          | 71  |
|  |     | \acmNumber: The default is now numerical . . . . .                     | 71  |
|  |     | \acmVolume: The default is now numerical . . . . .                     | 71  |

|   |     |  |   |    |
|---|-----|--|---|----|
| \acmYear: The default is now<br>numerical . . . . .   | 71  | v1.29  | General: Increased head to 13pt . . . . . | 50 |
| \description: Decreased indent . . . . .  | 59  | \mkabstract: Removed spurious<br>indentation (John Wickerson) . . . . .  | 97  |    |
| \grantnum: Added url . . . . .  | 113 | \ccsdesc@parse: Add spacing after<br>bullet and around rightharrow;<br>semicolon separators no longer in<br>bold/italic (John Wickerson) . . . . . | 76  |    |
| \grantsponsor: Renamed . . . . .  | 113 | standardpagestyle: Corrected<br>printfolios (Matthew Fluet) . . . . .  | 101                                       |    |
| \if@ACM@printacmref: Renamed<br>from \if@ACM@printbib . . . . .   | 73  |  |   |    |
| standardpagestyle: Added paper<br>title to sigs . . . . .   | 101 |  |   |    |
| v1.18   |     | v1.30  |   |    |
| General: Natbib is now the default for<br>all formats . . . . .   | 35  | General: Added \frenchspacing . . . . .  | 114                                       |    |
| \mkauthors@i: Now we andify<br>affiliations . . . . .   | 93  | Bibtex style now recognizes https://<br>in doi . . . . .   | 35  |    |
| \@typeset@author@line: Added<br>macro . . . . .   | 92  | Switched to T1: looks like libertine<br>has problems with \l in OT1 . . . . .  | 54  |    |
| v1.19   |     | Updated IMWUT and PACMPL . . . . .   | 59  |    |
| General: Include 'Abstract',<br>'Acknowledgements', and<br>'References' in PDF bookmarks<br>(Matthew Fluet) . . . . . | 35  | \department: Added optional<br>parameter . . . . .   | 91  |    |
| Include 'References' in PDF<br>bookmarks (Matthew Fluet) . . . . .  | 41  | v1.31  |   |    |
| \mkabstract: Include 'Abstract' in<br>PDF bookmarks (Matthew Fluet) . . . . .   | 97  | General: Documentation changes . . . . .   | 35  |    |
| \acks: Include 'Acknowledgements' in<br>PDF bookmarks (Matthew Fluet) . . . . .                                       | 113 | \@additionalaffiliation: Added<br>macro . . . . .  | 69  |    |
| v1.20   |     | \mkbibcitation: Disabled linebreak . . . . .   | 98  |    |
| General: Bug fixes for bst . . . . .  | 35  | \@startsection: Added<br>\tochangmeasure . . . . .   | 45  |    |
| \mkabstract: Deleted spurious space . . . . .   | 97  | Redefined macro . . . . .  | 47  |    |
| v1.21   |     | \@textbottom: Redefined . . . . .  | 53  |    |
| \showeprint: Added macro . . . . .  | 113 | \acmMonth: The default now is the<br>current month (Matteo Riondato) . . . . .   | 71  |    |
| v1.22   |     | \acmYear: The default now is the<br>current year (Matteo Riondato) . . . . .   | 71  |    |
| General: More bibliography changes<br>for Aptara . . . . .  | 35  | \additionalaffiliation: Added<br>macro . . . . .   | 69  |    |
| v1.23   |     | \l@section: Redefined macro . . . . .  | 47  |    |
| General: Add PACMPL journal option . . . . .  | 35  | \l@subsubsection: Redefined macro . . . . .  | 47  |    |
| v1.24   |     | v1.32  |   |    |
| General: Add IMWUT journal option . . . . .   | 59  | General: Added POMACS journal<br>option . . . . .  | 35  |    |
| v1.25   |     | Format siggraph is now obsolete . . . . .  | 35  |    |
| General: Updated PACMPL . . . . .   | 59  | \@formatdoi: New doi format . . . . .  | 79  |    |
| v1.26   |     | v1.33  |   |    |
| General: Corrected \shortcite bug . . . . .   | 35  | General: Added acmart-preload-hook . . . . .   | 35  |    |
| Documentation typos fixed (thanks<br>to Stephen Spencer) . . . . .  | 35  | Added cmap and glyphtounicode . . . . .  | 54  |    |
| v1.27   |     | BibTeX comma before articleno bug<br>corrected . . . . .   | 35  |    |
| \if@ACM@printccs: Typo corrected . . . . .  | 73  | BibTeX crossref bug corrected . . . . .  | 35  |    |
| v1.28   |     | BibTeX numpages bug corrected . . . . .  | 35  |    |
| General: Corrected option natbib<br>behavior . . . . .  | 43  | Documentation updates . . . . .  | 35  |    |
| Got rid of warnings in pdf keywords . . . . .   | 48  | Moved \citename definition for<br>non-natbib bibliography, so a<br>package may redefine it . . . . .   | 49  |    |
| \ccsdesc@parse: Change from \to to<br>\textrightharrow (Matteo<br>Riondato) . . . . .                                 | 76  |  |   |    |

|   |     |       |  |        |
|---|-----|-------|--|--------|
| Switched to Type 1 fonts for<br>libertine even if OTF-capable<br>engine is used (Kai Mindermann) .        | 54  | v1.34 | \mkbibcitation: Deleted DOI from<br>doi numbers . . . . .  | 98     |
| \ACM@addtoaddress: Added<br>obeypunctuation code . . . . .  | 90  |       | \ACM@linecount@bx: Rulers now are<br>continuous . . . . .  | 99     |
| \mkauthors@i: Added<br>obeypunctuation code . . . . .   | 93  |       | \ACM@linecountL: Rulers now are<br>continuous . . . . .  | 100    |
| \mkauthors@iii: Added<br>obeypunctuation code . . . . .   | 94  |       | \ACM@linecountR: Rulers now are<br>continuous . . . . .  | 100    |
| \mkauthors@iv: Added<br>obeypunctuation code . . . . .  | 95  |       | \maketitle: Added date to the<br>bibstrip in conf proceedings . . . .                                | 83     |
| \subtitlefont: Added<br>\normalsize . . . . .   | 89  |       | Deleted 'DOI' from doi numbers .   | 83     |
| \ACM@linecountL: Renamed macro .  | 100 |       | Rearranged bibstrip . . . . .  | 83     |
| \ACM@linecountR: Added macro . . .  | 100 |       | The \terms command is now<br>obsolete . . . . .  | 83     |
| \ACM@timestamp: Added current page<br>number . . . . .  | 100 |       | \terms: The \terms command now<br>just produces a warning . . . . .                                  | 73     |
| Added macro (Michael D. Adams) .  | 100 | v1.35 |  |        |
| Added submission id . . . . .   | 100 |       | General: BibTeX bug fixed: et al. . . .  | 35     |
| \acmSubmissionID: Added macro . .   | 71  |       | If the copyright is set to usgov or<br>rigtsretained, the price is<br>suppressed . . . . .           | 77     |
| \city: Added obeypunctuation code   | 91  |       | \bibstyle@acmauthoryear: Square<br>brackets for author-year style . . .                              | 43     |
| \country: Added obeypunctuation<br>code . . . . .   | 91  | v1.36 |  |        |
| \department: Added obeypunctuation<br>code . . . . .  | 91  |       | General: Added PACMHCI journal<br>options . . . . .  | 59     |
| \if@ACM@affiliation@obeypunctuation:<br>Added macro . . . . .   | 69  |       | Added the possibility to adjust<br>number of author boxes per row<br>in conference formats . . . . . | 35     |
| \if@ACM@authordraft: Added macro  | 38  |       | \ACM@authorsperrrow: Added macro   | 74     |
| \if@ACM@natbib@override: Deleted<br>macro . . . . .   | 37  |       | \mkauthors@iii: Added<br>authorsperrrow override . . . . .   | 94     |
| \if@ACM@timestamp: Added macro<br>(Michael D. Adams) . . . . .  | 38  |       | \mkauthors@iv: Added<br>authorsperrrow override . . . . .  | 95     |
| \institution: Added<br>obeypunctuation code . . . . .   | 91  |       | \if@ACM@authordraft: Corrected<br>typo, thanks to bargteil . . . . .                                 | 38     |
| firstpagestyle: Added right<br>linecount for two-column formats   | 104 | v1.37 |  |        |
| Added timestamp (Michael<br>D. Adams) . . . . .   | 104 |       | General: Reduce list indentation<br>(Matthew Fluet) . . . . .  | 58     |
| \maketitle: Fixed the bug with<br>figures on top and bottom of the<br>title page, thanks to David Epstein | 83  |       | Set \normalparindent; Reduce list<br>indentation (Matthew Fluet) . . . .                             | 35     |
| \position: Added obeypunctuation<br>code . . . . .  | 91  |       | \description: Reduce list<br>indentation (Matthew Fluet) . . . .                                     | 59     |
| \postcode: Added obeypunctuation<br>code . . . . .  | 91  |       | \descriptionlabel: Reduce list<br>indentation (Matthew Fluet) . . . .                                | 59     |
| \state: Added obeypunctuation code  | 91  |       | \normalparindent: Set<br>\normalparindent (Matthew<br>Fluet) . . . . .                               | 52     |
| \streetaddress: Added<br>obeypunctuation code . . . . .   | 91  | v1.38 |  |        |
| standardpagestyle: Added right<br>linecount for two-column formats  | 101 |       | General: Increase default font size for<br>SIGPLAN . . . . .   | 35, 40 |
| Added timestamp (Michael<br>D. Adams) . . . . .   | 101 | v1.39 |  |        |
|   |     |       | \@@authornotemark: Added macro .   | 97     |



|   |     |  |     |
|---|-----|--|-----|
| \authornotemark: Added macro . . .  | 71  | \mkbibcitation: If the paper has just one page, use 'page' instead of 'pages' . . . . .                      | 98  |
| v1.40   |     | \ACM@restore@pagestyle: Added macro . . . . .  | 99  |
| General: Added 'textcase' package . .   | 41  | \acmArticle: The default is now empty . . . . .  | 71  |
| Added heightrounded to geometry   | 50  | \acmArticleSeq: Now acmArticle might be empty . . . . .  | 71  |
| Added new copyright version: licensedcagov . . . . .  | 35  | \acmBooktitle: Added macro . . . . .   | 67  |
| Added package cleveref . . . . .  | 35  | \editor: Added macro . . . . .   | 67  |
| Added Ross Moore code for glyptounicode . . . . .   | 54  | \if@ACM@acmthm: Added macro . . . .  | 36  |
| Bibliography changes . . . . .  | 35  | \maketitle: Empty DOI or ISBN are not printed (by Michael Ekstrand)  | 83  |
| \@copyrightowner: Added new copyright version: licensedcagov .                                      | 78  | v1.45  |     |
| \@copyrightpermission: Added new copyright version: licensedcagov .                                 | 79  | \@folioblob: Switched \bfseries\sffamily to \sffamily\bfseries . . . . .                                     | 104 |
| \@mkauthors@i: Switched to MakeTextUppercase . . . . .  | 93  | \@parfont: Switched \bfseries\sffamily to \sffamily\bfseries . . . . .                                       | 107 |
| \@parfont: Switched to MakeTextUppercase . . . . .  | 107 | \@titlefont: Switched \bfseries\sffamily to \sffamily\bfseries . . . . .                                     | 88  |
| \ACM@linecount@bx: Work around a bug in xcolor: looks like cmyk colors in boxes do not work . . . . | 99  | v1.46  |     |
| \ccdesc@parse@finish: Added macro . . . . .   | 76  | General: Added etoolbox . . . . .  | 35  |
| \city: We now do not print this even in SIG . . . . .   | 91  | Bst file bug fixes: label width is calculated correctly . . . . .  | 35  |
| \country: Fixed bugs with extra spaces . . . . .  | 91  | Delayed hypersetup since journal options may change screen mode  | 48  |
| \l@section: Redefined macro . .   | 47  | PACM now set screen to true . . . .  | 59  |
| \postcode: We now do not print this even in SIG . . . . .   | 91  | Restore theorem defs to class file .   | 35  |
| \state: We now do not print this even in SIG . . . . .  | 91  | \@mkauthorsaddresses: Introduced macro . . . . .   | 97  |
| \streetaddress: We now do not print this even in SIG . . . . .                                      | 91  | \@mkbibcitation: Added subtitle . .  | 98  |
| v1.41   |     | \@printendtopmatter: Made it \par\bigskip uniformly . . . . .  | 99  |
| General: Added new badges . . . . .   | 35  | \@printtopmatter: Deleted rule . . .   | 87  |
| v1.42   |     | \@setauthorsaddresses: Introduced macro . . . . .  | 99  |
| General: Deleted ACM badges . . . . .   | 35  | \ACM@linecount@bx: Rearranged the code to get rid of spurious underfull messages (Benjamin Byholm) . . . . . | 99  |
| v1.43   |     | \author: Started counting authors . .  | 68  |
| \@startsection: Added \makeatletter . . . . .   | 47  | \authorsaddresses: Introduced macro . . . . .  | 70  |
| \country: Added comma before country for journals . . . . .   | 91  | \country: Corrected spacing for institution . . . . .  | 91  |
| v1.44   |     | \if@ACM@acmthm: Modified description . . . . .   | 36  |
| General: Added package refcount . . .   | 35  | \liningnums: Workaround for compatibility with fontspec . . . .  | 55  |
| Deleted package cleveref . . . . .  | 35  | \maketitle: Added authors' addresses   | 83  |
| Put theorem defs in a separate style  | 35  |  |     |
| \@acmBooktitle: Added macro . . . .   | 67  |  |     |
| \@acmEditors: Added macro . . . . .   | 67  |  |     |
| \@editorsAbbrev: Added macro . . .  | 67  |  |     |
| \@folioblob: Suppress the blob if acmArticleSeq is empty . . . . .                                  | 104 |  |     |

|   |     |       |  |     |
|---|-----|-------|--|-----|
| Thankses go before authors' addresses . . . . .   | 83  | v1.53 | General: Added PACMCGIT, TIOT, TDSCI . . . . .   | 59  |
| \num@author: Introduced macro . . . . .   | 68  | v1.54 | General: Added Ross's patch for sectioning . . . . .   | 107 |
| v1.47   |     |       | Deleted indent for subsubsection . . . . .   | 107 |
| General: New journal: THRI . . . . .  | 35  |       | XeTeX now uses T1 encoding . . . . .   | 54  |
| v1.48   |     |       | \@mkbibcitation: Bug corrected (Ross Moore) . . . . .  | 98  |
| General: \citeyear no longer behaves like \citeyearpar . . . . .                              | 49  |       | \@shortauthors: Added submission id in anonymous mode . . . . .                                | 101 |
| Code prettying (Michael D. Adams) . . . . .   | 35  |       | \ACM@adddotafter: Added macro . . . . .  | 107 |
| Initial support for Biblatex (Daniel Thomas) . . . . .  | 35  |       | \ACM@NR@adjustedSectionformat: Added macro . . . . .   | 106 |
| Misc entries in the bibliography no longer produce a separate date . . . . .                  | 35  |       | \ACM@NRadjust: Added macro . . . . .   | 106 |
| Typos fixed (Jamie Davis) . . . . .   | 35  |       | \author: Added submission id in anonymous mode . . . . .                                       | 68  |
| \@headfootfont: Deleted unnecessary switch (Michael D. Adams) . . . . .                       | 101 |       | \if@ACM@nonacm: Added macro . . . . .  | 37  |
| \@mkabstract: Removed spurious indentation if abstract is followed by an empty line . . . . . | 97  | v1.55 | General: Now we use purple color for links . . . . .   | 48  |
| \ACM@timestamp: Fromatting change (Michael D. Adams) . . . . .                                | 100 |       | Table captions for SIGCHI now use the same font size as figure captions (Luis Leiva) . . . . . | 56  |
| \if@ACM@review: Review mode now switches on folios . . . . .                                  | 36  |       | Typo corrected (Zack Weinberg) . . . . .   | 41  |
| \maketitle: Added acmart and version info to pdfcreator tag . . . . .                         | 83  |       | \@mkbibcitation: Bug corrected . . . . .   | 98  |
| Added language and doctitle attributes to PDF (Andreas Reichinger) . . . . .                  | 83  |       | \maketitle: Fixes topnum . . . . .   | 83  |
| Suppressed empty DOI (Serguei Mokhov) . . . . .   | 83  | v1.56 | General: Looks like XeTeX requires explicit monotype font declaration . . . . .                | 54  |
| v1.50   |     |       | Make two-column layouts flush (Philip Quinn) . . . . .   | 50  |
| \@copyrightpermission: New copyright statements for iw3c2w3[g] . . . . .                      | 79  |       | \@marginfigure: Added checking for description . . . . .                                       | 57  |
| v1.51   |     |       | \@mkteasers: Added check for description . . . . .   | 97  |
| General: Corrected the bug with price suppression . . . . .                                   | 77  |       | \acksname: Added macro (Philip Quinn) . . . . .  | 113 |
| Suppress price if the copyright is set to iw3c2w3 or iw3c2w3g . . . . .                       | 77  |       | \ccsdesc@parse: End the concepts list with a period (Philip Quinn) . . . . .                   | 76  |
| XeTeX now uses OTF fonts (Joachim Breitner) . . . . .   | 54  |       | \Description: Added macro . . . . .  | 55  |
| firstpagestyle: We now use journal abbreviation for footers . . . . .                         | 104 |       | \if@Description@present: Added macro . . . . .   | 55  |
| standardpagestyle: We now use journal abbreviation for footers . . . . .                      | 101 | v1.57 | \if@undescribed@images: Added macro . . . . .  | 55  |
| v1.52   |     |       | \ACM@origbaselinestretch: Added check whether the user changed \baselinestretch . . . . .      | 114 |
| \@copyrightowner: Rewording of licenses . . . . .   | 78  |       | \author: Added warning if \author has comma . . . . .  | 68  |
| \@copyrightpermission: Another rewording of copyright statements for iw3c2w3[g] . . . . .     | 79  |       | \email: Added warning if \author has comma . . . . .   | 69  |

|   |     |  |     |
|---|-----|--|-----|
| \if@ACM@balance: Added macro . . .  | 37  | \maketitle: Added a switch setting to show that \maketitle is typeset .                        | 83  |
| \vspace: Added warning . . . . .  | 114 |  |     |
| v1.58   |     | v1.65  |     |
| General: Added HEALTH. TDSCI is renamed to TDS . . . . .                                    | 59  | \@mkauthorsaddresses: Deleted cs@addpunct . . . . .  | 97  |
| Suppressed \addtocounter in pdf subject . . . . .   | 48  | v1.66  |     |
| \@dblfloat: Deleted spurious \vspace warning . . . . .                                      | 57  | General: Patching algorithm and algorithm* to prevent spurious space warnings . . . . .        | 55  |
| \@marginfigure: Deleted spurious \vspace warning . . . . .                                  | 57  | \@specialsection: Suppress warnings about \vspace . . . . .                                    | 86  |
| \@margintable: Deleted spurious \vspace warning . . . . .                                   | 57  | v1.67  |     |
| \@mkbibcitation: Deleted spurious \vspace warning . . . . .                                 | 98  | General: Patching lstlisting and lstlisting* to prevent spurious space warnings . . . . .      | 55  |
| \@printendtopmatter: Deleted spurious \vspace warning . . . . .                             | 99  | \@parfont: Deleted redefinitions of sections . . . . .   | 107 |
| \@sidebar: Deleted spurious \vspace warning . . . . .                                       | 57  | \@specialsection: Paragraph inside group does not print its argument. Added a bugfix . . . . . | 86  |
| \maketitle: Original \vspace inside \maketitle . . . . .                                    | 83  | v1.68  |     |
| \vspace: Preserved old versions as \@vspace@orig and \@vspace@orig . . . . .                | 114 | General: New command for unindent paras . . . . .  | 107 |
| v1.59   |     | \@specialsection: Deleted grouping altogether . . . . .  | 86  |
| \acmConference: Setting \@ACM@journal@bibstrip . . . . .                                    | 67  | v1.69  |     |
| \acmJournal: Setting \@ACM@journal@bibstrip . . . . .                                       | 67  | General: No dots for unindented paragraphs . . . . .   | 107 |
| \if@ACM@journal@bibstrip: Introduced macro . . . . .  | 39  | \@printendtopmatter: Deleted grouping . . . . .  | 99  |
| firstpagestyle: Added logic for conference papers using journal format . . . . .            | 104 | \@specialsection: Changed dot to colon for sigplan . . . . .                                   | 86  |
| Moved page styles to \@AtBeginDocument . . . . .  | 104 | \ACM@linecountR: Do not increase numbers in one column format . .                              | 100 |
| standardpagestyle: Added logic for conference papers using journal format . . . . .         | 101 | \ccsdesc@parse: Use math right arrow in text . . . . .   | 76  |
| Moved page styles to \@AtBeginDocument . . . . .  | 101 | v1.71  |     |
| v1.60   |     | \l@subsubsection: Bug fixed (thanks to Andrew Black) . . . . .                                 | 47  |
| \@headfootfont: Moved to footnotesize . . . . .   | 101 | v1.72  |     |
| v1.61   |     | General: Added hyperxmp . . . . .  | 48  |
| \@typeset@author@bx: Added \normalbaselines . . . . .                                       | 94  | \author: Added \detokenize (Kuldeep S. Meel) . . . . .   | 68  |
| v1.64   |     | \maketitle: Do not andify authors for pdf metadata (Scott Pakin) . . .                         | 83  |
| \ACM@linecount@bx: Bug fix: made the spacing on the left and the right size equal . . . . . | 99  | v1.73  |     |
| \if@ACM@maketitle@typeset: Introduced macro . . . . .                                       | 59  | 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  | v1.82 | \anon: Introduced macro . . . . .                                      | 82  |
| \@mkauthors@iv: Check the presence of required elements for affiliations . . . . .   | 95  | v1.83 | General: Use babel for multilanguage papers . . . . .                  | 43  |
| \city: Check the presence in affil . .   | 91  |       | \@mkabstract: I13n . . . . .   | 97  |
| \country: Check the presence in affil  | 91  |       | \@mktitle@i: Added   |     |
| \if@ACM@citypresent: Added macro   | 93  |       | \translatedtitle and   |     |
| \if@ACM@countrypresent: Added macro . . . . .  | 93  |       | \translatedsubtitle . . . . .  | 89  |
| \if@ACM@instpresent: Added macro   | 93  |       | \@mktitle@iii: Added   |     |
| \institution: Check the presence in affil . . . . .  | 91  |       | \translatedtitle and   |     |
| \maketitle: Do not check again the presense of address fields . . . . .  | 83  |       | \translatedsubtitle . . . . .  | 90  |
| v1.74  |     |       | \@mktitle@iv: Added  |     |
| General: Changed the order of font loading . . . . .   | 54  |       | \translatedtitle and   |     |
| v1.75  |     |       | \translatedsubtitle . . . . .  | 90  |
| \@ACM@checkaffil: Changed warning to error for country . . . . .   | 93  |       | \@mktranslatedabstract: Added macro . . . . .                          | 98  |
| \@beginmaketitlehook: Introduced macro . . . . .   | 82  |       | \@mktranslatedkeywords: Added macro . . . . .                          | 70  |
| \@AtBeginMaketitle: Introduced macro . . . . .   | 83  |       | \@translatedabstracts: Added macro . . . . .                           | 45  |
| \maketitle: Added  |     |       | \@translatedkeywords: Added macro . . . . .                            | 45  |
| \@beginmaketitlehook . . . . .   | 83  |       | \@translatedsubtitle: Added macro . . . . .                            | 45  |
| v1.76  |     |       | \@translatedtitle: Added macro . .                                     | 44  |
| General: Moved hyperxmp before hyperref, see <a href="https://github.com/borisveytsman/acmart/issues/425">https://github.com/borisveytsman/acmart/issues/425</a> . . . . . | 48  |       | \ACM@lang@check: Added macro . . .                                     | 44  |
| \author: Added code for orcid links .  | 68  |       | \ACM@languages: Introduced macro .                                     | 38  |
| \if@ACM@pbalance: Added macro . .  | 37  |       | \maketitle: I13n . . . . .   | 83  |
| \maketitle: Put \par inside group for keywords . . . . .   | 83  |       | translatedabstract: Added macro  | 45  |
| \orcid: Added code for orcid links . .   | 70  |       | \translatedkeywords: Added macro                                       | 45  |
| standardpagestyle: Fixed bug with no line numbers for nonacm . . .   | 101 |       | \translatedsubtitle: Added macro                                       | 45  |
| v1.77  |     |       | \translatedtitle: Added macro . .                                      | 45  |
| \@mkauthorsaddresses: New separator of institutions . . . . .  | 97  | v1.85 | General: Added CC licenses . . . . .                                   | 77  |
| v1.78  |     |       | \@acmengagemetadate: Introduced macro . . . . .                        | 83  |
| \@mkauthors@i: Unboxing  |     |       | \@copyrightowner: Added CC licenses . . . . .                          | 78  |
| \mktitle@bx . . . . .  | 93  |       | \@copyrightpermission: Added CC licenses . . . . .                     | 79  |
| \@mkauthors@iii: Unboxing  |     |       | \@typesetengagemetadate: Introduced macro . . . . .                    | 99  |
| \mktitle@bx . . . . .  | 94  |       | \if@ACM@engage: Introduced macro .                                     | 39  |
| \@mkteasers: Unboxing \mktitle@bx  | 97  |       | \maketitle: acmengage . . . . .  | 83  |
| \@printtopmatter: Added processing the overflowing title box . . . . .   | 87  |       | \setcctype: Added macro . . . . .                                      | 78  |
| \@specialsection: Again suppressed \vspace warning . . . . .   | 86  | v1.86 | \setengagemetadate: Introduced macro . . . . .                         | 83  |
|  |     |       | \country: Error if country is empty .                                  | 91  |
|  |     |       | standardpagestyle: Special treatment of ACM Engage materials . . . . . | 101 |

|                                       |     |                                       |
|---------------------------------------|-----|---------------------------------------|
| v1.87                                 |     |                                       |
| General: Added 'framed' package for   |     | standardpagestyle: Special            |
| acmcp . . . . .                       | 41  | treatment of ACMCP . . . . .          |
| No numbering sections for ACMCP       | 108 |                                       |
| \@ACM@color@frame: Introduced         |     | \@mktitle@i: Moved down title for     |
| macro . . . . .                       | 75  | acmcp . . . . .                       |
| \@ACM@copyright@check@cc: Added       |     |                                       |
| macro . . . . .                       | 79  | v1.89                                 |
| \@copyrightpermission: CC licenses    |     | General: Added 'zref-savepos' package |
| now are allowed only for non-acm      |     | for acmcp . . . . .                   |
| or ACM engage publications . . . .    | 79  | \@ACM@acmcp@delta: Added dimen . .    |
| \@mkauthors@i: Special treatment for  |     | \@ACM@badge@skip: Redefined macro     |
| acmcp . . . . .                       | 93  | \@ACM@color@frame: Added saving       |
| \@mktitle@i: Special treatment for    |     | the position of the bottom . . . . .  |
| acmcp . . . . .                       | 89  | \@acmBadgeL: Introduced macro . . .   |
| \acmArticleType: Introduced macro     | 75  | \@acmBadgeR: Introduced macro . . .   |
| \acmCodeLink: Added possibility to    |     | \@mktitle@i: Moved badges to top      |
| have several links . . . . .          | 75  | header . . . . .                      |
| Introduced macro . . . . .            | 75  | Moved up acmcp title . . . . .        |
| \acmDataLink: Introduced macro . .    | 75  | \@mktitle@iii: Moved badges to top    |
| Now this is the same as the code link | 75  | header . . . . .                      |
| \if@ACM@acmcp: Introduced macro . .   | 39  | \acmBadge: Added macro . . . . .      |
| firstpagestyle: Special treatment     |     | \acmBadgeL: Redefined macro . . . .   |
| for acmcp . . . . .                   | 104 | \acmBadgeR: Redefined macro . . . .   |
| \maketitle: CC license are allowed    |     | \if@ACM@badge: Deleted macro . . . .  |
| for non-acm publications . . . . .    | 83  | firstpagestyle: Moved badges here     |
| \set@ACM@acmcpbox: Added macro . .    | 86  | \set@ACM@acmcpbox: Added logo . . .   |
|                                       |     | Added zref position of the bottom     |
|                                       |     | 86                                    |

## 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   |                                    |   |
|---|------------------------------------|---|
| \\$ . . . . .   | 2195, 2199                         | \@ACM@instpresentfalse . . . . . 2580   |
| \- . . . . .  | 613                                | \@ACM@instpresenttrue . . . . . 2483, 2494, 2574  |
| \@ 1887, 1899, 1902, 1905, 1910, 2008, 2029, 2042               |                                    | \@ACM@journal@bibstripfalse . . . . . 232, 1455   |
| \@authornotemark . . . . .                                      | 1603, <u>2767</u>                  | \@ACM@journal@bibstriptrue . . . . . 230, 1441  |
| \@par . . . . .   | 479, 536                           | \@ACM@journalfalse . . . . . 211, 213, 215, 217, 219, 222   |
| \@ACM@acmcp@delta . . . . .                                     | 277, 2272, 2276                    | \@ACM@journaltrue . . . . . 203, 205, 207, 209, 225   |
| \@ACM@acmcp@box . . . . .                                       | 2259, 2263, 3043, 3165             | \@ACM@labelwidth 1004, 1007, 1015, 1020, 1046   |
| \@ACM@acmcp@false . . . . .                                     | 169                                | \@ACM@maketitle@typesetfalse . . . . . 1053   |
| \@ACM@acmcp@true . . . . .                                      | 226                                | \@ACM@maketitle@typesettrue . . . . . 2106  |
| \@ACM@addtoaddress . . . . .                                    | 2471, 2499, 2500, 2502             | \@ACM@manuscriptfalse 198   |
| \@ACM@author@sperrrow . . . . .                                 | 1707, 2646, 2647, 2699, 2700       | \@ACM@manuscripttrue 196  |
| \@ACM@badge@skip . . . . .                                      | 1632, 1644, 1657                   | \@ACM@newfontfalse . . . . . 834, 837, 840  |
| \@ACM@badge@width . . . . .                                     | 1629, 1641, 1647, 1654, 1660       | \@ACM@newfonttrue . . . . . 831   |
| \@ACM@balancefalse . . . . .                                    | 3398, 3422, 3424, 3426, 3438, 3442 | \@ACM@printacmreffalse . . . . . 95, 227  |
| \@ACM@checkaffil 2230, 2584, 2615, 2620, 2682, 2687, 2727, 2732 |                                    | \@ACM@printfoliostrue 78  |
| \@ACM@citypresentfalse . . . . .                                | 2581                               | \@ACM@resetaffil . . . . . 2579, 2614, 2619, 2681, 2686, 2726, 2731   |
| \@ACM@citypresenttrue . . . . .                                 | 2485, 2499, 2576                   | \@ACM@reviewtrue . . . . . 140  |
| \@ACM@color@frame . . . . .                                     | 1764, 2256                         | \@ACM@screenttrue 1171, 1215, 1221, 1235, 1241  |
| \@ACM@commabox . . . . .  | 2471, 2475, 2476                   | \@ACM@sigchiamodfalse . . . . . 200   |
| \@ACM@copyright@check@cc . . . . .                              | 1921, 2060                         | \@ACM@sigchiamodtrue 220  |
| \@ACM@countrypresentfalse . . . . .                             | 2582                               | \@ACM@timestamptrue 139   |
| \@ACM@countrypresenttrue . . . . .                              | 2490, 2502, 2578                   | \@ACM@title@width . . . . . 1631, 2444, 2446, 2455, 2456  |
| \@ACM@engagefalse . . . . .                                     | 167                                | \@DeclareACMFormat 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49   |
| \@ACM@engagetrue . . . . .                                      | 223                                | \@Description@presentfalse . . . . . 876, 879, 954, 2773  |
| \@ACM@institution@separator . . . . .                           | 2749, 2750, 2755                   | \@Description@presenttrue . . . . . 870, 873  |
|   |                                    | \@M . . . . . 479, 518, 536, 545, 3496  |
|   |                                    | \@abstract 1678, 2781, 2788   |
|   |                                    | \@acmArticle . . . . . 1609, 1612, 2194, 2806, 2807, 2935, 2938, 2958, 2968, 2979, 3047, 3090, 3110, 3121, 3132, 3169 |
|   |                                    | \@acmArticlePage . . . . . 2934, 2952, 2953, 2962, 2965, 2972, 2976   |
|   |                                    | \@acmArticleSeq 1611, 3073  |
|   |                                    | \@acmBadgeL . . . . . 1635, 1650, 1651, 1656, 3101, 3113, 3114, 3126, 3127, 3135, 3138, 3143, 3164                    |
|   |                                    | \@acmBadgeR . . . . . 1634, 1637, 1638, 1643, 3102, 3115, 3116, 3124, 3125, 3136, 3139, 3144, 3165                    |
|   |                                    | \@acmBooktitle . . . . . 1461, 2163, 2184, 2822   |
|   |                                    | \@acmCodeDataLink . . . . . 1771, 1772, 1774, 1776, 2279, 2280  |
|   |                                    | \@acmDOI . . . . . 1627, 2186, 2189, 2196, 2200, 2830, 2991, 2993, 3015, 3017, 3048, 3170                             |
|   |                                    | \@acmEditors 1469, 1470, 1471, 1474, 2823, 2824   |
|   |                                    | \@acmISBN . . . . . 1625, 2198  |
|   |                                    | \@acmMonth 1615, 1617, 2194   |
|   |                                    | \@acmNumber . . . . . 1607, 2819, 2958, 2968, 2979, 3046, 3110, 3121, 3132, 3168                                      |
|   |                                    | \@acmPrice 1621, 2195, 2199   |
|   |                                    | \@acmPubDate . . . . . 1617, 2819, 2958, 2968, 2979, 3048, 3111, 3122, 3133, 3170                                     |
|   |                                    | \@acmSubmissionID . . . . . 1495, 1496, 1515, 1516, 1623, 2915, 2916, 2926  |

|   |   |   |
|---|---|---|
| <code>\@acmVolume</code> . . . . .  | <code>\@authorfont</code> <a href="#">2532</a> , <a href="#">2537</a> ,                                   | <a href="#">2671</a> , <a href="#">2672</a> , <a href="#">2675</a> ,                      |
| <a href="#">1605</a> , <a href="#">2819</a> , <a href="#">2957</a> ,                      | <a href="#">2541</a> , <a href="#">2544</a> , <a href="#">2547</a> ,                                      | <a href="#">2678</a> , <a href="#">2679</a> , <a href="#">2684</a> ,                      |
| <a href="#">2967</a> , <a href="#">2978</a> , <a href="#">3046</a> ,                      | <a href="#">2550</a> , <a href="#">2553</a> , <a href="#">2556</a> ,                                      | <a href="#">2711</a> , <a href="#">2718</a> , <a href="#">2719</a> ,                      |
| <a href="#">3109</a> , <a href="#">3120</a> , <a href="#">3131</a> , <a href="#">3168</a> | <a href="#">2559</a> , <a href="#">2562</a> , <a href="#">2602</a> , <a href="#">2638</a>                 | <a href="#">2721</a> , <a href="#">2723</a> , <a href="#">2724</a> , <a href="#">2729</a> |
| <code>\@acmYear</code> . . <a href="#">1613</a> , <a href="#">1620</a> ,                  | <code>\@authornotemark</code> . . .   | <code>\@currentaffiliations</code>  |
| <a href="#">2079</a> , <a href="#">2163</a> , <a href="#">2194</a> , <a href="#">2810</a> | . . . <a href="#">1595</a> , <a href="#">1601</a> , <a href="#">2766</a>                                  | . . . . . <a href="#">2568</a> ,  |
| <code>\@acmdefinitionbodyfont</code>  | <code>\@authornotes</code> . . . . .  | <a href="#">2569</a> , <a href="#">2570</a> , <a href="#">2572</a> ,                      |
| . . . <a href="#">3309</a> , <a href="#">3321</a> , <a href="#">3335</a>                  | . . . <a href="#">1592</a> , <a href="#">1596</a> , <a href="#">2126</a>                                  | <a href="#">2598</a> , <a href="#">2610</a> , <a href="#">2611</a> , <a href="#">2617</a> |
| <code>\@acmdefinitionheadfont</code>  | <code>\@authorsaddresses</code> .   | <code>\@currentauthors</code> . . .   |
| . . . <a href="#">3311</a> , <a href="#">3323</a> , <a href="#">3337</a>                  | . . . . . <a href="#">1567</a> ,  | . . . . . <a href="#">2566</a> , <a href="#">2567</a> ,                                   |
| <code>\@acmdefinitionindent</code>  | <a href="#">2135</a> , <a href="#">2285</a> , <a href="#">2761</a> , <a href="#">2840</a>                 | <a href="#">2597</a> , <a href="#">2601</a> , <a href="#">2602</a> ,                      |
| . . . <a href="#">3310</a> , <a href="#">3322</a> , <a href="#">3336</a>                  | <code>\@auxout</code> . . . . . <a href="#">649</a> , <a href="#">2275</a>                                | <a href="#">2604</a> , <a href="#">2638</a> , <a href="#">2641</a> ,                      |
| <code>\@acmdefinitionnotefont</code>  | <code>\@begindocumenthook</code> <a href="#">645</a>  | <a href="#">2663</a> , <a href="#">2665</a> , <a href="#">2666</a> ,                      |
| . . . <a href="#">3312</a> , <a href="#">3324</a> , <a href="#">3340</a>                  | <code>\@beginmaketitlehook</code>   | <a href="#">2668</a> , <a href="#">2710</a> , <a href="#">2712</a> ,                      |
| <code>\@acmengagemetadata</code>  | . . . <a href="#">2096</a> , <a href="#">2099</a> , <a href="#">2105</a>                                  | <a href="#">2713</a> , <a href="#">2715</a> , <a href="#">2766</a> , <a href="#">2767</a> |
| . . . <a href="#">2100</a> , <a href="#">2102</a> , <a href="#">2843</a>                  | <code>\@botnum</code> . . . . . <a href="#">2249</a>  | <code>\@currentlabel</code> . <a href="#">563</a> , <a href="#">577</a>                   |
| <code>\@acmownedfalse</code> . . . .  | <code>\@citestyle</code> . . . . . <a href="#">311</a>  | <code>\@dblarg</code> . . . . . <a href="#">465</a>                                       |
| . . . . . <a href="#">1830</a> , <a href="#">1833</a> ,                                   | <code>\@classname</code> . . . . .  | <code>\@dblfloat</code> . . . . . <a href="#">966</a>                                     |
| <a href="#">1836</a> , <a href="#">1842</a> , <a href="#">1846</a> ,                      | <a href="#">24</a> , <a href="#">26</a> , <a href="#">35</a> , <a href="#">53</a> , <a href="#">55</a> ,  | <code>\@department</code> . . <a href="#">1545</a> , <a href="#">1546</a>                 |
| <a href="#">1849</a> , <a href="#">1852</a> , <a href="#">1855</a> ,                      | <a href="#">56</a> , <a href="#">61</a> , <a href="#">63</a> , <a href="#">64</a> , <a href="#">69</a> ,  | <code>\@dotsep</code> . . . . . <a href="#">3276</a>                                      |
| <a href="#">1861</a> , <a href="#">1864</a> , <a href="#">1868</a> , <a href="#">1872</a> | <a href="#">71</a> , <a href="#">72</a> , <a href="#">77</a> , <a href="#">80</a> , <a href="#">81</a> ,  | <code>\@editorsAbbrev</code> . . . .  |
| <code>\@acmownedtrue</code> . . . .   | <a href="#">86</a> , <a href="#">88</a> , <a href="#">89</a> , <a href="#">94</a> , <a href="#">100</a> , | . . . . . <a href="#">1468</a> , <a href="#">1473</a> , <a href="#">2824</a>              |
| . . . <a href="#">1817</a> , <a href="#">1826</a> , <a href="#">1858</a>                  | <a href="#">101</a> , <a href="#">105</a> , <a href="#">109</a> , <a href="#">114</a> ,                   | <code>\@empty</code> . . . . . <a href="#">155</a> ,                                      |
| <code>\@acmplainbodyfont</code> .   | <a href="#">116</a> , <a href="#">117</a> , <a href="#">122</a> , <a href="#">124</a> ,                   | <a href="#">234</a> , <a href="#">381</a> , <a href="#">421</a> , <a href="#">469</a> ,   |
| . . . <a href="#">3277</a> , <a href="#">3289</a> , <a href="#">3303</a>                  | <a href="#">125</a> , <a href="#">130</a> , <a href="#">132</a> , <a href="#">133</a> ,                   | <a href="#">1452</a> , <a href="#">1470</a> , <a href="#">1492</a> ,                      |
| <code>\@acmplainheadfont</code> .   | <a href="#">138</a> , <a href="#">142</a> , <a href="#">143</a> , <a href="#">161</a> ,                   | <a href="#">1495</a> , <a href="#">1513</a> , <a href="#">1515</a> ,                      |
| . . . <a href="#">3279</a> , <a href="#">3291</a> , <a href="#">3305</a>                  | <a href="#">171</a> , <a href="#">177</a> , <a href="#">183</a> , <a href="#">260</a> ,                   | <a href="#">1520</a> , <a href="#">1521</a> , <a href="#">1527</a> ,                      |
| <code>\@acmplainindent</code> . . .   | <a href="#">422</a> , <a href="#">446</a> , <a href="#">832</a> , <a href="#">835</a> ,                   | <a href="#">1637</a> , <a href="#">1650</a> , <a href="#">1668</a> ,                      |
| . . . <a href="#">3278</a> , <a href="#">3290</a> , <a href="#">3304</a>                  | <a href="#">838</a> , <a href="#">875</a> , <a href="#">884</a> , <a href="#">887</a> ,                   | <a href="#">1669</a> , <a href="#">1725</a> , <a href="#">1726</a> ,                      |
| <code>\@acmplainnotefont</code> .   | <a href="#">957</a> , <a href="#">1172</a> , <a href="#">1216</a> ,                                       | <a href="#">1732</a> , <a href="#">1739</a> , <a href="#">1771</a> ,                      |
| . . . <a href="#">3280</a> , <a href="#">3292</a> , <a href="#">3308</a>                  | <a href="#">1222</a> , <a href="#">1236</a> , <a href="#">1242</a> ,                                      | <a href="#">1780</a> , <a href="#">1806</a> , <a href="#">2097</a> ,                      |
| <code>\@adddotafter</code> . . . . .  | <a href="#">1436</a> , <a href="#">1438</a> , <a href="#">1485</a> ,                                      | <a href="#">2130</a> , <a href="#">2135</a> , <a href="#">2186</a> ,                      |
| <a href="#">3184</a> , <a href="#">3185</a> , <a href="#">3187</a> ,                      | <a href="#">1540</a> , <a href="#">1554</a> , <a href="#">1665</a> ,                                      | <a href="#">2195</a> , <a href="#">2198</a> , <a href="#">2199</a> ,                      |
| <a href="#">3199</a> , <a href="#">3214</a> , <a href="#">3218</a> , <a href="#">3271</a> | <a href="#">1671</a> , <a href="#">1676</a> , <a href="#">1683</a> ,                                      | <a href="#">2200</a> , <a href="#">2211</a> , <a href="#">2214</a> ,                      |
| <code>\@additionalaffiliation</code>  | <a href="#">1685</a> , <a href="#">1686</a> , <a href="#">1689</a> ,                                      | <a href="#">2220</a> , <a href="#">2224</a> , <a href="#">2279</a> ,                      |
| . . . . . <a href="#">1541</a> , <a href="#">1542</a>                                     | <a href="#">1691</a> , <a href="#">1692</a> , <a href="#">1695</a> ,                                      | <a href="#">2282</a> , <a href="#">2285</a> , <a href="#">2320</a> ,                      |
| <code>\@addpunct</code> . <a href="#">2753</a> , <a href="#">2839</a> ,                   | <a href="#">1703</a> , <a href="#">1705</a> , <a href="#">1706</a> ,                                      | <a href="#">2449</a> , <a href="#">2458</a> , <a href="#">2467</a> ,                      |
| <a href="#">2840</a> , <a href="#">3271</a> , <a href="#">3272</a> , <a href="#">3392</a> | <a href="#">1708</a> , <a href="#">1709</a> , <a href="#">1757</a> ,                                      | <a href="#">2489</a> , <a href="#">2568</a> , <a href="#">2601</a> ,                      |
| <code>\@addspaceafter</code> . . . . <a href="#">3272</a>                                 | <a href="#">1808</a> , <a href="#">1923</a> , <a href="#">1927</a> ,                                      | <a href="#">2609</a> , <a href="#">2610</a> , <a href="#">2665</a> ,                      |
| <code>\@affiliationfont</code> . .  | <a href="#">1930</a> , <a href="#">2586</a> , <a href="#">2589</a> ,                                      | <a href="#">2671</a> , <a href="#">2678</a> , <a href="#">2712</a> ,                      |
| . . . . . <a href="#">2533</a> , <a href="#">2538</a> ,                                   | <a href="#">2592</a> , <a href="#">2762</a> , <a href="#">2776</a> ,                                      | <a href="#">2718</a> , <a href="#">2723</a> , <a href="#">2761</a> ,                      |
| <a href="#">2542</a> , <a href="#">2545</a> , <a href="#">2548</a> ,                      | <a href="#">2803</a> , <a href="#">3500</a> , <a href="#">3503</a> , <a href="#">3510</a>                 | <a href="#">2769</a> , <a href="#">2806</a> , <a href="#">2811</a> ,                      |
| <a href="#">2551</a> , <a href="#">2554</a> , <a href="#">2557</a> ,                      | <code>\@clubpenalty</code> . . . . . <a href="#">524</a>  | <a href="#">2823</a> , <a href="#">2830</a> , <a href="#">2915</a> ,                      |
| <a href="#">2560</a> , <a href="#">2563</a> , <a href="#">2615</a> , <a href="#">2638</a> | <code>\@concepts</code> . <a href="#">1780</a> , <a href="#">1792</a> ,                                   | <a href="#">2926</a> , <a href="#">2991</a> , <a href="#">2993</a> ,                      |
| <code>\@afterheading</code> . <a href="#">510</a> , <a href="#">2252</a>                  | <a href="#">1806</a> , <a href="#">2214</a> , <a href="#">2216</a> , <a href="#">2234</a>                 | <a href="#">3015</a> , <a href="#">3017</a> , <a href="#">3047</a> ,                      |
| <code>\@afterindentfalse</code> .   | <code>\@copyrightowner</code> . . .   | <a href="#">3048</a> , <a href="#">3169</a> , <a href="#">3170</a> ,                      |
| . . . . . <a href="#">456</a> , <a href="#">2251</a>                                      | . . . . . <a href="#">1881</a> , <a href="#">2170</a>   | <a href="#">3280</a> , <a href="#">3312</a> , <a href="#">3461</a> , <a href="#">3478</a> |
| <code>\@afterindenttrue</code> . . <a href="#">454</a>                                    | <code>\@copyrightpermission</code>  | <code>\@endfloatbox</code> . . . . . <a href="#">969</a>                                  |
| <code>\@article@string</code> . . .   | . . . <a href="#">1937</a> , <a href="#">2146</a> , <a href="#">2158</a>                                  | <code>\@endpefalse</code> . . . . . <a href="#">3394</a>                                  |
| . . . <a href="#">2806</a> , <a href="#">2819</a> , <a href="#">2827</a>                  | <code>\@copyrightyear</code> . . . .  | <code>\@endwdefloatbox</code> <a href="#">969</a> , <a href="#">977</a>                   |
| <code>\@author</code> . . . . .   | . . . <a href="#">2078</a> , <a href="#">2170</a> , <a href="#">2172</a>                                  | <code>\@finalstrut</code> . . . <a href="#">568</a> , <a href="#">581</a>                 |
| <a href="#">1494</a> , <a href="#">1500</a> , <a href="#">1507</a> ,                      | <code>\@currbox</code> . . . <a href="#">983</a> , <a href="#">984</a> , <a href="#">985</a>              | <code>\@float</code> . . . . . <a href="#">971</a>  |
| <a href="#">2600</a> , <a href="#">2665</a> , <a href="#">2712</a> , <a href="#">2756</a> | <code>\@currentaffiliation</code>   | <code>\@flushglue</code> . . . . . <a href="#">3228</a>                                   |
|   | <a href="#">2639</a> , <a href="#">2642</a> , <a href="#">2664</a> ,                                      | <code>\@fnsymbol</code> . . . . . <a href="#">2116</a>                                    |



|  |   |  |
|--|---|--|
| <code>\@folioeht</code> . . . . .          | 1146, 1150, 1154,                       | 2222, 2235, 2282, 2283                     |
| 3053, 3080, 3086, 3087                     | 1159, 1163, 1167,                       | <code>\@latexerror</code> . . . . . 355    |
| <code>\@folio@max</code> 3053, 3076, 3077  | 1174, 1178, 1182,                       | <code>\@empty</code> . . . . . 1680, 2781  |
| <code>\@folio@voffset</code> 3053, 3082    | 1186, 1191, 1195,                       | <code>\@listI</code> . . . . . 1028, 1032  |
| <code>\@folio@wd</code> . . . . . 3053,    | 1199, 1203, 1208,                       | <code>\@listi</code> . . . . . 1025, 1032  |
| 3087, 3088, 3117, 3128                     | 1212, 1218, 1224,                       | <code>\@listii</code> . . . . . 1033       |
| <code>\@folioblob</code> . . . . . 3073,   | 1228, 1232, 1238,                       | <code>\@listiii</code> . . . . . 1036      |
| 3113, 3115, 3124, 3126                     | 1244, 1248, 1252,                       | <code>\@listiv</code> . . . . . 1038       |
| <code>\@footnotemark</code> . 585, 2114    | 1257, 1261, 1265,                       | <code>\@listv</code> . . . . . 1040        |
| <code>\@footnotemark@nolink</code>         | 1269, 1273, 1277,                       | <code>\@listvi</code> . . . . . 1042       |
| . . . . . 585, 2114                        | 1281, 1285, 1289,                       | <code>\@m</code> . . . . . 467             |
| <code>\@footnotetext</code> . . . .        | 1293, 1297, 1301,                       | <code>\@makefnmark</code> . . . 558,       |
| . . . . . 559, 586, 2115                   | 1305, 1309, 1313,                       | 583, 2118, 2123, 2127                      |
| <code>\@footnotetext@nolink</code>         | 1317, 1321, 1325,                       | <code>\@makefntext</code> . . . . .        |
| . . . . . 586, 2115                        | 1329, 1333, 1337,                       | . . . 558, 567, 580, 2129                  |
| <code>\@for</code> . . . . . 287           | 1341, 1345, 1349,                       | <code>\@marginfigure</code> . 949, 950     |
| <code>\@formatdoi</code> . . . . 1920,     | 1353, 1357, 1362,                       | <code>\@marginatable</code> . . 960, 961   |
| 2189, 2196, 2200,                          | 1367, 1371, 1375,                       | <code>\@minipagefalse</code> . 792, 979    |
| 2830, 2991, 2993,                          | 1380, 1384, 1388,                       | <code>\@minus</code> 3204, 3208, 3212,     |
| 3015, 3017, 3048, 3170                     | 1392, 1396, 1400,                       | 3216, 3220, 3225,                          |
| <code>\@fps</code> . . . . . 970           | 1404, 1408, 1412,                       | 3300, 3302, 3332, 3334                     |
| <code>\@fpsadddfault</code> . . . . 970    | 1416, 1420, 1424,                       | <code>\@mkabstract</code> . . 2210, 2780   |
| <code>\@gobble</code> . . . . . 309, 353   | 1428, 1432, 1443,                       | <code>\@mkauthors</code> 2119, 2121, 2504  |
| <code>\@hangfrom</code> . . . . . 478, 535 | 1444, 2182, 3046, 3168                  | <code>\@mkauthors@i</code> . . . . .       |
| <code>\@headfootfont</code> . . . .        | <code>\@journalNameShort</code> .       | . . . . 2508, 2510,                        |
| . . . . 2928, 2952,                        | . . . . . 1131,                         | 2512, 2514, 2528, 2596                     |
| 2953, 2954, 2955,                          | 1135, 1139, 1143,                       | <code>\@mkauthors@ii</code> . . . . 2631   |
| 2961, 2964, 2971,                          | 1147, 1151, 1155,                       | <code>\@mkauthors@iii</code> . . . .       |
| 2975, 2983, 2984,                          | 1160, 1164, 1169,                       | . . . . 2516, 2518,                        |
| 2990, 2992, 2996,                          | 1175, 1179, 1183,                       | 2520, 2522, 2526, 2643                     |
| 2999, 3007, 3008,                          | 1187, 1192, 1196,                       | <code>\@mkauthors@iv</code> 2524, 2696     |
| 3014, 3016, 3020, 3023                     | 1200, 1204, 1209,                       | <code>\@mkauthorsaddresses</code>          |
| <code>\@idxitem</code> . . . . . 3493      | 1213, 1219, 1225,                       | . . . . . 1568, 2740                       |
| <code>\@ifnextchar</code> . . . . . 1545   | 1229, 1233, 1239,                       | <code>\@mkbibcitation</code> 2245, 2797    |
| <code>\@ifnotempty</code> . . . . . 2084   | 1245, 1249, 1253,                       | <code>\@mkteasers</code> . . . 2119, 2768  |
| <code>\@ifnum</code> . . . . . 325, 327    | 1258, 1262, 1266,                       | <code>\@mkttitle</code> . . . . 2119, 2364 |
| <code>\@ifstar</code> . . . . . 463        | 1270, 1274, 1278,                       | <code>\@mkttitle@i</code> 2367, 2369,      |
| <code>\@ifundefined</code> . . . .         | 1282, 1286, 1290,                       | 2371, 2373, 2387, 2440                     |
| 3345, 3348, 3351,                          | 1294, 1298, 1302,                       | <code>\@mkttitle@ii</code> . . . . . 2453  |
| 3354, 3357, 3361, 3364                     | 1306, 1310, 1314,                       | <code>\@mkttitle@iii</code> . . . . .      |
| <code>\@iiiparbox</code> . . . . . 795     | 1318, 1322, 1326,                       | . . . . 2375, 2377,                        |
| <code>\@indextitlestyle</code> . . 3492    | 1330, 1334, 1338,                       | 2379, 2381, 2385, 2453                     |
| <code>\@input</code> . . . . . 547         | 1342, 1346, 1350,                       | <code>\@mkttitle@iv</code> . . 2383, 2463  |
| <code>\@insideauthorgroupfalse</code>      | 1354, 1358, 1363,                       | <code>\@mktranslatedabstract</code>        |
| . . . . . 1483, 1535                       | 1368, 1372, 1376,                       | . . . . . 444, 2790                        |
| <code>\@insideauthorgrouptrue</code>       | 1381, 1385, 1389,                       | <code>\@mktranslatedkeywords</code>        |
| . . . . . 1490                             | 1393, 1397, 1401,                       | . . . . . 441, 1569                        |
| <code>\@journalCode</code> . . . .         | 1405, 1409, 1413,                       | <code>\@mpargs</code> . . . . . 795        |
| 1054, 1172, 1216,                          | 1417, 1421, 1425,                       | <code>\@mparswitchfalse</code> . . 741     |
| 1222, 1236, 1242, 1436                     | 1429, 1433, 1444,                       | <code>\@mpfootins</code> . . . . .         |
| <code>\@journalCode@nr</code> . . .        | 2818, 2957, 2967,                       | 572, 573, 787, 788, 790                    |
| . . . 1054, 1128, 1442                     | 2978, 3109, 3120, 3131                  | <code>\@mpfootnotetext</code> . . . 571    |
| <code>\@journalName</code> . . 1130,       | <code>\@keywords</code> . . . . . 1667, | <code>\@one</code> . 313, 317, 321, 323,   |
| 1134, 1138, 1142,                          | 1668, 1669, 2220,                       | 635, 2857, 2863, 2867                      |



|                                  |                        |                                    |                        |                             |                         |
|----------------------------------|------------------------|------------------------------------|------------------------|-----------------------------|-------------------------|
| \@nil . . . . .                  | 332                    | \@printpermissiontrue . . .        | 1815, 1824, 1840       | \@teaserfigures . . . .     | 2080, 2082, 2769, 2774  |
| \@nobreakfalse . . .             | 512, 552               | \@printtopmatter . . . . .         | 2120, 2319             | \@tempa . . . . .           | 287,                    |
| \@noskipsecfalse . . .           | 516                    | \@proofindent . . . . .            | 3371, 3381, 3391       |                             | 288, 290, 292, 294,     |
| \@noskipsectrue . . . .          | 513                    | \@proofnamefont . . . . .          | 3370, 3380, 3392       |                             | 296, 298, 300, 302,     |
| \@pages@word . . . . .           | 2800, 2820, 2827       | \@received . . . . .               | 1723, 1726,            |                             | 304, 306, 308, 310,     |
| \@par . . . . .                  | 2132, 2139             |                                    | 1727, 1729, 1732,      |                             | 312, 314, 316, 318,     |
| \@parboxrestore . . . .          | 576                    |                                    | 1733, 1735, 1739, 1740 |                             | 320, 322, 324, 326,     |
| \@parfont . . . . .              | 3218, 3222, 3227, 3232 | \@restonecolfalse . . .            | 3490                   |                             | 328, 330, 332, 335,     |
| \@permissionCodeOne . . . . .    | 1132,                  | \@restonecoltrue . . .             | 3490                   |                             | 337, 339, 341, 343,     |
|                                  | 1136, 1140, 1144,      | \@rightskip . . . . .              | 3228, 3229             |                             | 345, 1519, 1520,        |
|                                  | 1148, 1152, 1156,      | \@saveabstract . . . . .           | 1674, 1675             |                             | 1724, 1725, 2488,       |
|                                  | 1161, 1165, 1170,      | \@saveteaser . . . . .             | 2081, 2082             |                             | 2489, 2609, 3461,       |
|                                  | 1176, 1180, 1184,      | \@savetranslatedabstract . . . . . | 444, 445               |                             | 3477, 3478, 3480, 3484  |
|                                  | 1188, 1193, 1197,      | \@secntformat . . . . .            | 472, 529               | \@tempb . . . . .           |                         |
|                                  | 1201, 1205, 1210,      | \@secfont . . . . .                | 3206, 3232             |                             | 288, 290, 292, 294,     |
|                                  | 1214, 1220, 1226,      | \@secpenalty . . . . .             | 461                    |                             | 296, 298, 300, 302,     |
|                                  | 1230, 1234, 1240,      | \@sect . . . . .                   | 465, 466               |                             | 304, 306, 308, 310,     |
|                                  | 1246, 1250, 1254,      | \@setaddresses . . . . .           | 2765                   |                             | 312, 314, 316, 318,     |
|                                  | 1259, 1263, 1267,      | \@setauthorsaddresses . . . . .    | 2139, 2285, 2840       |                             | 320, 322, 324, 326,     |
|                                  | 1271, 1275, 1279,      | \@setengagemetadata . . . . .      | 2103, 2842             |                             | 328, 330, 335, 337,     |
|                                  | 1283, 1287, 1291,      | \@setthanks . . . . .              | 2132, 2839             |                             | 339, 341, 343, 345,     |
|                                  | 1295, 1299, 1303,      | \@shortauthors . . . . .           | 2923, 2946, 2954,      |                             | 3479, 3480, 3483, 3484  |
|                                  | 1307, 1311, 1315,      |                                    | 2962, 2972, 2984, 3008 | \@tempboxa . . . . .        | 795, 2329, 2331         |
|                                  | 1319, 1323, 1327,      | \@sidebar . . . . .                | 945, 946               | \@tempc . . . . .           | 333, 334, 336,          |
|                                  | 1331, 1335, 1339,      | \@specialsection . . . . .         | 1571, 2215, 2221, 2289 |                             | 338, 340, 342, 344, 346 |
|                                  | 1343, 1347, 1351,      | \@sssect . . . . .                 | 464, 530               | \@tempcnta . . . . .        | 3073, 3074,             |
|                                  | 1355, 1359, 1364,      | \@startPage . . . . .              | 1663,                  |                             | 3076, 3077, 3079, 3081  |
|                                  | 1369, 1373, 1377,      |                                    | 2320, 2321, 2323, 2920 | \@tempdima . . . . .        | 2270,                   |
|                                  | 1382, 1386, 1390,      | \@startsection . . . . .           | 450,                   |                             | 2273, 2274, 2276,       |
|                                  | 1394, 1398, 1402,      |                                    | 542, 3203, 3207,       |                             | 2325, 2326, 2327,       |
|                                  | 1406, 1410, 1414,      | \@starttoc . . . . .               | 3211, 3215, 3219, 3224 |                             | 2333, 2334, 2335,       |
|                                  | 1418, 1422, 1426,      | \@subparfont . . . . .             | 3257                   |                             | 3080, 3081, 3082, 3084  |
|                                  | 1430, 1434, 1445, 2194 | \@subsecfont . . . . .             | 3210, 3232             | \@tempskipa . . . . .       |                         |
| \@permissionCodeTwo . . . . .    | 1157,                  | \@subsubsecfont . . . . .          | 3214, 3232             |                             | 453, 455, 456, 461,     |
|                                  | 1189, 1206, 1255,      | \@subtitle . . . . .               | 1476, 1584,            |                             | 474, 475, 506, 507,     |
|                                  | 1360, 1365, 1378, 1446 |                                    | 2449, 2450, 2458,      |                             | 509, 521, 522, 531, 532 |
| \@plus . . . . .                 | 545, 553,              | \@subtitlenotes . . . . .          | 1582, 1586, 1589, 2125 | \@textbottom . . . . .      | 796                     |
|                                  | 796, 3204, 3208,       |                                    | 469, 472, 478, 493     | \@textsuperscript . . . . . | 583, 2118, 2123         |
|                                  | 3212, 3216, 3220,      | \@svsec . . . . .                  | 491, 519, 539          |                             |                         |
|                                  | 3225, 3299, 3301,      | \@svsechd . . . . .                | 2082, 2770             | \@texttop . . . . .         | 797                     |
|                                  | 3331, 3333, 3389, 3494 | \@teaser . . . . .                 |                        |                             |                         |
| \@printcopyrightfalse . . . . .  | 1829, 1841             |                                    |                        | \@thefnmark . . . . .       | 564, 578,               |
| \@printcopyrighttrue . . . . .   | 1813, 1825             |                                    |                        |                             | 583, 2118, 2123, 2128   |
| \@printendtopmatter . . . . .    | 2250, 2832             |                                    |                        | \@title . . . . .           | 1575, 2233,             |
| \@printpermissionfalse . . . . . | 1828                   |                                    |                        |                             | 2448, 2457, 2466, 2810  |

|                            |                               |                               |
|----------------------------|-------------------------------|-------------------------------|
| \@translatedabstracts      | \@xp . . . . . 549, 550       | 2365, 2391, 2416,             |
| . 442, 449, 2211, 2212     | \@xsect . . . . 504, 505, 541 | 2506, 2534, 2878,             |
| \@translatedkeywords       | \ \ . . . . 666, 675, 1495,   | 2942, 3060, 3099,             |
| . 439, 441, 2224, 2225     | 1774, 2064, 2170,             | 3148, 3237, 3281,             |
| \@translatedsubtitle       | 2175, 2190, 2195,             | 3313, 3372, 3399, 3420        |
| . . . . . 436,             | 2199, 2280, 2802,             | \ACM@lang@check . . . .       |
| 438, 2450, 2459, 2468      | 2810, 2862, 3048, 3170        | 420, 434, 437, 440, 448       |
| \@translatedtitle 433,     | \{ . . . . . 295              | \ACM@languages . . . .        |
| 435, 2448, 2457, 2466      | \} . . . . . 295              | . . . 153, 381, 383, 421      |
| \@typeset@author@bx        | \_ . . . 1466, 1788, 1798,    | \ACM@linecount . . . .        |
| . . . . . 2635,            | 2170, 2172, 2195,             | . . . . 2856, 2857,           |
| 2689, 2695, 2734, 2739     | 2806, 2807, 2825, 2920        | 2862, 2863, 2866, 2867        |
| \@typeset@author@line      |                               | \ACM@linecount@bx . .         |
| 2565, 2599, 2623, 2628     | A                             | . . . 2853, 2873, 2903        |
| \@typesetengagemetadate    | \abstract . . . . . 1674      | \ACM@linecount@bxht           |
| . . . . . 2208, 2841       | abstract (env.) . . . . . 18  | 2855, 2861, 2864, 2865        |
| \@undefined . . . . .      | \abstractname . . 379,        | \ACM@linecountL . . . .       |
| . 645, 863, 1463, 2096     | 392, 2782, 2786, 2794         | . . . . 2869, 2944,           |
| \@undescribed@imagesfalse  | \acks . . . . . 3452          | 2947, 2952, 2955,             |
| . . . . . 872              | acks (env.) . . . . . 24      | 2961, 2963, 2971,             |
| \@undescribed@imagetrue    | \acksname 390, 401, 409,      | 2973, 2983, 2986,             |
| . . 883, 886, 956, 2775    | 417, 3451, 3454, 3455         | 2990, 2996, 3007,             |
| \@vspace 877, 880, 888,    | \ACM@adddotafter . . .        | 3010, 3014, 3020,             |
| 890, 892, 894, 896,        | . . . . . 3185, 3202          | 3042, 3101, 3113,             |
| 898, 900, 902, 904,        | \ACM@ArticleType . . .        | 3114, 3126, 3127,             |
| 906, 946, 951, 961,        | . . . 1742, 3041, 3163        | 3135, 3138, 3143, 3164        |
| 967, 2112, 2290,           | \ACM@ArticleType@nr           | \ACM@linecountR . 2876,       |
| 2316, 2798, 2833,          | 1742, 1744, 3039, 3161        | 2974, 2976, 2984,             |
| 2836, 3498, 3500, 3506     | \ACM@ecc@type . . . 1879,     | 2987, 2994, 3001,             |
| \@vspace@acm . . . . .     | 2061, 2063, 2064,             | 3008, 3011, 3018,             |
| . . . 2316, 2836, 3506     | 2067, 2068, 2069,             | 3025, 3136, 3139, 3144        |
| \@vspace@orig 877, 880,    | 2070, 2071, 2072, 2073        | \ACM@mk@linecount . .         |
| 888, 890, 892, 894,        | \ACM@CC@Url . . . . .         | . . . . 2858, 2871,           |
| 896, 898, 900, 902,        | 2062, 2063, 2064, 2065        | 2886, 2888, 2890,             |
| 904, 906, 946, 951,        | \ACM@ecc@version . . .        | 2892, 2894, 2896, 2898        |
| 961, 967, 2112,            | . . . 1878, 2063, 2074        | \ACM@NR@adjustedSectionformat |
| 2290, 2798, 2833, 3498     | \acm@copyrightinput 1819      | . . . . . 3182, 3191          |
| \@vspacer 878, 881, 889,   | \acm@copyrightmode .          | \ACM@NRadjust . . . . .       |
| 891, 893, 895, 897,        | . . . . . 1819,               | 3173, 3206, 3210,             |
| 899, 901, 903, 905,        | 1827, 1832, 1835,             | 3214, 3218, 3222, 3227        |
| 907, 947, 952, 962,        | 1839, 1845, 1848,             | \ACM@origbaselinestretch      |
| 968, 2113, 2291,           | 1851, 1854, 1857,             | . . . . . 3508                |
| 2317, 2799, 2834,          | 1860, 1863, 1867,             | \ACM@ps@headings . . .        |
| 2837, 3499, 3503, 3507     | 1871, 1882, 1938, 2145        | . . . . . 2847, 2851          |
| \@vspacer@acm . . . . .    | \ACM@fontsize 146, 234,       | \ACM@ps@myheadings .          |
| . . . 2317, 2837, 3507     | 237, 239, 241, 243,           | . . . . . 2846, 2850          |
| \@vspacer@orig . 878,      | 245, 247, 249, 251,           | \ACM@ps@plain . 2845, 2849    |
| 881, 889, 891, 893,        | 253, 255, 257, 260, 261       | \ACM@restore@pagestyle        |
| 895, 897, 899,             | \ACM@format . . . . 32, 161   | . . . . . 2845                |
| 901, 903, 905,             | \ACM@format@nr . . 32,        | \ACM@sect@format . . .        |
| 907, 947, 952,             | 161, 170, 176, 182,           | . . . . . 3192, 3194          |
| 962, 968, 2113,            | 195, 201, 235, 596,           | \ACM@sect@format@ . .         |
| 2291, 2799, 2834, 3499     | 681, 760, 798, 918,           | . . . 3181, 3194, 3196        |
| \@width . . . . . 776, 783 | 987, 2292, 2339,              |                               |

|                              |                              |                            |
|------------------------------|------------------------------|----------------------------|
| \ACM@sect@format@null        | \advance                     | \authors                   |
| ..... 3195, 3196             | 1029, 1034, 1037,            | 1497, 1502, 1509,          |
| \ACM@timestamp               | 1039, 1041, 1043,            | 2228, 2240, 2242, 2810     |
| ..... 2906, 3033, 3149, 3154 | 1487, 1489, 1767,            | \authorsaddresses 14, 1567 |
| \acmArticle                  | 2326, 2334, 2442,            |                            |
| ..... 14, 1609               | 2625, 2645, 2662,            | <b>B</b>                   |
| \acmArticleSeq               | 2698, 2709, 2863,            | \balance                   |
| ..... 15, 1611               | 2867, 3077, 3079, 3082       | ..... 3449                 |
| \acmArticleType              | \affiliation                 | \baselineskip              |
| ..... 20, 1742               | ..... 10,                    | ..... 2156,                |
| \acmBadge                    | ..... 1534, 2608, 2678, 2723 | 2864, 3204, 3205,          |
| ..... 15, 1662               | \and                         | 3208, 3209, 3212,          |
| \acmBadgeL                   | ..... 1474, 1507,            | 3216, 3220, 3299,          |
| ..... 1649                   | 1509, 1524, 1530,            | 3300, 3301, 3302,          |
| \acmBadgeR                   | 2599, 2604, 2606,            | 3331, 3332, 3333, 3334     |
| ..... 1636, 1662             | 2617, 2623, 2636,            | \baselinestretch           |
| \acmBooktitle                | 2670, 2689, 2695,            | ..... 3508, 3509, 3511     |
| ..... 9, 1461                | 2717, 2734, 2739, 2755       | \begin                     |
| \acmCodeLink                 | \andify                      | ..... 19, 2872, 2902, 3083 |
| ..... 20, 1770, 1777         | ..... 2240,                  | \beginninggroup            |
| \acmConference               | 2241, 2566, 2569, 2824       | ..... 476,                 |
| ..... 9, 1447                | \anon                        | 519, 533, 542, 634,        |
| \acmConference@date          | ..... 24, 2090               | 2111, 2504, 3174, 3453     |
| ..... 1450, 2165,            | anonsuppress (env.)          | \bfseries                  |
| 2998, 3001, 3022, 3025       | ..... 3500, 3503             | .....                      |
| \acmConference@name          | \AtBeginDocument             | 1044, 2152, 2393,          |
| ..... 1449, 1463, 1464, 1465 | ..... 78,                    | 2395, 2397, 2401,          |
| \acmConference@shortname     | 95, 227, 638, 646,           | 2403, 2405, 2407,          |
| ..... 1448, 1452, 1453,      | 1005, 1837, 1843,            | 2409, 2411, 2413,          |
| 1465, 1466, 2165,            | 1865, 1869, 1873,            | 2553, 2556, 2808,          |
| 2997, 3000, 3021, 3024       | 2852, 2929, 3093, 3197       | 3090, 3232, 3233,          |
| \acmConference@venue         | \AtBeginEnvironment          | 3247, 3248, 3250,          |
| ..... 1451, 2165,            | ..... 876, 879, 888,         | 3251, 3253, 3254,          |
| 2998, 3001, 3022, 3025       | 890, 892, 894, 896,          | 3255, 3256, 3260,          |
| \acmDataLink                 | 898, 900, 902, 904, 906      | 3261, 3264, 3265,          |
| ..... 20, 1777               | \AtBeginMaketitle            | 3267, 3268, 3291, 3323     |
| \acmdefinition               | ..... 32, 2099               | \bgroup                    |
| ..... 3330                   | \AtEndDocument               | ..... 449, 946, 950,       |
| \acmDOI                      | ..... 874, 1669,             | 961, 967, 1542,            |
| ..... 15, 1627               | 1693, 1738, 1806,            | 1569, 2214, 2220,          |
| \acmISBN                     | 2255, 2760, 3446, 3509       | 2261, 2635, 2672,          |
| ..... 15, 1625               | \AtEndEnvironment            | 2675, 2736, 2745,          |
| \acmJournal                  | ..... 882, 885               | 2770, 2780, 2797, 2809     |
| ..... 9, 1440                | \AtEndPreamble               | \bibfont                   |
| \acmMonth                    | ..... 611,                   | ..... 285                  |
| ..... 14, 1615               | 864, 3342, 3396, 3462        | \bibfont                   |
| \acmNumber                   | \author                      | ..... 285                  |
| ..... 14, 1607               | ..... 10,                    | \bibliographystyle         |
| \acmplain                    | 1484, 2108, 2109, 2804       | ..... 644                  |
| ..... 3298                   | \author@bx                   | \bibsection                |
| \acmPrice                    | 2631, 2637, 2640             | ..... 281                  |
| ..... 15, 1621, 1837,        | \author@bx@sep               | \bibstyle                  |
| 1843, 1865, 1869, 1873       | ..... 2633, 2640,            | 309, 311, 353, 649         |
| \acmSubmissionID             | 2645, 2662, 2698, 2709       | \bibstyle@acmauthoryear    |
| ..... 15, 1623               | \author@bx@wd                | ..... 359                  |
| \acmVolume                   | ..... 2632, 2635,            | \bibstyle@acmnumeric       |
| ..... 14, 1605               | 2644, 2645, 2647,            | ..... 365                  |
| \acmYear                     | 2653, 2655, 2657,            | \bigskip                   |
| ..... 14, 1613               | 2659, 2662, 2697,            | .....                      |
| \addcontentsline             | 2698, 2700, 2706, 2709       | 1740, 2279, 2280,          |
| ..... 283,                   | \authornote                  | 2282, 2285, 2357,          |
| 485, 498, 2782, 3455         | .....                        | 2452, 2462, 2470,          |
| \additionalaffiliation       | . 14, 1541, 1593, 2805       | 2695, 2739, 2770, 2835     |
| ..... 11, 1541               | \authornotemark              | \box                       |
| \addpenalty                  | ..... 14, 1599               | ..... 984, 2341,           |
| ..... 461                    |                              | 2343, 2345, 2347,          |
| \addresses                   |                              | 2349, 2351, 2353,          |
| .....                        |                              |                            |
| 1492, 1494, 1499,            |                              |                            |
| 1506, 1537, 1557,            |                              |                            |
| 1595, 1601, 1603,            |                              |                            |
| 2628, 2695, 2739, 2758       |                              |                            |
| \addto                       |                              |                            |
| ..... 384, 395, 403, 411     |                              |                            |
| \addtocounter                |                              |                            |
| ..... 589, 1800              |                              |                            |
| \addtolength                 |                              |                            |
| ..... 1013, 1014,            |                              |                            |
| 1015, 1019, 1020, 2864       |                              |                            |
| \addvspace                   |                              |                            |
| ..... 461, 553               |                              |                            |

|  |   |  |
|--|---|--|
| 2355, 2357, 2359,<br>2361, 2640, 3043, 3165  | 838, 884, 887, 957,<br>1485, 1554, 1665,<br>1709, 2776, 3500, 3503  | \DeclareTextFontCommand<br>..... 865   |
| <b>C</b>   | \ClassWarningNoLine<br>. 875, 1671, 1695,<br>1808, 2586, 2589, 2762   | \def 24, 38, 147, 153, 237,<br>239, 241, 243, 245,<br>247, 249, 251, 253,<br>255, 257, 288, 290,<br>292, 294, 296, 298,<br>300, 302, 304, 306,<br>308, 310, 312, 313,<br>314, 315, 316, 317,<br>318, 319, 320, 321,<br>322, 324, 326, 328,<br>330, 331, 335, 337,<br>339, 341, 343, 345,<br>433, 436, 439, 442,<br>445, 450, 466, 491,<br>505, 529, 530, 539,<br>542, 555, 556, 557,<br>558, 560, 571, 583,<br>589, 590, 591, 592,<br>593, 613, 644, 775,<br>782, 784, 796, 946,<br>950, 961, 967, 970,<br>974, 977, 995, 996,<br>997, 998, 1028,<br>1033, 1036, 1038,<br>1040, 1042, 1130,<br>1131, 1132, 1134,<br>1135, 1136, 1138,<br>1139, 1140, 1142,<br>1143, 1144, 1146,<br>1147, 1148, 1150,<br>1151, 1152, 1154,<br>1155, 1156, 1157,<br>1159, 1160, 1161,<br>1163, 1164, 1165,<br>1167, 1169, 1170,<br>1174, 1175, 1176,<br>1178, 1179, 1180,<br>1182, 1183, 1184,<br>1186, 1187, 1188,<br>1189, 1191, 1192,<br>1193, 1195, 1196,<br>1197, 1199, 1200,<br>1201, 1203, 1204,<br>1205, 1206, 1208,<br>1209, 1210, 1212,<br>1213, 1214, 1218,<br>1219, 1220, 1224,<br>1225, 1226, 1228,<br>1229, 1230, 1232,<br>1233, 1234, 1238,<br>1239, 1240, 1244,<br>1245, 1246, 1248, |
| \c@footnote ..... 2116   | \ClassWarningNoLine<br>. 875, 1671, 1695,<br>1808, 2586, 2589, 2762   |  |
| \c@secnumdepth ....<br>468, 482, 486, 495, 499   | \clearpage ..... 2332   |  |
| \captionenglish ... 384  | \clubpenalty ... 518, 524   |  |
| \captionsetup .. 910,<br>912, 914, 916, 925,<br>927, 930, 932, 935,<br>937, 947, 953, 962, 2771              | \CodelineIndex ..... 16   |  |
| \captionsfrench .... 395   | \Collect@Body 443, 945,<br>949, 960, 1674, 2081   |  |
| \captionsgerman .... 403   | \color .... 2092, 2154,<br>2862, 2866, 3040, 3162   |  |
| \captionsspanish ... 411   | \color@begingroup 566, 579  |  |
| \ccdesc@parse@finish 1811  | \color@endbox ..... 982   |  |
| \ccsdesc ..... 16, 1782  | \color@endgroup ....<br>..... 569, 582, 793   |  |
| \ccsdesc@parse 1783, 1784  | \colorbox . 1766, 3040, 3162  |  |
| \ccsdesc@parse@end .<br>..... 1783, 1811   | \colorlet ..... 1746,<br>1748, 1750, 1752, 1754   |  |
| \ccsdesc@parse@finish<br>..... 1805, 1811  | \columnsep ..... 3491   |  |
| CCSXML (env.) ..... 16   | \columnseprule .... 3491  |  |
| \centering ..... 546,<br>579, 665, 674,<br>954, 963, 2454,<br>2456, 2637, 2694, 3089                         | \columnwidth ... 575,<br>776, 968, 2697, 2736   |  |
| \changes ..... 146   | \contentsnamefont .. 546  |  |
| \cite ... 627, 628, 639, 643   | \copy ..... 2476  |  |
| \citeA ..... 633   | \copyright ..... 2170   |  |
| \citealt ..... 632   | \copyrightpermissionfootnoterule<br>..... 775   |  |
| \citeANP ..... 629   | \copyrightyear . 18, 2078   |  |
| \citeauthor ..... 629  | \country 11, 1551, 2479, 2754   |  |
| \citeN ..... 627   | \csname .... 353, 481,<br>483, 487, 494, 496,<br>500, 529, 549, 550,<br>564, 578, 1501,<br>1508, 1561, 1564,<br>1787, 1788, 1790,<br>1791, 1792, 1793,<br>1794, 1797, 1799,<br>2237, 2239, 3175, 3198 |  |
| \citename ..... 640  | \CurrentOption ....<br>..... 148, 149,<br>150, 151, 152, 158, 159   |  |
| \citeNN ..... 630  |   |  |
| \citeNP ..... 632  |   |  |
| \citet ..... 628   |   |  |
| \citestyle ... 25, 351, 371  |   |  |
| \citeyear ..... 631  |   |  |
| \citeyearNP ..... 631  |   |  |
| \citeyearpar ... 630, 643  |   |  |
| \city .. 11, 1548, 2479, 2751  |   |  |
| \ClassError .....<br>35, 422, 446, 1438,<br>1540, 1676, 1686,<br>1692, 1706, 1757,<br>1930, 2592, 2803, 3510 |   |  |
| \ClassInfo .. 161, 260,<br>1436, 1683, 1685,<br>1689, 1691, 1703,<br>1705, 1708, 1923, 1927                  |   |  |
| \ClassWarning 26, 171,<br>177, 183, 832, 835,  |   |  |
|  | <b>D</b>  |  |
|  | \day ..... 2918   |  |
|  | \DeclareNewFootnote<br>..... 779, 781   |  |
|  | \DeclareOptionX ....<br>38, 148, 149, 150,<br>151, 152, 154, 158, 159   |  |
|  | \DeclareRobustCommand<br>..... 633, 3194  |  |

|                   |                   |                            |
|-------------------|-------------------|----------------------------|
| 1249, 1250, 1252, | 1574, 1582, 1583, | 3179, 3181, 3191,          |
| 1253, 1254, 1255, | 1592, 1593, 1605, | 3195, 3202, 3228,          |
| 1257, 1258, 1259, | 1607, 1609, 1611, | 3232, 3233, 3234,          |
| 1261, 1262, 1263, | 1613, 1615, 1617, | 3235, 3241, 3242,          |
| 1265, 1266, 1267, | 1621, 1623, 1625, | 3244, 3245, 3247,          |
| 1269, 1270, 1271, | 1627, 1634, 1635, | 3248, 3250, 3251,          |
| 1273, 1274, 1275, | 1663, 1665, 1667, | 3253, 3254, 3255,          |
| 1277, 1278, 1279, | 1675, 1680, 1711, | 3256, 3257, 3260,          |
| 1281, 1282, 1283, | 1723, 1724, 1759, | 3261, 3264, 3265,          |
| 1285, 1286, 1287, | 1765, 1770, 1776, | 3267, 3268, 3271,          |
| 1289, 1290, 1291, | 1784, 1785, 1811, | 3272, 3277, 3278,          |
| 1293, 1294, 1295, | 1875, 1878, 1879, | 3279, 3280, 3289,          |
| 1297, 1298, 1299, | 1881, 1920, 1921, | 3290, 3291, 3292,          |
| 1301, 1302, 1303, | 1937, 2062, 2078, | 3309, 3310, 3311,          |
| 1305, 1306, 1307, | 2080, 2082, 2099, | 3312, 3321, 3322,          |
| 1309, 1310, 1311, | 2100, 2101, 2105, | 3323, 3324, 3370,          |
| 1313, 1314, 1315, | 2118, 2123, 2132, | 3371, 3380, 3381,          |
| 1317, 1318, 1319, | 2139, 2230, 2260, | 3459, 3461, 3477,          |
| 1321, 1322, 1323, | 2289, 2319, 2364, | 3478, 3479, 3483, 3490     |
| 1325, 1326, 1327, | 2390, 2415, 2440, | \define@boolkey ....       |
| 1329, 1330, 1331, | 2453, 2463, 2472, | ... 51, 59, 67, 75,        |
| 1333, 1334, 1335, | 2479, 2480, 2482, | 84, 92, 104, 108,          |
| 1337, 1338, 1339, | 2483, 2485, 2486, | 112, 120, 128, 136,        |
| 1341, 1342, 1343, | 2488, 2493, 2494, | 1539, 1681, 1687, 1701     |
| 1345, 1346, 1347, | 2498, 2499, 2501, | \define@choickey ..        |
| 1349, 1350, 1351, | 2502, 2504, 2532, | . 32, 1054, 1742, 1818     |
| 1353, 1354, 1355, | 2533, 2537, 2538, | \define@cmdkey .... 1707   |
| 1357, 1358, 1359, | 2541, 2542, 2544, | \definecolor .....         |
| 1360, 1362, 1363, | 2545, 2547, 2548, | ... 653, 654, 655,         |
| 1364, 1365, 1367, | 2550, 2551, 2553, | 656, 657, 658, 659, 660    |
| 1368, 1369, 1371, | 2554, 2556, 2557, | \department .....          |
| 1372, 1373, 1375, | 2559, 2560, 2562, | . 11, 1545, 2479, 2753     |
| 1376, 1377, 1378, | 2563, 2565, 2567, | \Description .... 23, 873  |
| 1380, 1381, 1382, | 2572, 2579, 2584, | \description .....         |
| 1384, 1385, 1386, | 2596, 2597, 2598, | 1045                       |
| 1388, 1389, 1390, | 2600, 2607, 2608, | \descriptionlabel ..       |
| 1392, 1393, 1394, | 2609, 2635, 2636, | ..... 1044, 1047           |
| 1396, 1397, 1398, | 2643, 2665, 2671, | \detokenize .....          |
| 1400, 1401, 1402, | 2678, 2696, 2712, | 1485                       |
| 1404, 1405, 1406, | 2718, 2723, 2740, | \dimexpr ... 965, 984,     |
| 1408, 1409, 1410, | 2746, 2747, 2748, | 2270, 3030, 3039, 3161     |
| 1412, 1413, 1414, | 2750, 2751, 2752, | \divide 2647, 2653, 2655,  |
| 1416, 1417, 1418, | 2754, 2755, 2756, | 2657, 2659, 2700, 2706     |
| 1420, 1421, 1422, | 2757, 2765, 2766, | \do .....                  |
| 1424, 1425, 1426, | 2767, 2768, 2770, | 287, 613                   |
| 1428, 1429, 1430, | 2780, 2790, 2797, | \do@url@hyp .....          |
| 1432, 1433, 1434, | 2800, 2801, 2802, | 613                        |
| 1440, 1442, 1443, | 2803, 2806, 2810, | \DocInput .....            |
| 1444, 1445, 1446, | 2832, 2839, 2840, | 20                         |
| 1461, 1468, 1469, | 2841, 2842, 2848, | \documentclass 8, 427, 429 |
| 1470, 1476, 1519, | 2858, 2869, 2876, | \dots .....                |
| 1541, 1542, 1543, | 2923, 2928, 2934, | 2199                       |
| 1544, 1545, 1546, | 3059, 3066, 3071, | \dp .....                  |
| 1559, 1567, 1573, | 3073, 3173, 3177, | 2326, 2334                 |
|                   |                   |                            |
|                   |                   | E                          |
|                   |                   | \edef .....                |
|                   |                   | 148, 149,                  |
|                   |                   | 150, 151, 152, 467, 2063   |
|                   |                   | \editor .....              |
|                   |                   | 9, 1470                    |
|                   |                   | \egroup .....              |
|                   |                   | 449,                       |
|                   |                   | 794, 948, 959, 963,        |

|                        |                               |                            |
|------------------------|-------------------------------|----------------------------|
| 975, 981, 1552,        | 2781, 2785, 2793,             | translatedabstract         |
| 1572, 2216, 2222,      | 2800, 2806, 2811,             | ..... 21                   |
| 2288, 2639, 2673,      | 2812, 2821, 2823,             | \everypar ..... 459,       |
| 2676, 2739, 2759,      | 2830, 2915, 2926,             | 514, 525, 2784, 2792       |
| 2771, 2789, 2810, 2831 | 2927, 2937, 2948,             | \excludecomment . 1779,    |
|                        | 2956, 2966, 2977,             | 3465, 3467, 3471, 3472     |
| \else ..... 54,        | 2981, 2988, 2991,             | \ExecuteOptionsX ...       |
| 62, 70, 79, 87, 99,    | 2993, 2995, 3005,             | ... 50, 58, 66, 74,        |
| 115, 123, 131, 141,    | 3012, 3015, 3017,             | 83, 91, 103, 107,          |
| 197, 231, 333, 354,    | 3019, 3047, 3048,             | 111, 119, 127, 135, 145    |
| 375, 382, 387, 398,    | 3074, 3104, 3108,             | \expandafter 332, 334,     |
| 406, 414, 460, 467,    | 3119, 3130, 3137,             | 646, 795, 1499,            |
| 470, 482, 486, 490,    | 3142, 3150, 3153,             | 1500, 1506, 1507,          |
| 495, 499, 511, 523,    | 3169, 3170, 3178,             | 1561, 1564, 1787,          |
| 538, 621, 637, 643,    | 3202, 3461, 3466,             | 1788, 1790, 1791,          |
| 645, 668, 670, 787,    | 3473, 3482, 3486, 3509        | 1797, 1799, 3175, 3198     |
| 851, 856, 882, 885,    | \email ..... 10, 1553,        |                            |
| 915, 955, 1431,        | 2607, 2671, 2718, 2757        | F                          |
| 1457, 1463, 1465,      | \emph ..... 2182, 2184        | \familydefault .... 867    |
| 1472, 1488, 1495,      | \empty ..... 2935             | \fancyfoot ..... 2949,     |
| 1498, 1504, 1505,      | \EnableCrossrefs .... 18      | 2957, 2967, 2978,          |
| 1515, 1518, 1523,      | \end ... 21, 2874, 2904, 3091 | 2982, 3006, 3033,          |
| 1526, 1529, 1536,      | \end@ACM@color@frame 2255     | 3044, 3045, 3103,          |
| 1556, 1579, 1588,      | \end@dblfloat ..... 973       | 3105, 3109, 3120,          |
| 1594, 1602, 1642,      | \end@float ..... 975          | 3131, 3140, 3145,          |
| 1655, 1669, 1684,      | \endcsname 352, 353, 481,     | 3149, 3154, 3166, 3167     |
| 1690, 1693, 1704,      | 483, 487, 494, 496,           | \fancyhead . 2944, 2945,   |
| 1715, 1718, 1728,      | 500, 529, 549, 550,           | 2946, 2947, 2952,          |
| 1731, 1734, 1739,      | 564, 578, 1501,               | 2953, 2954, 2955,          |
| 1773, 1796, 1801,      | 1508, 1562, 1565,             | 2961, 2963, 2964,          |
| 1802, 1803, 1806,      | 1787, 1788, 1790,             | 2971, 2973, 2974,          |
| 1925, 1929, 2087,      | 1791, 1792, 1793,             | 2975, 2983, 2984,          |
| 2093, 2119, 2130,      | 1794, 1797, 1799,             | 2986, 2987, 2990,          |
| 2134, 2135, 2136,      | 2237, 2239, 3175, 3198        | 2992, 2996, 2999,          |
| 2148, 2149, 2157,      | \enddescription .... 1051     | 3007, 3008, 3010,          |
| 2160, 2161, 2164,      | \endgroup ... 480, 519,       | 3011, 3014, 3016,          |
| 2171, 2176, 2183,      | 537, 552, 2207,               | 3020, 3023, 3038,          |
| 2188, 2191, 2192,      | 2530, 3177, 3179, 3457        | 3043, 3101, 3102,          |
| 2195, 2197, 2198,      | \endlist ..... 1049, 1051     | 3113, 3114, 3115,          |
| 2199, 2200, 2211,      | \endMakeFramed .... 1769      | 3116, 3124, 3125,          |
| 2214, 2219, 2220,      | \endminipage ..... 784        | 3126, 3127, 3135,          |
| 2224, 2267, 2279,      | \endtrivlist ..... 3394       | 3136, 3138, 3139,          |
| 2282, 2285, 2322,      | \enspace ..... 3272           | 3143, 3144, 3160, 3165     |
| 2449, 2458, 2467,      | environments:                 | \fancyheadoffset 3030,     |
| 2473, 2474, 2489,      | abstract ..... 18             | 3037, 3117, 3128, 3159     |
| 2491, 2492, 2493,      | acks ..... 24                 | \fancyhf ..... 2931, 3095  |
| 2495, 2497, 2498,      | anonsuppress .... 24          | \fancypagestyle 2930, 3094 |
| 2501, 2568, 2585,      | CCSXML ..... 16               | \fi ..... 56, 64, 72, 81,  |
| 2588, 2591, 2603,      | marginfigure .... 34          | 89, 101, 117, 125,         |
| 2609, 2616, 2637,      | marginable ..... 34           | 133, 143, 156, 175,        |
| 2648, 2658, 2667,      | printonly ..... 24            | 181, 194, 199, 228,        |
| 2674, 2683, 2701,      | screenonly ..... 24           | 233, 258, 259, 271,        |
| 2705, 2714, 2720,      | sidebar ..... 34              | 276, 289, 291, 293,        |
| 2728, 2742, 2744,      | teaserfigure .... 18          | 295, 297, 299, 301,        |
| 2760, 2769, 2774,      |                               |                            |

|                     |                           |                                  |
|---------------------|---------------------------|----------------------------------|
| 303, 305, 307, 309, | 2278, 2281, 2284,         | 2928, 2949, 2957,                |
| 311, 313, 315, 317, | 2285, 2315, 2324,         | 2967, 2978, 2982,                |
| 319, 321, 323, 325, | 2336, 2362, 2388,         | 2990, 2996, 3006,                |
| 327, 329, 331, 336, | 2414, 2439, 2443,         | 3045, 3105, 3109,                |
| 338, 340, 342, 344, | 2451, 2460, 2469,         | 3120, 3131, 3140,                |
| 346, 347, 356, 358, | 2477, 2490, 2491,         | 3145, 3151, 3167, 3497           |
| 372, 377, 380, 389, | 2493, 2495, 2497,         | \footnotetext .. 1578,           |
| 393, 400, 408, 416, | 2498, 2501, 2503,         | 1580, 1587, 1590, 1597           |
| 419, 432, 447, 451, | 2529, 2564, 2571,         | \footnotetextauthorsaddresses    |
| 457, 462, 467, 473, | 2587, 2590, 2594,         | ..... 2131, 2138                 |
| 484, 488, 497, 501, | 2605, 2621, 2622,         | \footnotetextcopyrightpermission |
| 503, 526, 527, 540, | 2626, 2637, 2660,         | ..... 2146, 2150                 |
| 551, 570, 610, 614, | 2661, 2669, 2677,         | \footrulewidth ....              |
| 623, 641, 643, 647, | 2688, 2707, 2708,         | 2933, 3036, 3097, 3158           |
| 650, 677, 678, 679, | 2716, 2722, 2733,         | \foreignlanguage 435, 438        |
| 757, 773, 791, 817, | 2742, 2744, 2764,         | \format ..... 32                 |
| 829, 860, 861, 862, | 2777, 2779, 2787,         | \FrameCommand ..... 1765         |
| 868, 875, 884, 887, | 2789, 2795, 2800,         | \FrameRestore ..... 1768         |
| 941, 942, 958, 972, | 2807, 2811, 2825,         | \FrameSep ..... 2271             |
| 976, 1003, 1435,    | 2828, 2829, 2830,         | \frenchspacing .... 3513         |
| 1454, 1460, 1466,   | 2868, 2875, 2901,         | \fulltextwidth ....              |
| 1467, 1475, 1491,   | 2905, 2917, 2922,         | ..... 964, 968, 984              |
| 1496, 1503, 1510,   | 2926, 2927, 2936,         |                                  |
| 1511, 1516, 1517,   | 2938, 2939, 2944,         | G                                |
| 1525, 1531, 1532,   | 2945, 2950, 2959,         | \g@addto@macro ....              |
| 1533, 1538, 1558,   | 2969, 2980, 2982,         | 157, 435, 438, 441,              |
| 1581, 1591, 1598,   | 2991, 2993, 3002,         | 449, 1474, 1506,                 |
| 1604, 1620, 1648,   | 3003, 3004, 3006,         | 1509, 1524, 1530,                |
| 1661, 1673, 1677,   | 3015, 3017, 3026,         | 1537, 1557, 1575,                |
| 1686, 1692, 1700,   | 3027, 3028, 3031,         | 1577, 1580, 1584,                |
| 1706, 1720, 1721,   | 3034, 3047, 3048,         | 1586, 1589, 1595,                |
| 1730, 1736, 1737,   | 3049, 3072, 3091,         | 1596, 1601, 1603,                |
| 1741, 1755, 1762,   | 3103, 3106, 3112,         | 1643, 1656, 1729,                |
| 1775, 1795, 1803,   | 3123, 3134, 3140,         | 1735, 1774, 1792,                |
| 1804, 1810, 1831,   | 3141, 3145, 3146,         | 1799, 2082, 2086,                |
| 1834, 1838, 1844,   | 3152, 3155, 3156,         | 2088, 2099, 2102,                |
| 1847, 1850, 1853,   | 3169, 3170, 3171,         | 2604, 2617, 2668,                |
| 1856, 1859, 1862,   | 3189, 3200, 3202,         | 2675, 2684, 2715,                |
| 1866, 1870, 1874,   | 3270, 3275, 3297,         | 2721, 2729, 2766, 2767           |
| 1919, 1935, 1936,   | 3329, 3367, 3386,         | \gdef ..... 156,                 |
| 2077, 2089, 2095,   | 3417, 3418, 3443,         | 1448, 1449, 1450,                |
| 2098, 2109, 2110,   | 3444, 3450, 3461,         | 1451, 1453, 1461,                |
| 2119, 2121, 2133,   | 3469, 3475, 3478,         | 1471, 1473, 1494,                |
| 2140, 2141, 2142,   | 3488, 3489, 3490, 3512    | 1497, 1499, 1502,                |
| 2143, 2147, 2155,   | \firstpagestyle .... 3093 | 1514, 1522, 1528,                |
| 2158, 2159, 2166,   | \floatname ..... 944      | 1561, 1564, 1638,                |
| 2167, 2168, 2173,   | \flushbottom 803, 805,    | 1651, 1678, 1710,                |
| 2185, 2190, 2195,   | 807, 809, 811, 814, 816   | 1727, 1733, 1772,                |
| 2199, 2200, 2201,   | \footnote ..... 2803      | 1788, 1790, 1791,                |
| 2202, 2203, 2204,   | \footnotemark 593, 1575,  | 1797, 2321, 2602,                |
| 2205, 2206, 2208,   | 1584, 2766, 2767, 2801    | 2606, 2611, 2641,                |
| 2212, 2217, 2218,   | \footnoterule ..... 782   | 2642, 2663, 2664,                |
| 2223, 2226, 2227,   | \footnotesep ... 568, 581 | 2666, 2670, 2672,                |
| 2246, 2257, 2277,   | \footnotesize 574, 2914,  | 2679, 2710, 2711,                |



|   |  |   |
|---|--|---|
| 2713, 2717, 2719,<br>2724, 2749, 2750, 2755   | \if@ACM@acmcp 168, 273,<br>1760, 2134, 2149,<br>2219, 2253, 2441,<br>2624, 3035, 3157, 3273  | 2956, 2966, 2977,<br>2985, 3009, 3104,<br>3108, 3119, 3130, 3150  |
| \geometry . . . 683, 686,<br>693, 700, 707, 714,<br>721, 728, 735, 744, 751   | \if@ACM@acmthm . 67, 3343  | \if@ACM@pbalance 108, 3397  |
| \getrefnumber . . 1670,<br>1694, 1807, 2267, 2800   | \if@ACM@affiliation@obeypunctuation . . . . . 1687, 2244<br>. . . . . 1539,  | \if@ACM@printacmref<br>. . . . . 1681, 2213   |
| \global . 513, 516, 552,<br>572, 873, 883, 886,<br>956, 983, 1441,<br>1455, 1487, 1489,<br>1490, 1535, 2242,<br>2243, 2247, 2249,<br>2263, 2276, 2483,<br>2485, 2490, 2494,<br>2499, 2502, 2580,<br>2581, 2582, 2599,<br>2623, 2627, 2637,<br>2689, 2692, 2734,<br>2772, 2775, 2863,<br>2867, 3398, 3422,<br>3424, 3426, 3438, 3442 | 2474, 2491, 2493,<br>2495, 2496, 2498, 2501  | \if@ACM@printccs . .<br>. . . . . 1681, 2213  |
| \grantnum . . . . . 25, 3460  | \if@ACM@anonymous . .<br>. . . . . 120, 1493,<br>1505, 1512, 1536,<br>1556, 1576, 1585,<br>1594, 2085, 2091,<br>2107, 2136, 2924, 3470 | \if@ACM@printfolios<br>1701, 2936, 2938,<br>2944, 2945, 2982,<br>3006, 3103, 3140, 3145   |
| \grantsponsor . . 25, 3459  | \if@ACM@authordraft<br>. . . . . 136, 661, 2151  | \if@ACM@review . . . .<br>. 75, 2853, 2870, 2877  |
| <b>H</b>  | \if@ACM@authorversion<br>. . . . . 84, 2157, 2177  | \if@ACM@screen 51, 615, 3463  |
| \hbox . 583, 2118, 2123, 2475   | \if@ACM@badge . . . . . 1629   | \if@ACM@sigchiamode<br>. . . . . 165, 559,<br>669, 866, 966, 973,<br>2119, 2121, 2637, 3029   |
| \headrulewidth 2932, 3096   | \if@ACM@balance . . . . . 104, 3419, 3447  | \if@ACM@timestamp . .<br>128, 2906, 3032, 3147  |
| \height . . . . . 1640, 1646, 1653, 1659  | \if@ACM@citypresent<br>. . . . . 2575, 2588  | \if@ACM@urlbreakonhyphens<br>. . . . . 59, 612  |
| \hfill . . . . . 2465, 2866   | \if@ACM@countrypresent<br>. . . . . 2577, 2591   | \if@acmowned . . . . . 1816   |
| \href . 1563, 1566, 1641,<br>1647, 1654, 1660,<br>2064, 2065, 3481, 3485  | \if@ACM@engage . 166,<br>378, 391, 1926,<br>2162, 2208, 2989, 3013   | \if@Description@present<br>. . . . . 869,<br>882, 885, 955, 2774  |
| \hrule . . . . . 776, 783, 2465   | \if@ACM@instpresent<br>. . . . . 2573, 2585  | \if@fileswh . . . . . 548, 648  |
| \hsize . 575, 1767, 2117,<br>2262, 2265, 2440,<br>2442, 2444, 2453,<br>2455, 2463, 2505,<br>2625, 2635, 2691, 2736  | \if@ACM@journal . . . . . 163, 229, 373,<br>385, 396, 404, 412,<br>911, 1457, 1716,<br>2481, 2760, 2783, 2791                          | \if@insideauthorgroup<br>. . . . . 1482, 1488   |
| \hskip . . 478, 492, 522,<br>535, 539, 2476, 3391   | \if@ACM@journal@bibstrip<br>. . . . . 164,<br>2137, 2161, 2181,<br>2193, 2817, 2941, 3098  | \if@nobreak . . . . . 458   |
| \hspace . . . . . 1644,<br>1657, 1765, 1948,<br>1959, 1968, 1993,<br>2005, 2026, 2640, 2694   | \if@ACM@maketitle@typeset<br>. . . . . 445, 1052, 1675   | \if@noskipsec . . 451, 515  |
| \ht . . . . . 2325, 2333  | \if@ACM@manuscript .<br>. . . . . 162,<br>268, 1713, 2160, 2174  | \if@printcopyright .<br>. . . . . 1812, 2169  |
| \Huge . 2399, 2401, 2403,<br>2405, 2407, 2409, 2411   | \if@ACM@natbib . . . . . 112, 279, 370, 626  | \if@printpermission<br>. . . . . 1814, 2158   |
| \hypersetup . . . . .<br>. . 616, 622, 624, 2231  | \if@ACM@natbib@override<br>. . . . . 112   | \if@twocolumn . 3448, 3490  |
| \hyphenpenalty . . . . 3496   | \if@ACM@newfonts 830, 841  | \if@undescribed@images<br>. . . . . 871, 874  |
| <b>I</b>  | \if@ACM@nonacm 92, 670,<br>1669, 1693, 1806,<br>1922, 2144, 2192,<br>2760, 2812, 2948,   | \IfBeginWith . . . . . 1560   |
| \if . . . . . 333   |  | \ifcase . 201, 235, 596,<br>681, 760, 798, 918,<br>987, 1128, 1617,<br>1744, 1882, 1938,<br>2292, 2339, 2365,<br>2391, 2416, 2506,<br>2534, 2649, 2702,<br>2878, 2942, 3060,<br>3099, 3237, 3281,<br>3313, 3372, 3399, 3420 |



|                                     |   |  |  |  |   |
|-------------------------------------|---|--|--|--|---|
| <code>\IfEq</code> . . . . .        | 2061, 2067,<br>2068, 2069, 2070,<br>2071, 2072, 2073, 2074  | 2991, 2993, 3015,<br>3017, 3047, 3048,<br>3169, 3170, 3175,<br>3198, 3202, 3461,<br>3478, 3480, 3484, 3509   | <code>\labelsep</code> . . . . .                                   | 1006, 1014, 1019,<br>1029, 1034, 1037,<br>1039, 1041, 1043, 3391                               |   |
| <code>\IfFileExists</code>          | 832, 835, 838   |  | <code>\labelwidth</code> . . . . .                                 | 1029, 1034, 1037,<br>1039, 1041, 1043, 1046  |   |
| <code>\IfInteger</code> . . . . .   | 1708  |  | <code>\LARGE</code> . . . . .                                      | 2393,<br>2395, 2397, 2413,<br>2424, 2426, 2428,<br>2430, 2432, 2436,<br>2541, 2544, 2559, 3090 |   |
| <code>\ifluatex</code> . . . . .    | 852   | <code>\ifxetex</code> . . . . .  | 847  | <code>\Large</code> . . . . .  | 2532, 2550,<br>3247, 3248, 3250,<br>3251, 3253, 3267, 3268  |
| <code>\ifNAT@numbers</code> . . . . | 643   | <code>\ignorespaces</code> . . . .   |  | <code>\large</code> . . . . .  | 2152, 2537, 2542,<br>2545, 2560, 2562,<br>3241, 3242, 3244, 3245  |
| <code>\ifnum</code> . . . . .       | 170,<br>176, 182, 195, 467,<br>468, 482, 486, 495,<br>499, 1670, 1694,<br>1801, 1802, 1803,<br>1807, 1827, 1832,<br>1835, 1839, 1845,<br>1848, 1851, 1854,<br>1857, 1860, 1863,<br>1867, 1871, 2109,<br>2145, 2267, 2646,<br>2699, 2741, 2743,<br>2800, 3074, 3076, 3148  | . . . 528, 568, 581,<br>873, 1543, 1544,<br>1546, 1559, 2479,<br>2480, 2482, 2484,<br>2485, 2486, 2487,<br>2491, 2748, 2788,<br>2796, 2802, 2810, 3392 |  | <code>\lastbox</code> . . . . .  | 517, 2784, 2792   |
| <code>\ifPDFTeX</code> . . . . .    | 818   | <code>\immediate</code> . . . . .  | 550, 649   | <code>\leaders</code> . . . . .  | 2465  |
| <code>\IfSubStr</code> . . . . .    | 1485, 1554  | <code>\includecomment</code> . . . .   |  | <code>\leavevmode</code>   | 451, 2465, 2693   |
| <code>\ifvmode</code> . . . . .     | 2473  | . . . 3464, 3468, 3474   |  | <code>\leftmargin</code>   | 1028, 1033,<br>1036, 1038, 1040, 1042   |
| <code>\ifvoid</code> . . . . .      | 787   | <code>\includegraphics</code> . . . .  |  | <code>\leftmargini</code>  | 1012, 1013,<br>1014, 1015, 1028, 1029   |
| <code>\ifx</code> . . . . .         | 155,<br>234, 288, 290, 292,<br>294, 296, 298, 300,<br>302, 304, 306, 308,<br>310, 312, 314, 316,<br>318, 320, 322, 324,<br>326, 328, 330, 335,<br>337, 339, 341, 343,<br>345, 381, 421, 645,<br>1452, 1463, 1465,<br>1470, 1492, 1495,<br>1513, 1515, 1520,<br>1521, 1527, 1600,<br>1637, 1650, 1669,<br>1725, 1726, 1732,<br>1739, 1771, 1787,<br>1796, 1806, 2096,<br>2130, 2135, 2186,<br>2195, 2198, 2199,<br>2200, 2211, 2214,<br>2220, 2224, 2279,<br>2282, 2285, 2320,<br>2449, 2458, 2467,<br>2489, 2568, 2601,<br>2609, 2610, 2665,<br>2671, 2678, 2712,<br>2718, 2723, 2761,<br>2769, 2781, 2806,<br>2811, 2823, 2830,<br>2915, 2926, 2935, | <code>\input</code> . . . . .  | 819  | <code>\leftmarginii</code> . . . . .   | 1018, 1019,<br>1020, 1021, 1033, 1034   |
|                                     |   | <code>\InputIfFileExists</code> . .  | 25   | <code>\leftmarginiii</code> . . . .  | 1021, 1022, 1036, 1037  |
|                                     |   | <code>\institution</code> . . . . .  | . 11, 1544, 2479, 2750   | <code>\leftmarginiv</code> . . . . .   | 1022, 1023, 1038, 1039  |
|                                     |   | <code>\interfootnotelinepenalty</code>   | . . . . . 562  | <code>\leftmarginv</code> . . . . .  | 1023, 1024, 1040, 1041  |
|                                     |   | <code>\interlinepenalty</code> . .   | . . . . . 479, 536, 562  | <code>\leftmarginvi</code> . . . . .   | 1024, 1042, 1043  |
|                                     |   | <code>\item</code> . . . . .   | 3391, 3493   | <code>\leftskip</code> . . . . .   | 2464, 2737, 3230  |
|                                     |   | <code>\itshape</code> . . . . .  | 2163, 2165, 3234,<br>3235, 3256, 3257,<br>3277, 3289, 3311, 3380   | <code>\let</code> . . . . .  | 309, 311,<br>323, 325, 327, 353,<br>469, 585, 586, 627,<br>628, 629, 630, 631,<br>632, 635, 639, 797,<br>863, 877, 878, 880,<br>881, 888, 889, 890,<br>891, 892, 893, 894,<br>895, 896, 897, 898,<br>899, 900, 901, 902,<br>903, 904, 905, 906,<br>907, 946, 947, 951,<br>952, 961, 962, 967,<br>968, 969, 1032,<br>1047, 1051, 1547,<br>1548, 1549, 1550,<br>1551, 1662, 1668, |
|                                     |   | <b>J</b>   |  |  |   |
|                                     |   | <code>\jobname</code> . . . . .  | 547, 550   |  |   |
|                                     |   | <b>K</b>   |  |  |   |
|                                     |   | <code>\kern</code>   | 775, 776, 782, 783, 2465   |  |   |
|                                     |   | <code>\keywords</code> . . . . .   | 16, 1667   |  |   |
|                                     |   | <code>\keywordsname</code> . . . . .   | 374, 376, 386, 388,<br>397, 399, 405, 407,<br>413, 415, 1571, 2221 |  |   |
|                                     |   | <b>L</b>   |  |  |   |
|                                     |   | <code>\l@section</code> . . . . .  | 555  |  |   |
|                                     |   | <code>\l@subsection</code> . . . . .   | 555, 556   |  |   |
|                                     |   | <code>\l@subsubsection</code> . . . .  | 557  |  |   |
|                                     |   | <code>\labelenumi</code> . . . . .   | 995  |  |   |
|                                     |   | <code>\labelenumii</code> . . . . .  | 996  |  |   |
|                                     |   | <code>\labelenumiii</code> . . . . .   | 997  |  |   |
|                                     |   | <code>\labelenumiv</code> . . . . .  | 998  |  |   |

|  |  |  |
|--|--|--|
| 1777, 1780, 2097,<br>2112, 2113, 2114,<br>2115, 2127, 2128,<br>2129, 2132, 2139,<br>2228, 2242, 2243,<br>2290, 2291, 2316,<br>2317, 2500, 2599,<br>2623, 2689, 2695,<br>2734, 2739, 2798,<br>2799, 2833, 2834,<br>2836, 2837, 2845,<br>2846, 2847, 2849,<br>2850, 2851, 3180,<br>3182, 3184, 3185,<br>3187, 3193, 3196,<br>3199, 3493, 3498,<br>3499, 3506, 3507, 3508 | <code>\mdseries</code> .. 2418, 2420,<br>2422, 2426, 2428,<br>2430, 2432, 2434,<br>2436, 2438, 2554, 2557<br><code>\medskip</code> .. 2294, 2296,<br>2298, 2300, 2627,<br>2629, 2693, 2778, 2808<br><code>\MessageBreak</code> .....<br>172, 178, 184, 185,<br>186, 187, 188, 189,<br>190, 191, 192, 423,<br>424, 425, 426, 428,<br>430, 1696, 1697,<br>1698, 1757, 1931, 1932<br><code>\metadata@authors</code> ..<br>... 2228, 2229, 2232<br><code>\mktitle@bx</code> <u>2104</u> , 2325,<br>2326, 2329, 2333,<br>2334, 2341, 2343,<br>2345, 2347, 2349,<br>2351, 2353, 2355,<br>2357, 2359, 2361,<br>2445, 2454, 2464,<br>2627, 2692, 2693, 2772<br><code>\month</code> ..... 1616, 2918<br><code>\moveleft</code> ..... 983<br><code>\multiply</code> ..... 3081 | <code>\NAT@yrsep</code> ..... 342<br><code>\NeedsTeXFormat</code> ..... 1<br><code>\newblock</code> ..... 636<br><code>\newbox</code> .....<br>2104, 2259, 2471, 2631<br><code>\newcommand</code> . 359, 365,<br>420, 434, 437, 440,<br>642, 873, 1447,<br>1534, 1569, 1599,<br>1636, 1649, 1724,<br>1782, 1877, 2090,<br>2487, 2496, 2913,<br>3219, 3451, 3460, 3476<br><code>\newcount</code> . 1478, 1480, 2856<br><code>\newcounter</code> 1781, 2909, 2911<br><code>\newdimen</code> 277, 964, 1004,<br>2632, 3053, 3055, 3057<br><code>\newenvironment</code> . 443,<br>949, 960, 1764, 2081<br><code>\newfloat</code> ..... 943<br><code>\newif</code> .. 162, 163, 164,<br>165, 166, 168, 830,<br>869, 871, 1052,<br>1482, 1812, 1814,<br>1816, 2573, 2575, 2577<br><code>\newlength</code> .....<br>1629, 1631, 1632, 2855<br><code>\newsavebox</code> ..... 2854<br><code>\newskip</code> ..... 1026, 2633<br><code>\newtheorem</code> .....<br>3346, 3349, 3352,<br>3355, 3358, 3362, 3365<br><code>\newtheoremstyle</code> ...<br>..... 3298, 3330<br><code>\newwrite</code> ..... 549<br><code>\next</code> .... 3177, 3179, 3189<br><code>\nobreak</code> ..... 508, 2808<br><code>\noindent</code> .. 558, 1572,<br>1740, 2129, 2216,<br>2222, 2294, 2296,<br>2298, 2300, 2331,<br>2338, 2445, 2447,<br>2450, 2459, 2465,<br>2466, 2468, 2566,<br>2627, 2628, 2692,<br>2738, 2772, 2773,<br>2808, 2809, 2842, 3381<br><code>\noindentparagraph</code> .<br>..... 2306, 3219<br><code>\nolinkurl</code> ..... 2673,<br>2676, 2719, 2721, 2757<br><code>\normalbaselines</code> ... 2636<br><code>\normalcolor</code> ..... 789 |
|--|--|--|

|                                      |  |  |   |
|--------------------------------------|--|--|---|
| <code>\normalfont</code> . . . .     | 583,<br>1740, 2123, 2533,<br>2538, 2547, 2548,<br>2550, 2551, 2563,<br>2859, 3292, 3309,<br>3321, 3324, 3389, 3513   | 1247, 1251, 1256,<br>1260, 1264, 1268,<br>1272, 1276, 1280,<br>1284, 1288, 1292,<br>1296, 1300, 1304,<br>1308, 1312, 1316,<br>1320, 1324, 1328,<br>1332, 1336, 1340,<br>1344, 1348, 1352,<br>1356, 1361, 1366,<br>1370, 1374, 1379,<br>1383, 1387, 1391,<br>1395, 1399, 1403,<br>1407, 1411, 1415,<br>1419, 1423, 1427,<br>1617, 1618, 1619,<br>1747, 1749, 1751,<br>1753, 1883, 1885,<br>1888, 1890, 1891,<br>1893, 1895, 1897,<br>1900, 1903, 1906,<br>1908, 1911, 1914,<br>1917, 1939, 1950,<br>1961, 1969, 1975,<br>1981, 1995, 2007,<br>2014, 2028, 2035,<br>2041, 2048, 2053,<br>2059, 2295, 2297,<br>2299, 2301, 2303,<br>2305, 2307, 2309,<br>2311, 2313, 2342,<br>2344, 2346, 2348,<br>2350, 2352, 2354,<br>2356, 2358, 2360,<br>2368, 2370, 2372,<br>2374, 2376, 2378,<br>2380, 2382, 2384,<br>2386, 2394, 2396,<br>2398, 2400, 2402,<br>2404, 2406, 2408,<br>2410, 2412, 2419,<br>2421, 2423, 2425,<br>2427, 2429, 2431,<br>2433, 2435, 2437,<br>2509, 2511, 2513,<br>2515, 2517, 2519,<br>2521, 2523, 2525,<br>2527, 2536, 2539,<br>2540, 2543, 2546,<br>2549, 2552, 2555,<br>2558, 2561, 2651,<br>2652, 2654, 2656,<br>2704, 2881, 2883,<br>2885, 2887, 2889, | 2891, 2893, 2895,<br>2897, 2899, 2951,<br>2960, 2970, 3062,<br>3067, 3107, 3118,<br>3129, 3239, 3240,<br>3243, 3246, 3249,<br>3252, 3258, 3262,<br>3266, 3269, 3283,<br>3284, 3285, 3286,<br>3287, 3288, 3293,<br>3294, 3295, 3296,<br>3315, 3316, 3317,<br>3318, 3319, 3320,<br>3325, 3326, 3327,<br>3328, 3374, 3375,<br>3376, 3377, 3378,<br>3379, 3382, 3383,<br>3384, 3385, 3401,<br>3402, 3403, 3405,<br>3407, 3409, 3411,<br>3413, 3414, 3416,<br>3423, 3425, 3427,<br>3429, 3431, 3433,<br>3435, 3437, 3439, 3441 |
| <code>\normalparindent</code> . . .  | <u>774</u>   |  |   |
| <code>\normalsize</code> . . . . .   | 2415, 2533, 2547,<br>2548, 2551, 2860, 3513  |  |   |
| <code>\num@authorgroups</code> . .   | . . . . . <u>1478</u> ,<br>1489, 2109, 2649,<br>2653, 2655, 2702, 2743   |  |   |
| <code>\num@author</code> . . . . .   | <u>1480</u> , 1487, 1501,<br>1508, 1562, 1565, 2741  |  |   |
| <code>\number</code> . . . . .       | 467  |  |   |
| <code>\numberline</code> . . . .     | 487, 500   |  |   |
| <code>\numexpr</code> .              | 2908, 2910, 2912   |  |   |
| <code>\nxandlist</code> . . . . .    | 2229   |  |   |
| <b>O</b>                             |  |  |   |
| <code>\onehalfspacing</code> . . . . | 270  |  |   |
| <code>\openout</code> . . . . .      | 550  |  |   |
| <code>\or</code> . . . . .           | 204, 206, 208,<br>210, 212, 214, 216,<br>218, 221, 224, 238,<br>240, 242, 244, 246,<br>248, 250, 252, 254,<br>256, 598, 599, 600,<br>601, 602, 603, 605,<br>606, 608, 609, 685,<br>692, 699, 706, 713,<br>720, 727, 734, 743,<br>750, 762, 763, 764,<br>766, 767, 768, 769,<br>770, 771, 772, 800,<br>801, 802, 804, 806,<br>808, 810, 812, 813,<br>815, 920, 921, 922,<br>923, 924, 926, 929,<br>934, 939, 940, 989,<br>990, 991, 992, 993,<br>994, 999, 1000,<br>1001, 1002, 1133,<br>1137, 1141, 1145,<br>1149, 1153, 1158,<br>1162, 1166, 1173,<br>1177, 1181, 1185,<br>1190, 1194, 1198,<br>1202, 1207, 1211,<br>1217, 1223, 1227,<br>1231, 1237, 1243, | 2891, 2893, 2895,<br>2897, 2899, 2951,<br>2960, 2970, 3062,<br>3067, 3107, 3118,<br>3129, 3239, 3240,<br>3243, 3246, 3249,<br>3252, 3258, 3262,<br>3266, 3269, 3283,<br>3284, 3285, 3286,<br>3287, 3288, 3293,<br>3294, 3295, 3296,<br>3315, 3316, 3317,<br>3318, 3319, 3320,<br>3325, 3326, 3327,<br>3328, 3374, 3375,<br>3376, 3377, 3378,<br>3379, 3382, 3383,<br>3384, 3385, 3401,<br>3402, 3403, 3405,<br>3407, 3409, 3411,<br>3413, 3414, 3416,<br>3423, 3425, 3427,<br>3429, 3431, 3433,<br>3435, 3437, 3439, 3441  |   |
| <code>\orcid</code> . . . . .        | <u>10</u> , <u>1559</u>  |  |   |
| <code>\outer@nobreak</code> . . . .  | 980  |  |   |
| <b>P</b>                             |  |  |   |
| <code>\pe</code> . . . . .           | 553, 758,<br>765, 775, 776, 782,<br>783, 3036, 3158,<br>3204, 3208, 3212,<br>3213, 3216, 3217,<br>3220, 3221, 3225,<br>3226, 3389, 3491, 3494  |  |   |
| <code>\PackageError</code>           | 56, 64, 72,<br>81, 89, 101, 105,<br>109, 117, 125, 133, 143  |  |   |
| <code>\PackageInfo</code> . . . .    | 53,<br>55, 61, 63, 69,<br>71, 77, 80, 86, 88,<br>94, 100, 114, 116,<br>122, 124, 130, 132,<br>138, 142, 1172,<br>1216, 1222, 1236, 1242  |  |   |
| <code>\PageIndex</code> . . . . .    | 15   |  |   |
| <code>\pageref</code> . . . . .      | 2920   |  |   |
| <code>\pagestyle</code> . . . . .    | 3051   |  |   |
| <code>\par</code> . . . .            | 435, 438, 452,<br>508, 544, 785, 978,<br>1572, 1740, 2132,<br>2139, 2158, 2163,<br>2165, 2216, 2222,<br>2265, 2280, 2283,  |  |   |

|   |   |  |
|---|---|--|
| 2294, 2296, 2298,<br>2300, 2341, 2343,<br>2345, 2357, 2361,<br>2450, 2452, 2459,<br>2462, 2465, 2468,<br>2470, 2493, 2495,<br>2497, 2498, 2566,<br>2570, 2627, 2629,<br>2636, 2638, 2666,<br>2668, 2675, 2684,<br>2693, 2695, 2713,<br>2715, 2721, 2729,<br>2737, 2739, 2770,<br>2771, 2772, 2774,<br>2788, 2808, 2831,<br>2835, 2839, 2842, 3387   | \ps@myheadings 2846, 2850<br>\ps@plain . . . . . 2845, 2849<br>\pushQED . . . . . 3388<br>\put . . . . . 2873, 2903   | 2800, 2857, 2879,<br>2880, 2882, 2884,<br>2900, 2910, 2912,<br>2915, 2943, 3061,<br>3063, 3064, 3065,<br>3068, 3069, 3070,<br>3073, 3074, 3076,<br>3079, 3080, 3081,<br>3082, 3100, 3148,<br>3175, 3198, 3202,<br>3238, 3282, 3314,<br>3373, 3389, 3400,<br>3421, 3480, 3484, 3494   |
| \paragraph . . . . . 3215<br>\parbox . . . . . 665, 674,<br>2446, 2456, 2859, 3088<br>\parindent . . . 758, 774,<br>1013, 2132, 2139,<br>2156, 2264, 3215,<br>3231, 3278, 3310, 3494<br>\parskip . . . 758, 2156, 3494<br>\part . . . . . 3224<br>\PassOptionsToClass<br>. . . . . 158, 159<br>\pdfgentounicode . . . 827<br>\pdfglyphtounicode .<br>. . . . . 820, 821,<br>822, 823, 824, 825, 826<br>\pdfstringdefDisableCommands<br>. . . . . 588<br>\phantomsection . . . .<br>. . . . . 283, 2782, 3455<br>\popQED . . . . . 3394<br>\position . . . . 11, 1543,<br>1547, 1548, 1549,<br>1550, 1551, 2479, 2748<br>\postcode . . . . .<br>. . . . . 11, 1550, 2479, 2747<br>printonly (env.) . . . . . 24<br>\ProcessOptionsX . . . . 160<br>\proof . . . . . 3387<br>\proofname . . . . . 3387<br>\protect . . . . . 487, 500<br>\protected@edef . . . .<br>. . . . . 472, 563, 577<br>\protected@write . . . . 2275<br>\providecommand . . . .<br>. . . . . 636, 640, 3276<br>\ProvidesClass . . . . . 5<br>\ProvidesFile . . . . . 3<br>\ps@headings . . . 2847, 2851 | <b>Q</b><br>\qed . . . . . 3388<br>\quad . . . . . 529, 2962,<br>2965, 2972, 2976, 3149<br><b>R</b><br>\raggedright . . . . .<br>2446, 2464, 2737, 3495<br>\raisebox . . . 1640, 1646,<br>1653, 1659, 2152,<br>3039, 3084, 3086, 3161<br>\real@adddotafter . .<br>. . . . . 3184, 3187<br>\realSectionformat .<br>. . . . . 3180, 3192, 3193<br>\received . . . . . 19, 1724<br>\RecordChanges . . . . . 17<br>\ref . . . . . 2820, 2827<br>\refname . . . . . 282, 283<br>\refstepcounter . . . . 471<br>\relax . . . . . 170, 176,<br>182, 195, 202, 236,<br>278, 332, 333, 421,<br>453, 472, 474, 478,<br>492, 506, 521, 531,<br>539, 550, 597, 682,<br>761, 797, 799, 919,<br>988, 1129, 1479,<br>1481, 1487, 1489,<br>1599, 1600, 1670,<br>1694, 1745, 1768,<br>1787, 1796, 1806,<br>1807, 1827, 1832,<br>1835, 1839, 1845,<br>1848, 1851, 1854,<br>1857, 1860, 1863,<br>1867, 1871, 1882,<br>1938, 2127, 2128,<br>2145, 2272, 2273,<br>2276, 2293, 2340,<br>2366, 2392, 2417,<br>2507, 2535, 2634,<br>2644, 2645, 2646,<br>2647, 2650, 2653,<br>2655, 2657, 2659,<br>2662, 2694, 2697,<br>2698, 2699, 2700,<br>2703, 2706, 2709,<br>2741, 2743, 2766, | \removelastskip . . . . 544<br>\renewcommand 281, 285,<br>286, 289, 291, 293,<br>295, 297, 299, 301,<br>351, 374, 376, 379,<br>386, 388, 390, 392,<br>397, 399, 401, 405,<br>407, 409, 413, 415,<br>417, 867, 1044,<br>1484, 1553, 2083,<br>2116, 2753, 2932,<br>2933, 3036, 3096,<br>3097, 3158, 3203,<br>3207, 3211, 3215, 3224<br>\renewenvironment . .<br>. . . . . 945, 1045, 1674, 3387<br>\repeat . . . . . 2335, 2865, 3078<br>\RequirePackage . . . 29,<br>30, 31, 262, 263,<br>264, 265, 266,<br>267, 269, 272,<br>274, 275, 280, 383,<br>584, 587, 651, 652,<br>662, 671, 680, 777,<br>828, 842, 848, 849,<br>853, 854, 857, 858,<br>859, 909, 1778,<br>2844, 3404, 3406,<br>3408, 3410, 3412,<br>3415, 3428, 3430,<br>3432, 3434, 3436, 3440<br>\reset@font . . . . . 561, 574<br>\reversemarginpar . . . 742<br>\rightarrow . . . . . 1784<br>\rightskip . . . . . 3229<br>\rlap . . . . . 3085<br>\rotatebox . . . . . 3040, 3162<br>\rule . . . . . 568, 581, 3087<br><b>S</b><br>\savebox . . . . . 2859 |

|                                |  |                                 |  |                                |  |
|--------------------------------|--|---------------------------------|--|--------------------------------|--|
| screenonly (env.) . . . . .    | 24   | \SetWatermarkColor . . . . .    | 664, 673   | \subsection . . . . .          | 3207   |
| \scriptsize . . . . .          | 2266, 2862, 2866   | \SetWatermarkFontSize . . . . . | 663, 672   | \subsubsection . . . . .       | 3211   |
| \scshape . . . . .             | 3279, 3370   | \SetWatermarkText . . . . .     | 665, 674   | \subtitle . . . . .            | 10, 1476   |
| \section . . . . .             | 282, 2302, 2304, 2308, 2310, 2312, 2314, 2786, 2794, 3203, 3454  | \sfdefault . . . . .            | 867  | \subtitlenote . . . . .        | 14, 1583   |
| \section@raggedright . . . . . | 3228, 3232, 3233, 3241, 3242, 3244, 3245, 3247, 3248, 3250, 3251, 3253, 3254, 3255, 3260, 3261, 3264, 3265, 3267, 3268 | \sffamily . . . . .             | 2393, 2395, 2397, 2399, 2401, 2403, 2407, 2411, 2413, 2532, 2537, 2541, 2562, 2928, 3090, 3232, 3233, 3234, 3241, 3242, 3244, 3245, 3250, 3251, 3260, 3261, 3264, 3265 | <b>T</b>                       |  |
| \Sectionformat . . . . .       | 3176, 3180, 3182, 3193   | \shortauthors . . . . .         | 19, 1513, 1514, 1521, 1522, 1524, 1527, 1528, 1530, 2241, 2243, 2927   |                                |  |
| \SelectFootnoteRule . . . . .  | 778, 780   | \shortcite . . . . .            | 639, 642   | \teaserfigure . . . . .        | 2081   |
| \selectlanguage . . . . .      | 1570, 2790   | \shorttitle . . . . .           | 2947, 2955, 2965, 2976, 2983, 3007   | teaserfigure (env.) . . . . .  | 18   |
| \set@ACM@acmcpbox . . . . .    | 2254, 2259   | \showeprint . . . . .           | 3476   | \terms . . . . .               | 16, 1665   |
| \setbox . . . . .              | 517, 572, 983, 2263, 2329, 2445, 2454, 2464, 2475, 2627, 2637, 2692, 2772, 2784, 2792                                  | \sidebar . . . . .              | 943  | \textbf . . . . .              | 1789, 1801, 2842   |
| \setccotype . . . . .          | 17, 1877   | sidebar (env.) . . . . .        | 34   | \textbullet . . . . .          | 591, 1788, 2962, 2965, 2972, 2976                                |
| \setcitestyle . . . . .        | 26, 286, 360, 366  | \skip . . . . .                 | 788  | \textcolor . . . . .           | 3090   |
| \setcopyright . . . . .        | 16, 1875   | \small . . . . .                | 561, 948, 955, 963, 1740, 2294, 2296, 2298, 2300, 2538, 2563, 2784, 2792, 2808, 3103   | \textheight . . . . .          | 2327, 2329, 2335, 2865, 3039, 3161                               |
| \setcounter . . . . .          | 2122, 2209, 2323, 2910, 2912, 3236, 3259, 3263, 3274   | \smallskipamount . . . . .      | 1027   | \textit . . . . .              | 1802, 2818, 2822, 2823, 2824                                     |
| \setengagemetadate . . . . .   | 19, 2101   | \smash . . . . .                | 1639, 1645, 1652, 1658   | \textrightarrow . . . . .      | 592, 1784, 1798  |
| \setkeys . . . . .             | 38, 174, 180, 1440, 1711, 1759, 1875, 2612, 2613, 2618, 2619, 2680, 2681, 2685, 2686, 2725, 2726, 2730, 2731           | \space . . . . .                | 496, 1486, 1555, 1699, 2237, 2501, 3047, 3169, 3461, 3500, 3503, 3511  | \textwidth . . . . .           | 965, 984, 985, 2117, 2440, 2453, 2463, 2505, 2644, 2691          |
| \setlength . . . . .           | 758, 759, 765, 774, 1006, 1007, 1012, 1018, 1021, 1022, 1023, 1024, 1630, 1633, 2264, 2861                             | \specialcomment . . . . .       | 3452   | \thanks . . . . .              | 13, 2083, 2839   |
| \setmonofont . . . . .         | 850, 855   | \standardpagestyle . . . . .    | 2929   | \thankses . . . . .            | 2086, 2088, 2130, 2839   |
| \settopmatter . . . . .        | 18, 98, 1699, 1711, 1712, 1714, 1717, 1719, 1722, 2816   | \startPage . . . . .            | 16, 1663   | \the . . . . .                 | 1501, 1508, 1562, 1565, 1614, 1616, 2276, 2862, 2866, 2918, 3081 |
| \setTrue . . . . .             | 543  | \state . . . . .                | 11, 1549, 2479, 2752   | \theACM@time@hours . . . . .   | 2912, 2919   |
|                                |  | \stepcounter . . . . .          | 1578, 1580, 1587, 1590, 1597, 1786   | \theACM@time@minutes . . . . . | 2919   |
|                                |  | \StrDel . . . . .               | 2488   | \theenumi . . . . .            | 995  |
|                                |  | \streetaddress . . . . .        | 11, 1547, 2479, 2746   | \theenumii . . . . .           | 996  |
|                                |  | \string . . . . .               | 423, 424, 427, 429, 649, 1486, 1555, 1665, 1699, 2276, 2804, 2805, 3500, 3503, 3511  | \theenumiii . . . . .          | 997  |
|                                |  | \strut . . . . .                | 3041, 3163   | \theenumiv . . . . .           | 998  |
|                                |  | \strutbox . . . . .             | 568, 581   | \thefootnote . . . . .         | 2116   |
|                                |  |                                 |  | \theindex . . . . .            | 3490   |
|                                |  |                                 |  | \theoremstyle . . . . .        | 3341, 3344, 3360, 3368   |
|                                |  |                                 |  | \thepage . . . . .             | 2920, 2936, 2938, 2944, 2945, 2982, 3006, 3103, 3140, 3145       |
|                                |  |                                 |  | \thispagestyle . . . . .       | 2330, 2337   |
|                                |  |                                 |  | \thmname . . . . .             | 3308, 3340   |
|                                |  |                                 |  | \thmnote . . . . .             | 3308, 3340   |
|                                |  |                                 |  | \thmnumber . . . . .           | 3308, 3340   |
|                                |  |                                 |  | \thr@@ . . . . .               | 327  |
|                                |  |                                 |  | \time . . . . .                | 2907, 2910, 2912   |
|                                |  |                                 |  | \title . . . . .               | 10, 2804   |
|                                |  |                                 |  | \titlenote . . . . .           | 14, 1574, 2805   |
|                                |  |                                 |  | \topsep . . . . .              | 1031, 1035, 3389   |
|                                |  |                                 |  | \translatedabstract . . . . .  | 443  |

|                                  |                                       |                                 |
|----------------------------------|---------------------------------------|---------------------------------|
| translatedabstract               | \upshape . . . . . 1044               | Y                               |
| (env.) . . . . . 21              | \url . 1772, 1774, 1920, 3461         | \year . . . . . 1614, 2918      |
| \translatedkeywords              | \UrlBreakPenalty . . . . . 2673, 2676 |                                 |
| . . . . . 21, 440                | \urlstyle . . . . . 595, 604, 607     | Z                               |
| \translatedsubtitle              | \usebox . . . . . 2873, 2903          | \z@ . . . . . 315, 319,         |
| . . . . . 21, 437                | \usepackage . . . . .                 | 455, 475, 507, 517,             |
| \translatedtitle . 21, 434       | . . . . . 9, 10, 11, 12, 13, 14       | 532, 545, 568, 581,             |
| \trivlist . . . . . 3390         |                                       | 759, 796, 913, 917,             |
| \tw@ . . . . . 325               | V                                     | 928, 1012, 1018,                |
| \two@digits . . . . . 2918, 2919 | \value . . . . . 1803                 | 1030, 2132, 2139,               |
| \twocolumn . 2347, 2349,         | \vbox . . . . . 572, 983,             | 2152, 2156, 2247,               |
| 2351, 2353, 2355, 2359           | 2263, 2445, 2454,                     | 2249, 2264, 2737,               |
|                                  | 2464, 2627, 2692, 2772                | 2784, 2792, 2932,               |
| U                                | \vskip 509, 544, 788, 796, 978        | 2933, 3038, 3043,               |
| \unskip . . . . . 520, 590,      | \vspace . . . . . 2274, 3498          | 3054, 3056, 3058,               |
| 786, 1546, 1552,                 | \vsplit . . . . . 2329                | 3084, 3086, 3096,               |
| 1559, 2476, 2479,                | \vtop . . . . . 2637                  | 3097, 3160, 3165,               |
| 2480, 2482, 2484,                |                                       | 3203, 3207, 3211,               |
| 2485, 2486, 2487,                | W                                     | 3219, 3224, 3231,               |
| 2501, 2570, 2746,                | \wd . . . . . 985, 2476               | 3290, 3322, 3491, 3494          |
| 2747, 2748, 2750,                | \write . . . . . 649                  | \z@skip 544, 978, 1035, 3230    |
| 2751, 2752, 2753,                |                                       | \zposy . . . . . 2270, 2271     |
| 2754, 2755, 2757,                | X                                     | \zrefused . . . . . 2268, 2269  |
| 2802, 2810, 2827, 2840           | \xdef . . . . . 336,                  | \zsaveposy . . . . . 1768, 2286 |
| \unvbox . 573, 790, 795,         | 338, 340, 342, 344, 346               |                                 |
| 2331, 2627, 2693, 2772           |                                       |                                 |