LaTeX Class for the *Association for Computing Machinery**

Boris Veytsman†

2024/12/28, v2.12

Abstract

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

Contents

1 Introduction **3**

2 User's guide **3**

2.1 Installation . . . 3
2.2 Invocation and options . . . 6
2.3 Top matter . . . 9
2.4 Top matter of ACM Engage materials . . . 18
2.5 ACM cover page . . . 19
2.6 Internationalization . . . 20
2.7 Algorithms . . . 21
2.8 Figures and tables . . . 21
2.9 Descriptions of images . . . 22
2.10 Theorems . . . 22
2.11 Online-only and offline-only material . . . 23
2.12 Note about anonymous mode . . . 23
2.13 Acknowledgments . . . 24
2.14 Bibliography . . . 24
2.14.1 Processing using BibTeX . . . 24
2.14.2 Processing using BibLaTeX . . . 28
2.15 Colors . . . 28
2.15.1 Manual bibliography . . . 29
2.16 Other notable packages and typographic remarks . . . 29
2.17 Counting words . . . 30
2.18 Disabled or forbidden commands . . . 30
2.19 Notes for wizards . . . 30
2.20 Currently supported publications . . . 31

*©2016–2024, Association for Computing Machinery

†borisv@lk.net, boris@varphi.com

2.21 Samples . . . 33
2.22 A note about sigchi-a format . . . 34
2.23 Experiments with tagging . . . 34

3 Implementation **35**
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 . . . 42
3.7 Internationalization . . . 44
3.8 Sectioning . . . 46
3.9 Hyperxmp and hyperref . . . 49
3.10 Other packages . . . 50
3.11 Paper size and paragraphing . . . 51
3.12 Fonts . . . 54
3.13 Image descriptions . . . 55
3.14 Floats . . . 56
3.15 Lists . . . 59
3.16 Top-matter data . . . 60
3.17 Concepts system . . . 78
3.18 Copyright system . . . 79
3.19 Maketitle hook . . . 84
3.20 ACM Engage top matter . . . 85
3.21 Typesetting top matter . . . 85
3.22 Headers and Footers . . . 101
3.23 Sectioning . . . 107
3.24 TOC lists . . . 110
3.25 Theorems . . . 111
3.26 Balancing columns . . . 114
3.27 Acknowledgments . . . 115
3.28 Conditional typesetting . . . 115
3.29 Additional bibliography commands . . . 115
3.30 Index . . . 116
3.31 End of Class . . . 116

1 Introduction

The Association for Computing Machinery[1] 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 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 LATEX package.

This package uses only free TEX packages and fonts included in TEXLive, MikTEX and other popular TEX distributions. It is intended to be published in these distributions itself, which minimizes users' efforts in the installation and support of this package.

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

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

2 User's guide

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

2.1 Installation

Most probably, you already have this package installed in your favorite 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.

[1] 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 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 LATEX can find them (see [1] or the documentation for your TEX system).
3. Update the database of file names. Again, see [1] or the documentation for your 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 TEX distributions (TEXLive, MacTEX, MikTEX) of 2015 and later, so you probably have them installed. Just in case here is the list of these packages:

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

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

2.2 Invocation and options

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

```
\documentclass[⟨options⟩]{acmart}
```

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

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

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

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

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

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

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

Sometimes conference proceedings are published as a special issue (or issues) of an ACM journal. In this case, you should use the journal format. The templates `sample-acmsmall-conf.tex` and `sample-acmtog-conf.tex` show how to enter conference information. Note that you need to comment out `\acmJournal{...}` line for such papers to get the conference information in the footers and headers.

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.

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, PACMCGIT, PACMHCI, PACMMOD, PACMNET, PACMPL, PACMSE, POMACS, TAAS, TACCESS, TACO, TALG, TALLIP (formerly TALIP), TCPS, TDS, TEAC, TECS, TELO, THRI, TIIS, TIOT, TISSEC, TIST, TKDD, TMIS, TOCE, TOCHI, TOCL, TOCS, TOCT, TODAES, TODS, TOIS, TOIT, TOMACS, TOMM (formerly TOMCCAP), TOMPECS, TOMS, TOPC, TOPLAS, 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, 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 `anonymous` is used for anonymous review processes and causes all author information to be obscured.

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 overriden 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. When there are many figures near the end of the document, the attempts to balance columns may lead to the loss of the figures. Set this option to `false` if you encounter problems. An alternative is the (experimental) option `pbalance`, which uses the new package `pbalance`. You may want to try `pbalance=true` to see if you get better results.

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.

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. Currenly 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

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. 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 \orcid \affiliation \email 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:

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

Do *not* use the LaTeX \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{\o}rv{\"a}ld Group}
  \city{Hekla}
  \country{Iceland}}
\affiliation{%
  \institution{Institute for Clarity in Documentation}
  \city{Dublin}
  \state{Ohio}}
```

Here Trovato and Tobin share their affiliation with the Institute for Clarity in Documentation, but only Ben Trovato is affiliated with The Thørväld Group.

`\position`
`\institution`
`\department`
`\city`
`\state`
`\country`

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, \state, 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.

Starting 2024, ACM no longer collects or print postal addresses of the authors. Thus the commands \streetaddress and \postcode, present in the previous versions of the class, now produce a warining.

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}
  \city{Sidney}
  \state{NSW}
  \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}}
```

\thanks Like amsart (and unlike standard 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 LaTeX typesets them itself using the information you give it. However, you can override its choice using the commmand \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 \subtitlenote \authornote While the command \thanks generates a note without a footnote mark, sometimes the authors might need notes more tightly connected to the title, subtitle or author. The commands \titlenote, \subtitlenote and \authornote that follow the corresponding commands (\title, \subtitle and \author) generate such notes. For example,

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

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

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

```
\author{A. U. Thor}
```

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

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

\acmVolume
\acmNumber
\acmArticle
\acmYear
\acmMonth

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

```
\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*. 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
```

\acmSubmissionID

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

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

\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

```
\acmBadge[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` `\keywords` The command `\keywords{`⟨*keyword, keyword,…*⟩`}` sets keywords for the article. They must be separated by commas, for example,

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

`CCSXML` (*env.*) `\ccsdesc` 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`.

Table 3: Parameters for the \setcopyright command

Parameter	Meaning
none	The copyright and permission information is not typeset. (This is the option for some ACM conferences.)
acmlicensed	The authors retain the copyright but license the publication rights to ACM.
rightsretained	The authors retain the copyright and publication rights to themselves or somebody else.
usgov	All the authors are employees of the US government.
usgovmixed	Some authors are employees of the US government.
cagov	All the authors are employees of the Canadian government.
cagovmixed	Some authors are employees of the Canadian government.
licensedusgovmixed	Some authors are employees of the US government, and the publication rights are licensed to ACM.
licensedcagov	All the authors are employees of the Canadian government, and the publication rights are licensed to ACM.
licensedcagovmixed	Some authors are employees of the Canadian government, and the publication rights are licensed to ACM.
othergov	Authors are employees of a government other than the US or Canada.
licensedothergov	Authors are employees of a government other than the US or Canada, and the publication rights are licensed to ACM.
iw3c2w3	Special statement for conferences organized by IW3C2.
iw3c2w3g	Special statement for conferences organized by IW3C2, when some authors are approved Google employees.
cc	Creative Commons license. If this key is set, *doclicense* images are used to typeset the license. See also \setcctype command.
acmcopyright	The authors transfer the copyright to the ACM. This choice is no longer available for the non-commissioned authors and will trigger a warning.

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 license the paper to the ACM, some or all authors might be employees of the US or Canadian governments, etc. Accordingly the command \setcopyright{...} is introduced. Its argument is the copyright status of the paper, for example, \setcopyright{acmcopyright}. The possible values for this command are listed in Table 3. This command must be placed in the preamble, before \begin{document}. Additional information about ACM copyright rules is discussed in Section **??**.

\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 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 permssion 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}
```

Table 4: Settings for the \settopmatter command

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

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

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

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

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

\maketitle The macro \maketitle must be the last command in the top-matter group. That is it must follow the commands defined in this section.

\shortauthors *After* the command \maketitle, the macro \shortauthors stores the names of the authors for the running head. You can redefine it if the list of author's name is too long, e.g.,

```
\maketitle
\renewcommand{\shortauthors}{Zhou et al.}
```

2.4 Top matter of ACM Engage materials

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

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

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

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

2.5 ACM cover page

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

There are several top matter commands specific for this format.

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

```
\acmArticleType{Review}
```

`\acmCodeLink` `\acmDataLink` The commands `\acmCodeDataLink{`⟨*link*⟩`}` and `\acmDataLink{`⟨*link*⟩`}` set the links 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.

`\acmContributions` The command `\acmContributions{`⟨*contributions*⟩`}` sets the contributions of the authors, for example,

```
\acmContributions{AW designed the study, CD performed it, all
authors contributed to the writing.}
```

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` `\translatedsubtitle` `\translatedkeywords`

The commands `\translatedtitle{`⟨*language*⟩`}`title, `\translatedsubtitle{`⟨*language*⟩`}`subtitle and `\translatedkeywords`language`keywords` are used to set title, subtitle and keywords 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{translatedastract}{english}
  This is the English version of the abstract
\end{translatedastract}
```

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 LaTeX 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 $0.5$~V with most
  measurements between $0.2$~V and $0.8$~V}
  \caption{Histogram of the measurements of voltage}
  \label{fig:voltage}
\end{figure}
```

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

2.10 Theorems

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

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

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

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

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

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

2.11 Online-only and offline-only material

`printonly` (*env.*)
`screenonly` (*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, TEX suppresses author information (including the number of authors) for an anonymous 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 or comments.

\grantsponsor \grantnum 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{my-grant-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 BibTEX or BibLATEX to process your references: they require slightly different setup of your LATEX file, as detailed in the following subsections.

2.14.1 Processing using BibTEX

This uses the `natbib` package for formatting references and the BibTEX style file `ACM-Reference-Format.bst` for BibTEX 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 BibTEX 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 BIBTEX entry types and fields in the ACM style file ACM-Reference-Format.bst that you may want to be aware of.

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

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

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

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

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

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

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

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

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

```
@ArtifactSoftware{R,
   title = {R: A Language and Environment for Statistical Computing},
   author = {{R Core Team}},
   organization = {R Foundation for Statistical Computing},
   address = {Vienna, Austria},
   year = {2019},
   url = {https://www.R-project.org/},
}
@ArtifactDataset{UMassCitations,
 author    =  {Sam Anzaroot and Andrew McCallum},
 title     =  {{UMass} Citation Field Extraction Dataset},
 year      = 2013,
 url       =
    {http://www.iesl.cs.umass.edu/data/data-umasscitationfield},
 lastaccessed = {May 27, 2019}
}
```

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

There are two ways to enter video or audio sources in the bibliograpy corresponding to two different possibilies. 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 includes, so you can use strings like `journal = taccess` for *ACM Transactions on Accessible Computing*.

2.14.2 Processing using BibLaTeX

You will find in this package two sets of style files for BibLaTeX, `acmnumeric` and `acmauthoryear`, that mimic the behavior of the ACM-Reference-Format.bst BibTeX style. They provide you access to all the power of BibLaTeX and already include support for advanced citation of software artifacts 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 BibLaTeX instead of BibTeX, that we summarize briefly here (please refer to the official BibLaTeX documentation for more details).

First of all, you need to pass the `natbib=false` option to the document class, and remove the `\citestyle{acmauthoryear}` command from the sources (if present).

Then, in the preamble of your document you need to load the BibLaTeX package and select the approriate 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` command (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 BibLaTeX 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 faciliate 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 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.

2.19 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.

2.20 Currently supported publications

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

Abbreviation	Publication
ACMJCSS	ACM Journal on Computing and Sustainable Societies
CIE	ACM Computers in Entertainment
CSUR	ACM Computing Surveys
DLT	Distributed Ledger Technologies: Research and Practice
DGOV	Digital Government: Research and Practice
DTRAP	Digital Threats: Research and Practice
FAC	Formal Aspects of Computing
GAMES	ACM Games: Research and Practice
HEALTH	ACM Transactions on Computing for Healthcare
IMWUT	PACM on Interactive, Mobile, Wearable and Ubiquitous Technologies
JACM	Journal of the ACM
JATS	ACM Journal on Autonomous Transportation Systems
JDIQ	ACM Journal of Data and Information Quality
JDS	ACM/IMS Journal of Data Science
JEA	ACM Journal of Experimental 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

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

Abbreviation	Publication
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
PACMSE	PACM on Software Engineering
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 and Optimization
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
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

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

Abbreviation	Publication
TOPML	ransactions 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.

2.21 Samples

There are several samples of acmart documents, that can serve as templates for the authors. Among them `sample-sig...` are templates for conference papers, while `sample-acm...` are templates for journal articles and special materials.

Here is the list of the samples:

sample-manuscript: A proceedings paper in the manuscript format.

sample-acmsmall: A journal paper in the `acmsmall` format.

sample-acmsmall-biblatex: A journal paper using experimental *biblatex* bibliography processing.

sample-acmlarge: A journal paper in the `acmlarge` format.

sample-acmtog: A journal paper in the `acmtog` format.

sample-sigconf: A proceedings paper in the standard `sigconf` format.

sample-sigconf-biblatex: A proceedings paper in the `sigconf` format using experimental *biblatex* bibliography processing.

sample-sigconf-authordraft: A proceedings paper in the `sigconf` format with the `authordraft` option selected.

sample-sigconf-i13n: A proceedings paper in the `sigconf` format with multilanguage titles and abstract.

sample-sigconf-xelatex: A proceedings paper in the `sigconf` format, XeLaTeX version.

sample-sigconf-lualatex: A proceedings paper in the `sigconf` format, LuaLaTeX version.

sample-sigplan: A proceedings paper in the `sigplan` format.

sample-acmsmall-conf: A proceedings paper in the `acmsmall` format for the publication in a journal using this option.

sample-acmtog-conf: A proceedings paper in the `acmtog` format for the publication in a journal using this option.

sample-acmcp: A sample of ACM Cover Page used by JDS.

sample-acmengage: A sample of ACM Engage publication.

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.*)
`marginfigure` (*env.*)
`margintable` (*env.*)

This format has large margin uses for special figures and tables. This package provides three environments for this with optional captions:

sidebar: textual information in the margin,

marginfigure: a figure in the margin,

margintable: a table in the margin.

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

The horizontal sizes of figures are:

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

2.23 Experiments with tagging

ACM is firmly committed to produce fully tagged PDFs compliant with the accessibility standards. We use the developmental version of tagging code by LaTeX3 team, see the details at https://www.latex-project.org/publications/indexbytopic/pdf/ and https://tug.org/twg/accessibility/overview.html.

At present this work is highly experimental. You may try the experiments by (1) using the class `acmart-tagged` in the document class line, and (2) adding the command `\DocumentMetadata[`⟨*options*⟩`]` in the preamble, see the file `sample-acmsmall-tagged.tex`. If you do this, please *do not ask ACM for support.* On the other hand, bug reports at https://github.com/borisveytsman/acmart/issues will be appreciated.

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.

```
⟨class⟩\NeedsTeXFormat{LaTeX2e}
⟨*gobble⟩
\ProvidesFile{acmart.dtx}
⟨/gobble⟩
⟨class&!tagged⟩\ProvidesClass{acmart}
⟨tagged⟩\ProvidesClass{acmart-tagged}
[2024/12/28 v2.12 Typesetting articles for the Association for Computing Machinery]
```

And the driver code:

```
⟨*gobble⟩
\documentclass{ltxdoc}
\usepackage{array,booktabs,amsmath,graphicx,fancyvrb,tabularx, longtable}
\usepackage[tt=false, type1=true]{libertine}
\usepackage[varqu]{zi4}
\usepackage[libertine]{newtxmath}
\usepackage[tableposition=top]{caption}
\usepackage{hypdoc}
\PageIndex
\CodelineIndex
\RecordChanges
\EnableCrossrefs
\begin{document}
  \DocInput{acmart.dtx}
\end{document}
⟨/gobble⟩
⟨*class⟩
⟨!tagged⟩\def\@classname{acmart}
⟨tagged⟩\def\@classname{acmart-tagged}
```

3.2 Preload hook

We preload `acmart-preload-hook`:

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

3.3 Options

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

```
\RequirePackage{xkeyval}
```

We use `xstring` to check whether user input is valid

```
\RequirePackage{xstring}
```

We need `iftex` to check the engine

```
\RequirePackage{iftex}
```

`format` The possible formats

```
\define@choicekey*+{\@classname.cls}{format}[\ACM@format\ACM@format@nr]{%
  manuscript, acmsmall, acmlarge, acmtog, sigconf, siggraph,
  sigplan, sigchi, sigchi-a, acmengage, acmcp}[manuscript]{}{%
  \ClassError{\@classname}{The option format must be manuscript,
    acmsmall, acmlarge, acmtog, sigconf, siggraph,
    sigplan, sigchi or sigchi-a}}
\def\@DeclareACMFormat#1{\DeclareOptionX{#1}{\setkeys{\@classname.cls}{format=#1}}}
\@DeclareACMFormat{manuscript}
\@DeclareACMFormat{acmsmall}
\@DeclareACMFormat{acmlarge}
\@DeclareACMFormat{acmtog}
\@DeclareACMFormat{sigconf}
\@DeclareACMFormat{siggraph}
\@DeclareACMFormat{sigplan}
\@DeclareACMFormat{sigchi}
\@DeclareACMFormat{sigchi-a}
\@DeclareACMFormat{acmengage}
\@DeclareACMFormat{acmcp}
\ExecuteOptionsX{format}
```

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

```
\define@boolkey+{\@classname.cls}[@ACM@]{screen}[true]{%
  \if@ACM@screen
    \PackageInfo{\@classname}{Using screen mode}%
  \else
    \PackageInfo{\@classname}{Not using screen mode}%
  \fi}{\PackageError{\@classname}{The option screen can be either true or
    false}}
\ExecuteOptionsX{screen=false}
```

`\if@ACM@urlbreakonhyphens`

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

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

```
\define@boolkey+{\@classname.cls}[@ACM@]{acmthm}[true]{%
  \if@ACM@acmthm
    \PackageInfo{\@classname}{Requiring acmthm}%
  \else
    \PackageInfo{\@classname}{Suppressing acmthm}%
  \fi}{\PackageError{\@classname}{The option acmthm can be either true or
    false}}
\ExecuteOptionsX{acmthm=true}
```

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

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

```
  \if@ACM@review
    \PackageInfo{\@classname}{Using review mode}%
    \AtBeginDocument{\@ACM@printfoliostrue}%
  \else
    \PackageInfo{\@classname}{Not using review mode}%
  \fi}{\PackageError{\@classname}{The option review can be either true or
    false}}
\ExecuteOptionsX{review=false}
```

`\if@ACM@authorversion` Whether we use author's-version mode

```
\define@boolkey+{\@classname.cls}[@ACM@]{authorversion}[true]{%
  \if@ACM@authorversion
    \PackageInfo{\@classname}{Using authorversion mode}%
  \else
    \PackageInfo{\@classname}{Not using authorversion mode}%
 \fi}{\PackageError{\@classname}{The option authorversion can be either true or
    false}}
\ExecuteOptionsX{authorversion=false}
```

`\if@ACM@nonacm` Special option for non-ACM publications using the ACM typesetting options.

```
\define@boolkey+{\@classname.cls}[@ACM@]{nonacm}[true]{%
  \if@ACM@nonacm
    \PackageInfo{\@classname}{Using nonacm mode}%
    \AtBeginDocument{\@ACM@printacmreffalse}%
    % in 'nonacm' mode we disable the "ACM Reference Format"
    % printing by default, but this can be re-enabled by the
    % user using \settopmatter{printacmref=true}
  \else
    \PackageInfo{\@classname}{Not using nonacm mode}%
  \fi}{\PackageError{\@classname}{The option nonacm can be either true or
    false}}
\ExecuteOptionsX{nonacm=false}
```

`\if@ACM@balance` Whether to balance the last page

```
\define@boolkey+{\@classname.cls}[@ACM@]{balance}[true]{}{%
  \PackageError{\@classname}{The option balance can be either true or
    false}}
\ExecuteOptionsX{balance}
```

`\if@ACM@pbalance` Whether to balance the last page

```
\define@boolkey+{\@classname.cls}[@ACM@]{pbalance}[true]{}{%
  \PackageError{\@classname}{The option pbalance can be either true or
    false}}
\ExecuteOptionsX{pbalance=false}
```

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

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

```
\define@boolkey+{\@classname.cls}[@ACM@]{natbib}[true]{%
  \if@ACM@natbib
    \PackageInfo{\@classname}{Explicitly selecting natbib mode}%
  \else
    \PackageInfo{\@classname}{Explicitly deselecting natbib mode}%
  \fi}{\PackageError{\@classname}{The option natbib can be either true or
```

```
    false}}
\ExecuteOptionsX{natbib=true}
```

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

```
\define@boolkey+{\@classname.cls}[@ACM@]{anonymous}[true]{%
  \if@ACM@anonymous
    \PackageInfo{\@classname}{Using anonymous mode}%
  \else
    \PackageInfo{\@classname}{Not using anonymous mode}%
  \fi}{\PackageError{\@classname}{The option anonymous can be either true or
    false}}
\ExecuteOptionsX{anonymous=false}
```

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

```
\define@boolkey+{\@classname.cls}[@ACM@]{timestamp}[true]{%
  \if@ACM@timestamp
    \PackageInfo{\@classname}{Using timestamp mode}%
  \else
    \PackageInfo{\@classname}{Not using timestamp mode}%
  \fi}{\PackageError{\@classname}{The option timestamp can be either true or
    false}}
\ExecuteOptionsX{timestamp=false}
```

`\if@ACM@authordraft` Whether we use author-draft mode

```
\define@boolkey+{\@classname.cls}[@ACM@]{authordraft}[true]{%
  \if@ACM@authordraft
    \PackageInfo{\@classname}{Using authordraft mode}%
    \@ACM@timestamptrue
    \@ACM@reviewtrue
  \else
    \PackageInfo{\@classname}{Not using authordraft mode}%
 \fi}{\PackageError{\@classname}{The option authordraft can be either true or
    false}}
\ExecuteOptionsX{authordraft=false}
```

`\ACM@fontsize` The font size to pass to the base class

```
% \changes{v1.87}{2022/08/27}{Added fontsize 8pt}
\def\ACM@fontsize{}
\DeclareOptionX{8pt}{\edef\ACM@fontsize{\CurrentOption}}
\DeclareOptionX{9pt}{\edef\ACM@fontsize{\CurrentOption}}
\DeclareOptionX{10pt}{\edef\ACM@fontsize{\CurrentOption}}
\DeclareOptionX{11pt}{\edef\ACM@fontsize{\CurrentOption}}
\DeclareOptionX{12pt}{\edef\ACM@fontsize{\CurrentOption}}
```

`\ACM@languages` The languages of the document

```
\def\ACM@languages{}
\DeclareOptionX{language}{%
  \ifx\ACM@languages\@empty
  \gdef\ACM@languages{english}\fi
  \g@addto@macro\ACM@languages{, #1}}

\DeclareOptionX{draft}{\PassOptionsToClass{\CurrentOption}{amsart}}
\DeclareOptionX{*}{\PassOptionsToClass{\CurrentOption}{amsart}}
\ProcessOptionsX
\ClassInfo{\@classname}{Using format \ACM@format, number \ACM@format@nr}
```

3.4 Setting switches

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

```
\newif\if@ACM@manuscript
```

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

```
\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.

```
\newif\if@ACM@journal@bibstrip
```

`\if@ACM@journal@bibstrip@or@tog` ACM TOG sometimes uses journal-like bibstrip even for conference proceedings, so we need to set it separately

```
\newif\if@ACM@journal@bibstrip@or@tog
```

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

```
\newif\if@ACM@sigchiamode
```

`\if@ACM@engage` ACM Engage course materials have special formatting

```
\newif\if@ACM@engage
\@ACM@engagefalse
```

`\if@ACM@acmcp` ACM cover page formatting

```
\newif\if@ACM@acmcp
\@ACM@acmcpfalse
```

Setting up switches

```
\ifnum\ACM@format@nr=5\relax % siggraph
\ClassWarning{\@classname}{%
  The format siggraph is now obsolete.\MessageBreak
  I am switching to sigconf.}
  \setkeys{\@classname.cls}{format=sigconf}
\fi
\ifnum\ACM@format@nr=7\relax % sigchi
\ClassWarning{\@classname}{%
  The format sigchi is now obsolete.\MessageBreak
  I am switching to sigconf.}
  \setkeys{\@classname.cls}{format=sigconf}
\fi
\ifnum\ACM@format@nr=8\relax % sigchi
\ClassWarning{\@classname}{%
  ACM SIGCHI has retired the SIGCHI-A template\MessageBreak
  effective immediately. ACM is keeping this template\MessageBreak
  option available to authors who are working on legacy\MessageBreak
  documents only. ACM will not, under any circumstances,\MessageBreak
  accept documents in this format for publication and\MessageBreak
  will not offer technical support to the authors who use\MessageBreak
  this template.\MessageBreak
  ACM SIGCHI is directing Conference leaders and\MessageBreak
  authors to publish their articles using the SIGCONF\MessageBreak
  template call.}
```

```
\fi
\ifnum\ACM@format@nr=0\relax
  \@ACM@manuscripttrue
\else
  \@ACM@manuscriptfalse
\fi
\@ACM@sigchiamodefalse
\ifcase\ACM@format@nr
\relax % manuscript
  \@ACM@journaltrue
\or % acmsmall
  \@ACM@journaltrue
\or % acmlarge
  \@ACM@journaltrue
\or % acmtog
  \@ACM@journaltrue
  \@ACM@journal@bibstrip@or@togtrue
\or % sigconf
  \@ACM@journalfalse
\or % siggraph
  \@ACM@journalfalse
 \or % sigplan
  \@ACM@journalfalse
 \or % sigchi
  \@ACM@journalfalse
\or % sigchi-a
  \@ACM@journalfalse
  \@ACM@sigchiamodetrue
\or % acmengage
  \@ACM@journalfalse
  \@ACM@engagetrue
\or % acmcp
  \@ACM@journaltrue
  \@ACM@acmcptrue
  \AtBeginDocument{\@ACM@printacmreffalse}%
\fi
\if@ACM@journal
  \@ACM@journal@bibstriptrue
  \@ACM@journal@bibstrip@or@togtrue
\else
 \@ACM@journal@bibstripfalse
\fi
```

3.5 Loading the base class and package

¡*tagged¿ Before we load the base class we want to save the original definitions of sectioning commands since acmart redefines them, and we need the vanilla versions.

`\@startsection@kernel`

```
\let\@startsection@kernel\@startsection
```

`\@xsect@kernel`

```
\let\@xsect@kernel\@xsect
```

\@sect@kernel

```
\let\@sect@kernel\@sect
```

\@ssect@kernel

```
\let\@ssect@kernel\@ssect
```

¡/tagged¿

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

```
\ifx\ACM@fontsize\@empty
  \ifcase\ACM@format@nr
  \relax % manuscript
    \def\ACM@fontsize{9pt}%
  \or % acmsmall
    \def\ACM@fontsize{10pt}%
  \or % acmlarge
    \def\ACM@fontsize{10pt}%
  \or % acmtog
    \def\ACM@fontsize{9pt}%
  \or % sigconf
    \def\ACM@fontsize{9pt}%
  \or % siggraph
    \def\ACM@fontsize{9pt}%
   \or % sigplan
    \def\ACM@fontsize{10pt}%
   \or % sigchi
    \def\ACM@fontsize{9pt}%
  \or % sigchi-a
    \def\ACM@fontsize{10pt}%
  \or % acmengage
    \def\ACM@fontsize{10pt}%
  \or % acmcp
    \def\ACM@fontsize{9pt}%
  \fi
\fi
\ClassInfo{\@classname}{Using fontsize \ACM@fontsize}
\LoadClass[\ACM@fontsize, reqno]{amsart}
\RequirePackage{microtype}
```

We need etoolbox for delayed code

```
\RequirePackage{etoolbox}
```

Booktabs is now the default

```
\RequirePackage{booktabs}
```

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

```
\RequirePackage{refcount}
\RequirePackage{totpages}
```

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

```
\RequirePackage{environ}
```

We use setspace for double spacing

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

```
\RequirePackage{setspace}
\onehalfspacing
\fi
```

We no longer need `textcase` for better upcasing.

```
% \RequirePackage{textcase}

\if@ACM@acmcp
\RequirePackage{framed}
\RequirePackage{zref-savepos, zref-user}
\fi
```

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

```
\newdimen\@ACM@acmcp@delta
\@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.

```
\if@ACM@natbib
  \RequirePackage{natbib}
  \renewcommand{\bibsection}{%
     \section*{\refname}%
     \phantomsection\addcontentsline{toc}{section}{\refname}%
  }
  \renewcommand{\bibfont}{\bibliofont}
  \renewcommand\setcitestyle[1]{
  \@for\@tempa:=#1\do
  {\def\@tempb{round}\ifx\@tempa\@tempb
     \renewcommand\NAT@open{(}\renewcommand\NAT@close{)}\fi
   \def\@tempb{square}\ifx\@tempa\@tempb
     \renewcommand\NAT@open{[}\renewcommand\NAT@close{]}\fi
   \def\@tempb{angle}\ifx\@tempa\@tempb
     \renewcommand\NAT@open{$<$}\renewcommand\NAT@close{$>$}\fi
   \def\@tempb{curly}\ifx\@tempa\@tempb
     \renewcommand\NAT@open{\{}\renewcommand\NAT@close{\}}\fi
   \def\@tempb{semicolon}\ifx\@tempa\@tempb
     \renewcommand\NAT@sep{;}\fi
   \def\@tempb{colon}\ifx\@tempa\@tempb
     \renewcommand\NAT@sep{;}\fi
   \def\@tempb{comma}\ifx\@tempa\@tempb
     \renewcommand\NAT@sep{,}\fi
   \def\@tempb{authoryear}\ifx\@tempa\@tempb
     \NAT@numbersfalse\fi
   \def\@tempb{numbers}\ifx\@tempa\@tempb
     \NAT@numberstrue\NAT@superfalse\fi
   \def\@tempb{super}\ifx\@tempa\@tempb
     \NAT@numberstrue\NAT@supertrue\fi
   \def\@tempb{nobibstyle}\ifx\@tempa\@tempb
     \let\bibstyle=\@gobble\fi
   \def\@tempb{bibstyle}\ifx\@tempa\@tempb
     \let\bibstyle=\@citestyle\fi
   \def\@tempb{sort}\ifx\@tempa\@tempb
```

```
    \def\NAT@sort{\@ne}\fi
  \def\@tempb{nosort}\ifx\@tempa\@tempb
    \def\NAT@sort{\z@}\fi
  \def\@tempb{compress}\ifx\@tempa\@tempb
    \def\NAT@cmprs{\@ne}\fi
  \def\@tempb{nocompress}\ifx\@tempa\@tempb
    \def\NAT@cmprs{\z@}\fi
  \def\@tempb{sort&compress}\ifx\@tempa\@tempb
    \def\NAT@sort{\@ne}\def\NAT@cmprs{\@ne}\fi
  \def\@tempb{mcite}\ifx\@tempa\@tempb
    \let\NAT@merge\@ne\fi
  \def\@tempb{merge}\ifx\@tempa\@tempb
    \@ifnum{\NAT@merge<\tw@}{\let\NAT@merge\tw@}{}\fi
  \def\@tempb{elide}\ifx\@tempa\@tempb
    \@ifnum{\NAT@merge<\thr@@}{\let\NAT@merge\thr@@}{}\fi
  \def\@tempb{longnamesfirst}\ifx\@tempa\@tempb
    \NAT@longnamestrue\fi
  \def\@tempb{nonamebreak}\ifx\@tempa\@tempb
    \def\NAT@nmfmt#1{\mbox{\NAT@up#1}}\fi
  \expandafter\NAT@find@eq\@tempa=\relax\@nil
  \if\@tempc\relax\else
    \expandafter\NAT@rem@eq\@tempc
    \def\@tempb{open}\ifx\@tempa\@tempb
     \xdef\NAT@open{\@tempc}\fi
    \def\@tempb{close}\ifx\@tempa\@tempb
     \xdef\NAT@close{\@tempc}\fi
    \def\@tempb{aysep}\ifx\@tempa\@tempb
     \xdef\NAT@aysep{\@tempc}\fi
    \def\@tempb{yysep}\ifx\@tempa\@tempb
     \xdef\NAT@yrsep{\@tempc}\fi
    \def\@tempb{notesep}\ifx\@tempa\@tempb
     \xdef\NAT@cmt{\@tempc}\fi
    \def\@tempb{citesep}\ifx\@tempa\@tempb
     \xdef\NAT@sep{\@tempc}\fi
  \fi
 }%
 \NAT@@setcites
 }
 \renewcommand\citestyle[1]{%
   \ifcsname bibstyle@#1\endcsname%
   \csname bibstyle@#1\endcsname\let\bibstyle\@gobble%
   \else%
   \@latex@error{Undefined `#1' citestyle}%
   \fi
 }%
\fi
```

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

```
\newcommand{\bibstyle@acmauthoryear}{%
 \setcitestyle{%
   authoryear,%
   open={[},close={]},citesep={;},%
   aysep={},yysep={,},%
   notesep={, }}}
```

\bibstyle@acmnumeric The default numeric format:

```
\newcommand{\bibstyle@acmnumeric}{%
  \setcitestyle{%
    numbers,sort&compress,%
    open={[},close={]},citesep={,},%
    notesep={, }}}
```

The default is numeric:

```
\if@ACM@natbib
\citestyle{acmnumeric}
\fi
```

3.7 Internationalization

```
\if@ACM@journal
  \renewcommand\keywordsname{Additional Key Words and Phrases}%
\else
  \renewcommand\keywordsname{Keywords}%
\fi
\if@ACM@engage
   \renewcommand\abstractname{Synopsis}%
\fi
\ifx\ACM@languages\@empty
\else
  \RequirePackage[\ACM@languages]{babel}%
  \addto\captionsenglish{%
      \if@ACM@journal
        \renewcommand\keywordsname{Additional Key Words and Phrases}%
      \else
        \renewcommand\keywordsname{Keywords}%
      \fi
      \renewcommand\acksname{Acknowledgements}%
      \if@ACM@engage
         \renewcommand\abstractname{Synopsis}%
      \fi
  }%
  \addto\captionsfrench{%
      \if@ACM@journal
        \renewcommand\keywordsname{Mots Clés et Phrases Supplémentaires}%
      \else
        \renewcommand\keywordsname{Mots clés}%
      \fi
      \renewcommand\acksname{Remerciements}%
  }%
  \addto\captionsgerman{%
      \if@ACM@journal
        \renewcommand\keywordsname{Zusätzliche Schlagwörter und Phrasen}%
      \else
        \renewcommand\keywordsname{Schlagwörter}%
      \fi
      \renewcommand\acksname{Danksagungen}%
  }%
  \addto\captionsspanish{%
      \if@ACM@journal
```

```
        \renewcommand\keywordsname{Palabras y Frases Claves Adicionales}%
      \else
        \renewcommand\keywordsname{Palabras claves}%
      \fi
      \renewcommand\acksname{Expresiones de gratitud}%
  }%
\fi
```

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

```
\newcommand\ACM@lang@check[1]{%
  \ifx\ACM@languages\@empty\relax
  \ClassError{\@classname}{%
    Command \string#1 \MessageBreak is used in monlingual document}{%
    You used a command (\string#1) \MessageBreak
    that does not have a meaning \MessageBreak
    unless are languages are defined. \MessageBreak
    Please choose the languages in \string\documentclass
    \MessageBreak
    (e.g. \string\documentclass[languages={french, english}]{acmart}),
    \MessageBreak
    or delete the command.}%
  \fi}
```

`\@translatedtitle`

```
\def\@translatedtitle{}
```

`\translatedtitle` The title of the paper in a different language

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

`\@translatedsubtitle`

```
\def\@translatedsubtitle{}
```

`\translatedsubtitle` The subtitle of the paper in a different language

```
\newcommand\translatedsubtitle[2]{\ACM@lang@check{\translatedsubtitle}%
\g@addto@macro\@translatedsubtitle{\par\foreignlanguage{#1}{#2}}}
```

`\@translatedkeywords`

```
\def\@translatedkeywords{}
```

`\translatedkeywords` Add keywords to the paper in the language specified

```
\newcommand\translatedkeywords[2]{\ACM@lang@check{\translatedkeywords}%
\g@addto@macro\@translatedkeywords{\@mktranslatedkeywords{#1}{#2}}}
```

`\@translatedabstracts` The container for translated abstracts.

```
\def\@translatedabstracts{}
```

`translatedabstract` We save translated abstracts into `\@translatedabstracts`

```
\newenvironment{translatedabstract}[1]{\Collect@Body
  \@savetranslatedabstract\@mktranslatedabstract{#1}}{}
```

\@savetranslatedabstract And saving the abstract

```
\long\def\@savetranslatedabstract#1{\if@ACM@maketitle@typeset
  \ClassError{\@classname}{Abstract must be defined before maketitle
    command. Please move it!}\fi
  \ACM@lang@check{translatedabstract}%
  \g@addto@macro\@translatedabstracts{\bgroup#1\egroup}}
```

3.8 Sectioning

\@startsection Before we call hyperref, we redefine \startsection commands to their LaTeX 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:

```
⟨/class⟩
⟨*tagged⟩
\let\@startsection\@startsection@kernel
\let\@sect\@sect@kernel
\let\@ssect\@ssect@kernel
\let\@xsect\@xsect@kernel
⟨/tagged⟩
⟨*class&!tagged⟩
\def\@startsection#1#2#3#4#5#6{%
  \if@noskipsec \leavevmode \fi
  \par
  \@tempskipa #4\relax
  \@afterindenttrue
  \ifdim \@tempskipa <\z@
    \@tempskipa -\@tempskipa \@afterindentfalse
  \fi
  \if@nobreak
    \everypar{}%
  \else
    \addpenalty\@secpenalty\addvspace\@tempskipa
  \fi
  \@ifstar
    {\@ssect{#3}{#4}{#5}{#6}}%
    {\@dblarg{\@sect{#1}{#2}{#3}{#4}{#5}{#6}}}}
\def\@sect#1#2#3#4#5#6[#7]#8{%
  \edef\@toclevel{\ifnum#2=\@m 0\else\number#2\fi}%
  \ifnum #2>\c@secnumdepth
    \let\@svsec\@empty
  \else
    \refstepcounter{#1}%
    \protected@edef\@svsec{\@seccntformat{#1}\relax}%
  \fi
  \@tempskipa #5\relax
  \ifdim \@tempskipa>\z@
    \begingroup
      #6{%
        \@hangfrom{\hskip #3\relax\@svsec}%
          \interlinepenalty \@M #8\@@par}%
    \endgroup
    \csname #1mark\endcsname{#7}%
    \ifnum #2>\c@secnumdepth \else
```

```
        \@tochangmeasure{\csname the#1\endcsname}%
    \fi
    \addcontentsline{toc}{#1}{%
      \ifnum #2>\c@secnumdepth \else
        \protect\numberline{\csname the#1\endcsname}%
      \fi
      #7}%
  \else
    \def\@svsechd{%
      #6{\hskip #3\relax
      \@svsec #8}%
      \csname #1mark\endcsname{#7}%
      \ifnum #2>\c@secnumdepth \else
        \@tochangmeasure{\csname the#1\endcsname\space}%
      \fi
      \addcontentsline{toc}{#1}{%
        \ifnum #2>\c@secnumdepth \else
          \protect\numberline{\csname the#1\endcsname}%
        \fi
        #7}}%
  \fi
  \@xsect{#5}}
\def\@xsect#1{%
  \@tempskipa #1\relax
  \ifdim \@tempskipa>\z@
    \par \nobreak
    \vskip \@tempskipa
    \@afterheading
  \else
    \@nobreakfalse
    \global\@noskipsectrue
    \everypar{%
      \if@noskipsec
        \global\@noskipsecfalse
       {\setbox\z@\lastbox}%
        \clubpenalty\@M
        \begingroup \@svsechd \endgroup
        \unskip
        \@tempskipa #1\relax
        \hskip -\@tempskipa
      \else
        \clubpenalty \@clubpenalty
        \everypar{}%
      \fi}%
  \fi
  \ignorespaces}
\def\@ssect#1#2#3#4#5{%
  \@tempskipa #3\relax
  \ifdim \@tempskipa>\z@
    \begingroup
      #4{%
        \@hangfrom{\hskip #1}%
          \interlinepenalty \@M #5\@@par}%
    \endgroup
```

```
  \else
    \def\@svsechd{#4{\hskip #1\relax #5}}%
  \fi
  \@xsect{#3}}
⟨/class&!tagged⟩
⟨*class⟩
\def\@seccntformat#1{\csname the#1\endcsname\quad}
```

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

```
\def\@starttoc#1#2{\begingroup\makeatletter
  \setTrue{#1}%
  \par\removelastskip\vskip\z@skip
  \@startsection{section}\@M\z@{\linespacing\@plus\linespacing}%
    {.5\linespacing}{\centering\contentsnamefont}{#2}%
⟨tagged⟩\@starttoc@cfgpoint@before{#1}%NEW<<<<<<<<<< (name will change)
  \@input{\jobname.#1}%
⟨tagged⟩\@starttoc@cfgpoint@after{#1}%NEW<<<<<<<<<<<  (name will change)
  \if@filesw
    \@xp\newwrite\csname tf@#1\endcsname
    \immediate\@xp\openout\csname tf@#1\endcsname \jobname.#1\relax
  \fi
  \global\@nobreakfalse \endgroup
  \addvspace{32\p@\@plus14\p@}%
}
```

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

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

\l@subsection The spacing in amsart is too large

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

\l@subsubsection The spacing in amsart is too large

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

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

\@makefntext We do not use indentation for footnotes

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

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

```
\if@ACM@sigchiamode
\long\def\@footnotetext#1{\marginpar{%
    \reset@font\small
    \interlinepenalty\interfootnotelinepenalty
    \protected@edef\@currentlabel{%
       \csname p@footnote\endcsname\@thefnmark
    }%
    \color@begingroup
      \@makefntext{%
        \rule\z@\footnotesep\ignorespaces#1\@finalstrut\strutbox}%
    \color@endgroup}}%
\fi
```

\@mpfootnotetext We want the footnotes in minipages centered:

```
\long\def\@mpfootnotetext#1{%
  \global\setbox\@mpfootins\vbox{%
    \unvbox\@mpfootins
    \reset@font\footnotesize
    \hsize\columnwidth
    \@parboxrestore
    \protected@edef\@currentlabel
         {\csname p@mpfootnote\endcsname\@thefnmark}%
    \color@begingroup\centering
      \@makefntext{%
        \rule\z@\footnotesep\ignorespaces#1\@finalstrut\strutbox}%
    \color@endgroup}}
```

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

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

3.9 Hyperxmp and hyperref

Adding hyperref

```
\let\@footnotemark@nolink\@footnotemark
\let\@footnotetext@nolink\@footnotetext
\RequirePackage[bookmarksnumbered,unicode]{hyperref}
\RequirePackage{hyperxmp}
\pdfstringdefDisableCommands{%
  \def\addtocounter#1#2{}%
  \def\unskip{}%
  \def\textbullet{- }%
  \def\textrightarrow{ -> }%
  \def\footnotemark{}%
}
\urlstyle{rm}
\ifcase\ACM@format@nr
\relax % manuscript
\or % acmsmall
\or % acmlarge
\or % acmtog
\or % sigconf
\or % siggraph
\or % sigplan
  \urlstyle{sf}
\or % sigchi
\or % sigchi-a
  \urlstyle{sf}
\or % acmengage
\or % acmcp
\fi
\AtEndPreamble{%
  \if@ACM@urlbreakonhyphens
    \def\do@url@hyp{\do\-}%
  \fi
  \if@ACM@screen
    \hypersetup{colorlinks,
```

```
      linkcolor=ACMPurple,
      citecolor=ACMPurple,
      urlcolor=ACMDarkBlue,
      filecolor=ACMDarkBlue}
    \else
    \hypersetup{hidelinks}
  \fi
  \hypersetup{pdflang={en},
    pdfdisplaydoctitle}}
```

Bibliography mangling.

```
\if@ACM@natbib
  \let\citeN\cite
  \let\cite\citep
  \let\citeANP\citeauthor
  \let\citeNN\citeyearpar
  \let\citeyearNP\citeyear
  \let\citeNP\citealt
  \DeclareRobustCommand\citeA
     {\begingroup\NAT@swafalse
       \let\NAT@ctype\@ne\NAT@partrue\NAT@fullfalse\NAT@open\NAT@citetp}%
  \providecommand\newblock{}%
\else
  \AtBeginDocument{%
    \let\shortcite\cite%
    \providecommand\citename[1]{#1}}
\fi
\newcommand\shortcite[2][]{%
  \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 LaTeX definition:

```
\def\bibliographystyle#1{%
  \ifx\@begindocumenthook\@undefined\else
    \expandafter\AtBeginDocument
  \fi
    {\if@filesw
       \immediate\write\@auxout{\string\bibstyle{#1}}%
     \fi}}
```

3.10 Other packages

Graphics and color.

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

We define ACM colors according to [8]:

```
\definecolor[named]{ACMBlue}{cmyk}{1,0.1,0,0.1}
\definecolor[named]{ACMYellow}{cmyk}{0,0.16,1,0}
\definecolor[named]{ACMOrange}{cmyk}{0,0.42,1,0.01}
\definecolor[named]{ACMRed}{cmyk}{0,0.90,0.86,0}
\definecolor[named]{ACMLightBlue}{cmyk}{0.49,0.01,0,0}
\definecolor[named]{ACMGreen}{cmyk}{0.20,0,1,0.19}
\definecolor[named]{ACMPurple}{cmyk}{0.55,1,0,0.15}
\definecolor[named]{ACMDarkBlue}{cmyk}{1,0.58,0,0.21}
```

Author-draft mode or sigchi-a mode

```
\if@ACM@authordraft
  \RequirePackage{draftwatermark}
  \SetWatermarkFontSize{0.5in}
  \SetWatermarkColor[gray]{.9}
  \SetWatermarkText{\parbox{12em}{\centering
      Unpublished working draft.\\
      Not for distribution.}}
\else
  \if@ACM@sigchiamode
    \if@ACM@nonacm\else
      \RequirePackage{draftwatermark}
      \SetWatermarkFontSize{0.5in}
      \SetWatermarkColor[gray]{.9}
      \SetWatermarkText{\parbox{12em}{\centering
          Legacy document. \\
          Not for publication in an ACM venue}}
    \fi
  \fi
\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.

```
\RequirePackage{geometry}
\ifcase\ACM@format@nr
\relax % manuscript
   \geometry{letterpaper,head=13pt,
   marginparwidth=6pc,heightrounded}%
\or % acmsmall
   \geometry{twoside=true,
     includeheadfoot, head=13pt, foot=2pc,
     paperwidth=6.75in, paperheight=10in,
     top=58pt, bottom=44pt, inner=46pt, outer=46pt,
     marginparwidth=2pc,heightrounded
   }%
\or % acmlarge
   \geometry{twoside=true, head=13pt, foot=2pc,
     paperwidth=8.5in, paperheight=11in,
     includeheadfoot,
     top=78pt, bottom=114pt, inner=81pt, outer=81pt,
     marginparwidth=4pc,heightrounded
     }%
\or % acmtog
   \geometry{twoside=true, head=13pt, foot=2pc,
     paperwidth=8.5in, paperheight=11in,
     includeheadfoot, columnsep=24pt,
     top=52pt, bottom=75pt, inner=52pt, outer=52pt,
     marginparwidth=2pc,heightrounded
     }%
\or % sigconf
```

```
  \geometry{twoside=true, head=13pt,
    paperwidth=8.5in, paperheight=11in,
    includeheadfoot, columnsep=2pc,
    top=57pt, bottom=73pt, inner=54pt, outer=54pt,
    marginparwidth=2pc,heightrounded
    }%
\or % siggraph
  \geometry{twoside=true, head=13pt,
    paperwidth=8.5in, paperheight=11in,
    includeheadfoot, columnsep=2pc,
    top=57pt, bottom=73pt, inner=54pt, outer=54pt,
    marginparwidth=2pc,heightrounded
    }%
\or % sigplan
  \geometry{twoside=true, head=13pt,
    paperwidth=8.5in, paperheight=11in,
    includeheadfoot=false, columnsep=2pc,
    top=1in, bottom=1in, inner=0.75in, outer=0.75in,
    marginparwidth=2pc,heightrounded
    }%
\or % sigchi
  \geometry{twoside=true, head=13pt,
    paperwidth=8.5in, paperheight=11in,
    includeheadfoot, columnsep=2pc,
    top=66pt, bottom=73pt, inner=54pt, outer=54pt,
    marginparwidth=2pc,heightrounded
    }%
\or % sigchi-a
  \geometry{twoside=false, head=13pt,
    paperwidth=11in, paperheight=8.5in,
    includeheadfoot, marginparsep=72pt,
    marginparwidth=170pt, columnsep=20pt,
    top=72pt, bottom=72pt, left=314pt, right=72pt
    }%
    \@mparswitchfalse
    \reversemarginpar
\or % acmengage
  \geometry{twoside=true, head=13pt,
    paperwidth=8.5in, paperheight=11in,
    includeheadfoot, columnsep=2pc,
    top=57pt, bottom=73pt, inner=54pt, outer=54pt,
    marginparwidth=2pc,heightrounded
    }%
\or % acmcp
  \geometry{twoside=true,
    includeheadfoot, head=13pt, foot=2pc,
    paperwidth=6.75in, paperheight=10in,
    top=58pt, bottom=44pt, inner=46pt, outer=46pt,
    marginparwidth=2pc,heightrounded
  }%
\fi
```

\parindent \parskip Paragraphing

```
\setlength\parindent{10\p@}
```

```
\setlength\parskip{\z@}
\ifcase\ACM@format@nr
\relax % manuscript
\or % acmsmall
\or % acmlarge
\or % acmtog
  \setlength\parindent{9\p@}%
\or % sigconf
\or % siggraph
\or % sigplan
\or % sigchi
\or % sigchi-a
\or % acmengage
\or % acmcp
\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.

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

Footnotes require some consideration. We have several layers of footnotes: frontmatter 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.

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

\RequirePackage{manyfoot}
\SelectFootnoteRule[2]{copyrightpermission}
\DeclareNewFootnote{authorsaddresses}
\SelectFootnoteRule[2]{copyrightpermission}
\DeclareNewFootnote{copyrightpermission}
```

`\footnoterule` Tschichold's rules:

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

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

```
\def\endminipage{%
    \par
    \unskip
    \ifvoid\@mpfootins\else
      \vskip\skip\@mpfootins
      \normalcolor
      \unvbox\@mpfootins
    \fi
```

```
    \@minipagefalse
  \color@endgroup
  \egroup
  \expandafter\@iiiparbox\@mpargs{\unvbox\@tempboxa}}
```

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

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

```
\ifcase\ACM@format@nr
\relax % manuscript
\or % acmsmall
\or % acmlarge
\or % acmtog
  \flushbottom
\or % sigconf
  \flushbottom
\or % siggraph
  \flushbottom
\or % sigplan
  \flushbottom
\or % sigchi
  \flushbottom
\or % sigchi-a
\or % acmengage
  \flushbottom
\or % acmcp
  \flushbottom
\fi
```

3.12 Fonts

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

The code below is by Ross Moore.

```
\ifPDFTeX
\input{glyphtounicode}
\pdfglyphtounicode{f_f}{FB00}
\pdfglyphtounicode{f_f_i}{FB03}
\pdfglyphtounicode{f_f_l}{FB04}
\pdfglyphtounicode{f_i}{FB01}
\pdfglyphtounicode{t_t}{0074 0074}
\pdfglyphtounicode{f_t}{0066 0074}
\pdfglyphtounicode{T_h}{0054 0068}
\pdfgentounicode=1
\RequirePackage{cmap}
\fi
```

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

```
\newif\if@ACM@newfonts
```

```
\@ACM@newfontstrue
\IfFileExists{libertine.sty}{}{\ClassWarning{\@classname}{You do not
    have the libertine package installed.  Please upgrade your
    TeX}\@ACM@newfontsfalse}
\IfFileExists{zi4.sty}{}{\ClassWarning{\@classname}{You do not
    have the inconsolata (zi4.sty) package installed.  Please upgrade your
    TeX}\@ACM@newfontsfalse}
\IfFileExists{newtxmath.sty}{}{\ClassWarning{\@classname}{You do not
    have the newtxmath package installed.  Please upgrade your
    TeX}\@ACM@newfontsfalse}
```

We use Libertine throughout. We use Libertine throughout.

```
\if@ACM@newfonts
  % Note that the order in which packages are loaded matters,
  % and the correct order depends on the LaTeX engine used.
  % See https://github.com/borisveytsman/acmart/issues/402
  % and https://github.com/borisveytsman/acmart/issues/410
  \ifxetex
    \RequirePackage{unicode-math}
    \setmathfont[Scale=MatchUppercase]{libertinusmath-regular.otf}
    \RequirePackage[tt=false]{libertine}
    \setmonofont[StylisticSet=3]{inconsolata}
  \else
    \ifluatex
      \RequirePackage{unicode-math}
      \setmathfont[Scale=MatchUppercase]{libertinusmath-regular.otf}
      \RequirePackage[tt=false]{libertine}
      \setmonofont[StylisticSet=3]{inconsolata}
    \else
       \RequirePackage[T1]{fontenc}
       \RequirePackage[tt=false, type1=true]{libertine}
       \RequirePackage[varqu]{zi4}
       \RequirePackage[libertine]{newtxmath}
    \fi
  \fi
\fi
```

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

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

The SIGCHI extended abstracts are sans serif:

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

3.13 Image descriptions

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

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

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

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

\Description The Description macro right now just sets switches

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

The global warning

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

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

```
\AtBeginEnvironment{figure}{\@Description@presentfalse
  \let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}
\AtBeginEnvironment{figure*}{\@Description@presentfalse
  \let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}
\AtEndEnvironment{figure}{\if@Description@present\else
  \global\@undescribed@imagestrue
  \ClassWarning{\@classname}{A possible image without description}\fi}
\AtEndEnvironment{figure*}{\if@Description@present\else
  \global\@undescribed@imagestrue
  \ClassWarning{\@classname}{A possible image without description}\fi}
\AtBeginEnvironment{table}{\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}
\AtBeginEnvironment{table*}{\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}
\AtBeginEnvironment{algorithm}{\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}
\AtBeginEnvironment{algorithm*}{\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}
\AtBeginEnvironment{lstlisting}{\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}
\AtBeginEnvironment{lstlisting*}{\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}
\AtBeginEnvironment{minted}{\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}
\AtBeginEnvironment{minted*}{\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}
\AtBeginEnvironment{listing}{\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}
\AtBeginEnvironment{listing*}{\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}
\AtBeginEnvironment{lstinputlisting}{\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}
\AtBeginEnvironment{lstinputlisting*}{\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig}

```

3.14 Floats

We use the `caption` package

```
\RequirePackage{caption, float}
\captionsetup[table]{position=top}
\if@ACM@journal
  \captionsetup{labelfont={sf, small},
    textfont={sf, small}, margin=\z@}
  \captionsetup[figure]{name={Fig.}}
\else
  \captionsetup{labelfont={bf},
    textfont={bf}, labelsep=colon, margin=\z@}
  \ifcase\ACM@format@nr
  \relax % manuscript
  \or % acmsmall
  \or % acmlarge
  \or % acmtog
  \or % sigconf
  \or % siggraph
    \captionsetup{textfont={it}}
  \or % sigplan
    \captionsetup{labelfont={bf},
      textfont={normalfont}, labelsep=period, margin=\z@}
  \or % sigchi
    \captionsetup[figure]{labelfont={bf, small},
      textfont={bf, small}}
    \captionsetup[table]{labelfont={bf, small},
      textfont={bf, small}}
  \or % sigchi-a
    \captionsetup[figure]{labelfont={bf, small},
      textfont={bf, small}}
    \captionsetup[table]{labelfont={bf, small},
      textfont={bf, small}}
  \or % acmengage
  \or % acmcp
  \fi
\fi
```

`sidebar` The `sidebar` environment:

```
\newfloat{sidebar}{}{sbar}
\floatname{sidebar}{Sidebar}
\renewenvironment{sidebar}{\Collect@Body\@sidebar}{}
```

`\@sidebar` The processing of the saved text

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

`marginfigure` The `marginfigure` environment:

```
\newenvironment{marginfigure}{\Collect@Body\@marginfigure}{}
```

`\@marginfigure` The processing of the saved text

```
\long\def\@marginfigure#1{\bgroup
  \let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig
  \captionsetup{type=figure}%
  \marginpar{\@Description@presentfalse\centering
```

```
    \small#1\if@Description@present\else
      \global\@undescribed@imagestrue
      \ClassWarning{\@classname}{A possible image without description}
      \fi}%
  \egroup}
```

`margintable` The `margintable` environment:

```
\newenvironment{margintable}{\Collect@Body\@margintable}{}
```

`\@margintable` The processing of the saved text

```
\long\def\@margintable#1{\bgroup\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig\captionsetup{type=table}%
  \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

```
\newdimen\fulltextwidth
\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)

```
\if@ACM@sigchiamode
\def\@dblfloat{\bgroup\let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig\columnwidth=\fulltextwidth
  \let\@endfloatbox\@endwidefloatbox
  \def\@fpsadddefault{\def\@fps{tp}}%
  \@float}
\fi
```

`\end@dblfloat` And the end. Just adding a `\bgroup`.

```
\if@ACM@sigchiamode
\def\end@dblfloat{%
    \end@float\egroup}
\fi
```

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

```
\def\@endwidefloatbox{%
  \par\vskip\z@skip
  \@minipagefalse
  \outer@nobreak
  \egroup
  \color@endbox
  \global\setbox\@currbox=\vbox{\moveleft
    \dimexpr(\fulltextwidth-\textwidth)\box\@currbox}%
  \wd\@currbox=\textwidth
}
```

3.15 Lists

```
\ifcase\ACM@format@nr
\relax % manuscript
\or % acmsmall
\or % acmlarge
\or % acmtog
\or % sigconf
\or % siggraph
\or % sigplan
\def\labelenumi{\theenumi.}
\def\labelenumii{\theenumii.}
\def\labelenumiii{\theenumiii.}
\def\labelenumiv{\theenumiv.}
\or % sigchi
\or % sigchi-a
\or % acmengage
\or % acmcp
\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.

```
\newdimen\@ACM@labelwidth
\AtBeginDocument{%
  \setlength\labelsep{4pt}
  \setlength{\@ACM@labelwidth}{6.5pt}

  %% First-level list: when beginning after the first line of an
  %% indented paragraph or ending before an indented paragraph, labels
  %% should not hang to the left of the preceding/following text.
  \setlength\leftmargini{\z@}
  \addtolength\leftmargini{\parindent}
  \addtolength\leftmargini{2\labelsep}
  \addtolength\leftmargini{\@ACM@labelwidth}

  %% Second-level and higher lists.
  \setlength\leftmarginii{\z@}
  \addtolength\leftmarginii{0.5\labelsep}
  \addtolength\leftmarginii{\@ACM@labelwidth}
  \setlength\leftmarginiii{\leftmarginii}
  \setlength\leftmariniv{\leftmarginiii}
  \setlength\leftmarginv{\leftmariniv}
  \setlength\leftmarginvi{\leftmarginv}
  \@listi}
\newskip\listisep
\listisep\smallskipamount
\def\@listI{\leftmargin\leftmargini
  \labelwidth\leftmargini \advance\labelwidth-\labelsep
  \listparindent\z@
  \topsep\listisep}
\let\@listi\@listI
```

```
\def\@listii{\leftmargin\leftmarginii
  \labelwidth\leftmarginii \advance\labelwidth-\labelsep
  \topsep\z@skip}
\def\@listiii{\leftmargin\leftmarginiii
  \labelwidth\leftmarginiii \advance\labelwidth-\labelsep}
\def\@listiv{\leftmargin\leftmarginiv
  \labelwidth\leftmarginiv \advance\labelwidth-\labelsep}
\def\@listv{\leftmargin\leftmarginv
  \labelwidth\leftmarginv \advance\labelwidth-\labelsep}
\def\@listvi{\leftmargin\leftmarginvi
  \labelwidth\leftmarginvi \advance\labelwidth-\labelsep}
```

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

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

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

```
\renewenvironment{description}{\list{}{%
    \labelwidth\@ACM@labelwidth
    \let\makelabel\descriptionlabel}%
}{
  \endlist
}
\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 initally false, and setting top matter when it is true is wrong.

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

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

```
\define@choicekey*+{ACM}{acmJournal}[\@journalCode\@journalCode@nr]{%
  ACMJCSS,%
  CIE,%
  CSUR,%
  DGOV,%
  DLT,%
  DTRAP,%
  FAC,%
  GAMES,%
  HEALTH,%
  IMWUT,%
  JACM,%
  JATS,%
  JDIQ,%
  JDS,%
  JEA,%
  JERIC,%
  JETC,%
  JOCCH,%
  JRC,%
  PACMCGIT,%
```

```
  PACMHCI,%
  PACMMOD,%
  PACMNET,%
  PACMPL,%
  PACMSE,%
  POMACS,%
  TAAS,%
  TACCESS,%
  TACO,%
  TALG,%
  TALLIP,%
  TAP,%
  TCPS,%
  TDS,%
  TEAC,%
  TECS,%
  TELO,%
  THRI,%
  TIIS,%
  TIOT,%
  TISSEC,%
  TIST,%
  TKDD,%
  TMIS,%
  TOCE,%
  TOCHI,%
  TOCL,%
  TOCS,%
  TOCT,%
  TODAES,%
  TODS,%
  TOG,%
  TOIS,%
  TOIT,%
  TOMACS,%
  TOMM,%
  TOMPECS,%
  TOMS,%
  TOPC,%
  TOPLAS,%
  TOPML,%
  TOPS,%
  TORS,%
  TOS,%
  TOSEM,%
  TOSN,%
  TQC,%
  TRETS,%
  TSAS,%
  TSC,%
  TSLP,%
  TWEB,%
  FACMP%
}{%
```

```
\ifcase\@journalCode@nr
\relax % ACMJCSS
  \def\@journalName{ACM Journal on Computing and Sustainable Societies}%
  \def\@journalNameShort{ACM J. Comput. Sustain. Soc.}%
  \def\@permissionCodeOne{2834-5533}%
  \def\@permissionCodeTwo{2834-5533}%
\or % CIE
  \def\@journalName{ACM Computers in Entertainment}%
  \def\@journalNameShort{ACM Comput. Entertain.}%
  \def\@permissionCodeOne{1544-3574}%
\or % CSUR
  \def\@journalName{ACM Computing Surveys}%
  \def\@journalNameShort{ACM Comput. Surv.}%
  \def\@permissionCodeOne{0360-0300}%
  \def\@permissionCodeTwo{1557-7341}%
\or % DGOV
  \def\@journalName{Digital Government: Research and Practice}%
  \def\@journalNameShort{Digit. Gov. Res. Pract.}%
  \def\@permissionCodeOne{2639-0175}%
  \def\@permissionCodeTwo{2639-0175}%
\or % DLT
  \def\@journalName{Distributed Ledger Technologies: Research and Practice}%
  \def\@journalNameShort{Distrib. Ledger Technol.}%
  \def\@permissionCodeOne{2769-6472}%
  \def\@permissionCodeTwo{2769-6480}%
\or % DTRAP
  \def\@journalName{Digital Threats: Research and Practice}%
  \def\@journalNameShort{Digit. Threat. Res. Pract.}%
  \def\@permissionCodeOne{2576-5337}%
  \def\@permissionCodeTwo{2576-5337}%
\or % FAC
  \def\@journalName{Formal Aspects of Computing}%
  \def\@journalNameShort{Form. Asp. Comput.}%
  \def\@permissionCodeOne{0934-5043}%
  \def\@permissionCodeTwo{1433-299X}%
\or % GAMES
  \def\@journalName{ACM Games: Research and Practice}%
  \def\@journalNameShort{ACM Games}%
  \def\@permissionCodeOne{2832-5516}%
  \def\@permissionCodeTwo{2832-5516}%
\or % HEALTH
  \def\@journalName{ACM Transactions on Computing for Healthcare}%
  \def\@journalNameShort{ACM Trans. Comput. Healthcare}%
  \def\@permissionCodeOne{2637-8051}%
  \def\@permissionCodeTwo{2637-8051}%
\or % IMWUT
  \def\@journalName{Proceedings of the ACM on Interactive, Mobile,
    Wearable and Ubiquitous Technologies}%
 \def\@journalNameShort{Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.}%
  \def\@permissionCodeOne{2474-9567}%
  \def\@permissionCodeTwo{2474-9567}%
  \@ACM@screentrue
  \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
\or % JACM
```

```
  \def\@journalName{Journal of the ACM}%
  \def\@journalNameShort{J. ACM}%
  \def\@permissionCodeOne{0004-5411}%
  \def\@permissionCodeTwo{1557-735X}%
\or % JATS
  \def\@journalName{Journal on Autonomous Transportation Systems}%
  \def\@journalNameShort{ACM J. Auton. Transport. Syst.}%
  \def\@permissionCodeOne{2833-0528}%
  \def\@permissionCodeTwo{2833-0528}%
\or % JDIQ
  \def\@journalName{ACM Journal of Data and Information Quality}%
  \def\@journalNameShort{ACM J. Data Inform. Quality}%
  \def\@permissionCodeOne{1936-1955}%
  \def\@permissionCodeTwo{1936-1963}%
\or % JDS
  \def\@journalName{ACM/IMS Journal of Data Science}%
  \def\@journalNameShort{ACM/IMS J. Data Sci.}%
  \def\@permissionCodeOne{2831-3194}%
  \def\@permissionCodeTwo{2831-3194}%
\or % JEA
  \def\@journalName{ACM Journal of Experimental Algorithmics}%
  \def\@journalNameShort{ACM J. Exp. Algor.}%
  \def\@permissionCodeOne{1084-6654}%
  \def\@permissionCodeTwo{1084-6654}%
\or % JERIC
  \def\@journalName{ACM Journal of Educational Resources in Computing}%
  \def\@journalNameShort{ACM J. Edu. Resources in Comput.}%
  \def\@permissionCodeOne{1073-0516}%
\or % JETC
 \def\@journalName{ACM Journal on Emerging Technologies in Computing Systems}%
  \def\@journalNameShort{ACM J. Emerg. Technol. Comput. Syst.}%
  \def\@permissionCodeOne{1550-4832}%
  \def\@permissionCodeTwo{1550-4840}%
\or % JOCCH
  \def\@journalName{ACM Journal on Computing and Cultural Heritage}%
  \def\@journalNameShort{ACM J. Comput. Cult. Herit.}%
  \def\@permissionCodeOne{1556-4673}%
  \def\@permissionCodeTwo{1556-4711}%
\or % JRC
  \def\@journalName{ACM Journal on Responsible Computing}%
  \def\@journalNameShort{ACM J. Responsib. Comput.}%
  \def\@permissionCodeOne{2832-0565}%
  \def\@permissionCodeTwo{2832-0565}%
\or % PACMCGIT
 \def\@journalName{Proceedings of the ACM on Computer Graphics and Interactive Techniques}%
  \def\@journalNameShort{Proc. ACM Comput. Graph. Interact. Tech.}%
  \def\@permissionCodeOne{2577-6193}%
  \def\@permissionCodeTwo{2577-6193}%
  \@ACM@screentrue
  \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
\or % PACMHCI
  \def\@journalName{Proceedings of the ACM on Human-Computer Interaction}%
  \def\@journalNameShort{Proc. ACM Hum.-Comput. Interact.}%
  \def\@permissionCodeOne{2573-0142}%
```

```
  \def\@permissionCodeTwo{2573-0142}%
  \@ACM@screentrue
  \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
\or % PACMMOD
  \def\@journalName{Proceedings of the ACM on Management of Data}%
  \def\@journalNameShort{Proc. ACM Manag. Data}%
  \def\@permissionCodeOne{2836-6573}%
  \def\@permissionCodeTwo{2836-6573}%
\or % PACMNET
  \def\@journalName{Proceedings of the ACM on Networkng}%
  \def\@journalNameShort{Proc. ACM Netw.}%
  \def\@permissionCodeOne{2834-5509}%
  \def\@permissionCodeTwo{2834-5509}%
\or % PACMPL
  \def\@journalName{Proceedings of the ACM on Programming Languages}%
  \def\@journalNameShort{Proc. ACM Program. Lang.}%
  \def\@permissionCodeOne{2475-1421}%
  \def\@permissionCodeTwo{2475-1421}%
  \@ACM@screentrue
  \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
\or % PACMSE
  \def\@journalName{Proceedings of the ACM on Software Engineering}%
  \def\@journalNameShort{Proc. ACM Softw. Eng.}%
  \def\@permissionCodeOne{2994-970X}%
  \def\@permissionCodeTwo{2994-970X}%
  \@ACM@screentrue
  \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
\or % POMACS
 \def\@journalName{Proceedings of the ACM on Measurement and Analysis of Computing Systems}%
  \def\@journalNameShort{Proc. ACM Meas. Anal. Comput. Syst.}%
  \def\@permissionCodeOne{2476-1249}%
  \def\@permissionCodeTwo{2476-1249}%
  \@ACM@screentrue
  \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
\or % TAAS
  \def\@journalName{ACM Transactions on Autonomous and Adaptive Systems}%
  \def\@journalNameShort{ACM Trans. Autonom. Adapt. Syst.}%
  \def\@permissionCodeOne{1556-4665}%
  \def\@permissionCodeTwo{1556-4703}%
\or % TACCESS
  \def\@journalName{ACM Transactions on Accessible Computing}%
  \def\@journalNameShort{ACM Trans. Access. Comput.}%
  \def\@permissionCodeOne{1936-7228}%
  \def\@permissionCodeTwo{1936-7236}%
\or % TACO
  \def\@journalName{ACM Transactions on Architecture and Code Optimization}%
  \def\@journalNameShort{ACM Trans. Arch. Code Optim.}%
  \def\@permissionCodeOne{1544-3566}%
  \def\@permissionCodeTwo{1544-3973}%
\or % TALG
  \def\@journalName{ACM Transactions on Algorithms}%
  \def\@journalNameShort{ACM Trans. Algor.}%
  \def\@permissionCodeOne{1549-6325}%
  \def\@permissionCodeTwo{1549-6333}%
```

```
\or % TALLIP
 \def\@journalName{ACM Transactions on Asian and Low-Resource Language Information Processing}%
  \def\@journalNameShort{ACM Trans. Asian Low-Resour. Lang. Inf. Process.}%
  \def\@permissionCodeOne{2375-4699}%
  \def\@permissionCodeTwo{2375-4702}%
\or % TAP
  \def\@journalName{ACM Transactions on Applied Perception}%
  \def\@journalNameShort{ACM Trans. Appl. Percept.}%
  \def\@permissionCodeOne{1544-3558}%
  \def\@permissionCodeTwo{1544-3965}%
\or % TCPS
  \def\@journalName{ACM Transactions on Cyber-Physical Systems}%
  \def\@journalNameShort{ACM Trans. Cyber-Phys. Syst.}%
  \def\@permissionCodeOne{2378-962X}%
  \def\@permissionCodeTwo{2378-9638}%
\or % TDS
  \def\@journalName{ACM/IMS Transactions on Data Science}%
  \def\@journalNameShort{ACM/IMS Trans. Data Sci.}%
  \def\@permissionCodeOne{2577-3224}%
\or % TEAC
  \def\@journalName{ACM Transactions on Economics and Computation}%
  \def\@journalNameShort{ACM Trans. Econ. Comput.}%
  \def\@permissionCodeOne{2167-8375}%
  \def\@permissionCodeTwo{2167-8383}%
\or % TECS
  \def\@journalName{ACM Transactions on Embedded Computing Systems}%
  \def\@journalNameShort{ACM Trans. Embedd. Comput. Syst.}%
  \def\@permissionCodeOne{1539-9087}%
  \def\@permissionCodeTwo{1558-3465}%
\or % TELO
 \def\@journalName{ACM Transactions on Evolutionary Learning and Optimization}%
  \def\@journalNameShort{ACM Trans. Evol. Learn. Optim.}%
  \def\@permissionCodeOne{2688-299X}%
  \def\@permissionCodeTwo{2688-3007}%
\or % THRI
  \def\@journalName{ACM Transactions on Human-Robot Interaction}%
  \def\@journalNameShort{ACM Trans. Hum.-Robot Interact.}%
  \def\@permissionCodeOne{2573-9522}%
  \def\@permissionCodeTwo{2573-9522}%
\or % TIIS
  \def\@journalName{ACM Transactions on Interactive Intelligent Systems}%
  \def\@journalNameShort{ACM Trans. Interact. Intell. Syst.}%
  \def\@permissionCodeOne{2160-6455}%
  \def\@permissionCodeTwo{2160-6463}%
\or % TIOT
  \def\@journalName{ACM Transactions on Internet of Things}%
  \def\@journalNameShort{ACM Trans. Internet Things}%
  \def\@permissionCodeOne{2577-6207}%
  \def\@permissionCodeTwo{2577-6207}%
\or % TISSEC
  \def\@journalName{ACM Transactions on Information and System Security}%
  \def\@journalNameShort{ACM Trans. Info. Syst. Sec.}%
  \def\@permissionCodeOne{1094-9224}%
\or % TIST
```

```
  \def\@journalName{ACM Transactions on Intelligent Systems and Technology}%
  \def\@journalNameShort{ACM Trans. Intell. Syst. Technol.}%
  \def\@permissionCodeOne{2157-6904}%
  \def\@permissionCodeTwo{2157-6912}%
\or % TKDD
  \def\@journalName{ACM Transactions on Knowledge Discovery from Data}%
  \def\@journalNameShort{ACM Trans. Knowl. Discov. Data.}%
  \def\@permissionCodeOne{1556-4681}%
  \def\@permissionCodeTwo{1556-472X}%
\or % TMIS
  \def\@journalName{ACM Transactions on Management Information Systems}%
  \def\@journalNameShort{ACM Trans. Manag. Inform. Syst.}%
  \def\@permissionCodeOne{2158-656X}%
  \def\@permissionCodeTwo{2158-6578}%
\or % TOCE
  \def\@journalName{ACM Transactions on Computing Education}%
  \def\@journalNameShort{ACM Trans. Comput. Educ.}%
  \def\@permissionCodeOne{1946-6226}%
  \def\@permissionCodeTwo{1946-6226}%
\or % TOCHI
  \def\@journalName{ACM Transactions on Computer-Human Interaction}%
  \def\@journalNameShort{ACM Trans. Comput.-Hum. Interact.}%
  \def\@permissionCodeOne{1073-0516}%
  \def\@permissionCodeTwo{1557-7325}%
\or % TOCL
  \def\@journalName{ACM Transactions on Computational Logic}%
  \def\@journalNameShort{ACM Trans. Comput. Logic}%
  \def\@permissionCodeOne{1529-3785}%
  \def\@permissionCodeTwo{1557-945X}%
\or % TOCS
  \def\@journalName{ACM Transactions on Computer Systems}%
  \def\@journalNameShort{ACM Trans. Comput. Syst.}%
  \def\@permissionCodeOne{0734-2071}%
  \def\@permissionCodeTwo{1557-7333}%
\or % TOCT
  \def\@journalName{ACM Transactions on Computation Theory}%
  \def\@journalNameShort{ACM Trans. Comput. Theory}%
  \def\@permissionCodeOne{1942-3454}%
  \def\@permissionCodeTwo{1942-3462}%
\or % TODAES
 \def\@journalName{ACM Transactions on Design Automation of Electronic Systems}%
  \def\@journalNameShort{ACM Trans. Des. Autom. Electron. Syst.}%
  \def\@permissionCodeOne{1084-4309}%
  \def\@permissionCodeTwo{1557-7309}%
\or % TODS
  \def\@journalName{ACM Transactions on Database Systems}%
  \def\@journalNameShort{ACM Trans. Datab. Syst.}%
  \def\@permissionCodeOne{0362-5915}%
  \def\@permissionCodeTwo{1557-4644}%
\or % TOG
  \def\@journalName{ACM Transactions on Graphics}%
  \def\@journalNameShort{ACM Trans. Graph.}%
  \def\@permissionCodeOne{0730-0301}%
  \def\@permissionCodeTwo{1557-7368}%
```

```
\or % TOIS
  \def\@journalName{ACM Transactions on Information Systems}%
  \def\@journalNameShort{ACM Trans. Inf. Syst.}%
  \def\@permissionCodeOne{1046-8188}%
  \def\@permissionCodeTwo{1558-2868}%
\or % TOIT
  \def\@journalName{ACM Transactions on Internet Technology}%
  \def\@journalNameShort{ACM Trans. Internet Technol.}%
  \def\@permissionCodeOne{1533-5399}%
  \def\@permissionCodeTwo{1557-6051}%
\or % TOMACS
  \def\@journalName{ACM Transactions on Modeling and Computer Simulation}%
  \def\@journalNameShort{ACM Trans. Model. Comput. Simul.}%
  \def\@permissionCodeOne{1049-3301}%
  \def\@permissionCodeTwo{1558-1195}%
\or % TOMM
 \def\@journalName{ACM Transactions on Multimedia Computing, Communications and Applications}%
  \def\@journalNameShort{ACM Trans. Multimedia Comput. Commun. Appl.}%
  \def\@permissionCodeOne{1551-6857}%
  \def\@permissionCodeTwo{1551-6865}%
\or % TOMPECS
 \def\@journalName{ACM Transactions on Modeling and Performance Evaluation of Computing Systems}%
  \def\@journalNameShort{ACM Trans. Model. Perform. Eval. Comput. Syst.}%
  \def\@permissionCodeOne{2376-3639}%
  \def\@permissionCodeTwo{2376-3647}%
\or % TOMS
  \def\@journalName{ACM Transactions on Mathematical Software}%
  \def\@journalNameShort{ACM Trans. Math. Softw.}%
  \def\@permissionCodeOne{0098-3500}%
  \def\@permissionCodeTwo{1557-7295}%
\or % TOPC
  \def\@journalName{ACM Transactions on Parallel Computing}%
  \def\@journalNameShort{ACM Trans. Parallel Comput.}%
  \def\@permissionCodeOne{2329-4949}%
  \def\@permissionCodeTwo{2329-4957}%
\or % TOPLAS
  \def\@journalName{ACM Transactions on Programming Languages and Systems}%
  \def\@journalNameShort{ACM Trans. Program. Lang. Syst.}%
  \def\@permissionCodeOne{0164-0925}%
  \def\@permissionCodeTwo{1558-4593}%
\or % TOPML
  \def\@journalName{ACM Transactions on Probabilistic Machine Learning}%
  \def\@journalNameShort{ACM Trans. Probab. Mach. Learn.}%
  \def\@permissionCodeOne{2836-8924}%
  \def\@permissionCodeTwo{2836-8924}%
\or % TOPS
  \def\@journalName{ACM Transactions on Privacy and Security}%
  \def\@journalNameShort{ACM Trans. Priv. Sec.}%
  \def\@permissionCodeOne{2471-2566}%
  \def\@permissionCodeTwo{2471-2574}%
\or % TORS
  \def\@journalName{ACM Transactions on Recommender Systems}%
  \def\@journalNameShort{ACM Trans. Recomm. Syst.}%
  \def\@permissionCodeOne{2770-6699}%
```

```
  \def\@permissionCodeTwo{2770-6699}%
\or % TOS
  \def\@journalName{ACM Transactions on Storage}%
  \def\@journalNameShort{ACM Trans. Storage}%
  \def\@permissionCodeOne{1553-3077}%
  \def\@permissionCodeTwo{1553-3093}%
\or % TOSEM
 \def\@journalName{ACM Transactions on Software Engineering and Methodology}%
  \def\@journalNameShort{ACM Trans. Softw. Eng. Methodol.}%
  \def\@permissionCodeOne{1049-331X}%
  \def\@permissionCodeTwo{1557-7392}%
\or % TOSN
  \def\@journalName{ACM Transactions on Sensor Networks}%
  \def\@journalNameShort{ACM Trans. Sensor Netw.}%
  \def\@permissionCodeOne{1550-4859}%
  \def\@permissionCodeTwo{1550-4867}%
\or % TQC
  \def\@journalName{ACM Transactions on Quantum Computing}%
  \def\@journalNameShort{ACM Trans. Quantum Comput.}%
  \def\@permissionCodeOne{2643-6817}%
  \def\@permissionCodeTwo{2643-6817}%
\or % TRETS
 \def\@journalName{ACM Transactions on Reconfigurable Technology and Systems}%
  \def\@journalNameShort{ACM Trans. Reconfig. Technol. Syst.}%
  \def\@permissionCodeOne{1936-7406}%
  \def\@permissionCodeTwo{1936-7414}%
\or % TSAS
  \def\@journalName{ACM Transactions on Spatial Algorithms and Systems}%
  \def\@journalNameShort{ACM Trans. Spatial Algorithms Syst.}%
  \def\@permissionCodeOne{2374-0353}%
  \def\@permissionCodeTwo{2374-0361}%
\or % TSC
  \def\@journalName{ACM Transactions on Social Computing}%
  \def\@journalNameShort{ACM Trans. Soc. Comput.}%
  \def\@permissionCodeOne{2469-7818}%
  \def\@permissionCodeTwo{2469-7826}%
\or % TSLP
  \def\@journalName{ACM Transactions on Speech and Language Processing}%
  \def\@journalNameShort{ACM Trans. Speech Lang. Process.}%
  \def\@permissionCodeOne{1550-4875}%
  \def\@permissionCodeTwo{2329-9304}%
\or % TWEB
  \def\@journalName{ACM Transactions on the Web}%
  \def\@journalNameShort{ACM Trans. Web}%
  \def\@permissionCodeOne{1559-1131}%
  \def\@permissionCodeTwo{1559-114X}%
\else % FACMP, a dummy journal
  \def\@journalName{ACM Just Accepted}%
  \def\@journalNameShort{ACM Accepted}%
  \def\@permissionCodeOne{XXXX-XXXX}%
\fi
\ClassInfo{\@classname}{Using journal code \@journalCode}%
}{%
  \ClassError{\@classname}{Incorrect journal #1}%
```

```
}%
```

`\acmJournal` And the syntactic sugar around it

```
\def\acmJournal#1{\setkeys{ACM}{acmJournal=#1}%
  \global\@ACM@journal@bibstriptrue
  \global\@ACM@journal@bibstrip@or@togtrue}
```

The defaults:

```
\def\@journalCode@nr{0}
\def\@journalName{}%
\def\@journalNameShort{\@journalName}%
\def\@permissionCodeOne{XXXX-XXXX}%
\def\@permissionCodeTwo{\@permissionCodeOne}%
```

`\acmConference` This is the conference command

```
\newcommand\acmConference[4][]{%
  \gdef\acmConference@shortname{#1}%
  \gdef\acmConference@name{#2}%
  \gdef\acmConference@date{#3}%
  \gdef\acmConference@venue{#4}%
  \ifx\acmConference@shortname\@empty
    \gdef\acmConference@shortname{#2}%
  \fi
  \global\@ACM@journal@bibstripfalse
  \ifx\@acmBooktitle\@empty\relax
    \acmBooktitle{Proceedings of \acmConference@name
      \ifx\acmConference@name\acmConference@shortname\else
      \ (\acmConference@shortname)\fi}%
  \fi
}
\if@ACM@journal\else
\acmConference[Conference'17]{ACM Conference}{July 2017}{Washington,
  DC, USA}%
\fi
```

`\acmBooktitle` `\@acmBooktitle` The book title of the conference:

```
\def\acmBooktitle#1{\gdef\@acmBooktitle{#1}}
\acmBooktitle{}
```

`\@editorsAbbrev` How to abbreviate editors

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

`\@acmEditors` The list of editors

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

`\editor` Add a new editor to the list

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

`\subtitle` The subtitle macro

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

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

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

`\num@authors` The total number of authors

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

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

```
\newif\if@insideauthorgroup
\@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.

```
\renewcommand\author[2][]{%
 \IfSubStr{\detokenize{#2}}{,}{\ClassWarning{\@classname}{Do not put several
     authors in the same \string\author\space macro!}}{}%
 \global\advance\num@authors by 1\relax
 \if@insideauthorgroup\else
   \global\advance\num@authorgroups by 1\relax
   \global\@insideauthorgrouptrue
 \fi
 \ifx\addresses\@empty
   \if@ACM@anonymous
     \gdef\addresses{\@author{Anonymous Author(s)%
       \ifx\@acmSubmissionID\@empty\else\\Submission Id:
         \@acmSubmissionID\fi}}%
     \gdef\authors{Anonymous Author(s)}%
   \else
     \expandafter\gdef\expandafter\addresses\expandafter{%
       \expandafter\@author\expandafter{%
         \csname typeset@author\the\num@authors\endcsname{#2}}}%
     \gdef\authors{#2}%
   \fi
 \else
   \if@ACM@anonymous\else
   \expandafter\g@addto@macro\expandafter\addresses\expandafter{%
     \expandafter\and\expandafter\@author\expandafter{%
       \csname typeset@author\the\num@authors\endcsname{#2}}}%
     \g@addto@macro\authors{\and#2}%
   \fi
 \fi
 \if@ACM@anonymous
   \ifx\shortauthors\@empty
     \gdef\shortauthors{Anon.
```

```
        \ifx\@acmSubmissionID\@empty\else Submission Id:
        \@acmSubmissionID\fi}%
    \fi
  \else
    \def\@tempa{#1}%
    \ifx\@tempa\@empty
      \ifx\shortauthors\@empty
        \gdef\shortauthors{#2}%
      \else
        \g@addto@macro\shortauthors{\and#2}%
      \fi
    \else
      \ifx\shortauthors\@empty
        \gdef\shortauthors{#1}%
      \else
        \g@addto@macro\shortauthors{\and#1}%
      \fi
    \fi
  \fi}
```

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

```
\newcommand{\affiliation}[2][]{%
  \global\@insideauthorgroupfalse
  \if@ACM@anonymous\else
    \g@addto@macro\addresses{\affiliation{#1}{#2}}%
  \fi}
```

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

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

`\additionalaffiliation` Additional affiliations go to footnotes

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

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

```
\def\@additionalaffiliation#1{\bgroup
  \def\position##1{\ignorespaces}%
  \def\institution##1{##1\ignorespaces}%
  \def\department{\@ifnextchar[{\@department}{\@department[]}}%
  \def\@department[##1]##2{##2, \ignorespaces}%
  \let\city\position
  \let\state\position
  \let\country\position
  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.

```
\renewcommand{\email}[2][]{%
  \IfSubStr{#2}{,}{\ClassWarning{\@classname}{Do not put several
      addresses in the same \string\email\space macro!}}{}%
  \if@ACM@anonymous\else
```

```
    \g@addto@macro\addresses{\email{#1}{#2}}%
  \fi}
```

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

```
\def\orcid#1{\unskip\ignorespaces%
  \IfBeginWith{#1}{http}{%
    \expandafter\gdef\csname
        typeset@author\the\num@authors\endcsname##1{%
          \href{#1}{##1}}}{%
    \expandafter\gdef\csname
        typeset@author\the\num@authors\endcsname##1{%
          \href{https://orcid.org/#1}{##1}}}}
```

`\authorsaddresses` Setting up authors' addresses

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

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

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

`\@titlenotes` The title notes

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

`\titlenote` Adding a note to the title

```
\def\titlenote#1{%
  \g@addto@macro\@title{\footnotemark}%
  \if@ACM@anonymous
    \g@addto@macro\@titlenotes{%
      \stepcounter{footnote}\footnotetext{Title note}}%
  \else
    \g@addto@macro\@titlenotes{\stepcounter{footnote}\footnotetext{#1}}%
  \fi}
```

`\@subtitlenotes` The subtitle notes

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

`\subtitlenote` Adding a note to the subtitle

```
\def\subtitlenote#1{%
  \g@addto@macro\@subtitle{\footnotemark}%
  \if@ACM@anonymous
    \g@addto@macro\@subtitlenotes{%
      \stepcounter{footnote}\footnotetext{Subtitle note}}%
  \else
    \g@addto@macro\@subtitlenotes{%
      \stepcounter{footnote}\footnotetext{#1}}%
  \fi}
```

`\@authornotes` The author notes

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

\authornote Adding a note to the author

```
\def\authornote#1{%
  \if@ACM@anonymous\else
    \g@addto@macro\addresses{\@authornotemark}%
    \g@addto@macro\@authornotes{%
      \stepcounter{footnote}\footnotetext{#1}}%
  \fi}
```

\authornotemark Adding a footnote mark to the authors

```
\newcommand\authornotemark[1][\relax]{%
  \if@ACM@anonymous\else
    \ifx#1\relax\relax\relax
      \g@addto@macro\addresses{\@authornotemark}%
    \else
      \g@addto@macro\addresses{\@@authornotemark{#1}}%
    \fi
  \fi}
```

\acmVolume The current volume

```
\def\acmVolume#1{\def\@acmVolume{#1}}
\acmVolume{1}
```

\acmNumber The current number

```
\def\acmNumber#1{\def\@acmNumber{#1}}
\acmNumber{1}
```

\acmArticle The current article

```
\def\acmArticle#1{\def\@acmArticle{#1}}
\acmArticle{}
```

\acmArticleSeq The sequence number

```
\def\acmArticleSeq#1{\def\@acmArticleSeq{#1}}
\acmArticleSeq{\@acmArticle}
```

\acmYear The current year

```
\def\acmYear#1{\def\@acmYear{#1}}
\acmYear{\the\year}
```

\acmMonth The current month

```
\def\acmMonth#1{\def\@acmMonth{#1}}
\acmMonth{\the\month}
```

\@acmPubDate The publication date

```
\def\@acmPubDate{\ifcase\@acmMonth\or
  January\or February\or March\or April\or May\or June\or
  July\or August\or September\or October\or November\or
  December\fi~\@acmYear}
```

\acmPrice The price—obsolete

```
\def\acmPrice#1{\ClassWarning{\@classname}{The macro \string\acmPrice
    is obsolete.  ACM no longer prints the price in bibstrip.}}
```

\acmSubmissionID The submission ID

```
\def\acmSubmissionID#1{\def\@acmSubmissionID{#1}}
\acmSubmissionID{}
```

\acmISBN The book ISBN

```
\def\acmISBN#1{\def\@acmISBN{#1}}
\acmISBN{978-x-xxxx-xxxx-x/YYYY/MM}
```

\acmDOI The paper DOI

```
\def\acmDOI#1{\def\@acmDOI{#1}}
\acmDOI{10.1145/nnnnnnn.nnnnnnn}
```

\if@ACM@badge

\@ACM@badge@width The width of the badge

```
\newlength\@ACM@badge@width
\setlength\@ACM@badge@width{3pc}
```

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

```
\newlength\@ACM@title@width
```

\@ACM@badge@skip The spacing between badges

```
\newlength\@ACM@badge@skip
\setlength\@ACM@badge@skip{1pt}
```

\@acmBadgeR

```
\def\@acmBadgeR{}
```

\@acmBadgeL

```
\def\@acmBadgeL{}
```

\acmBadgeR Setting the right badge

```
\newcommand\acmBadgeR[2][]{%
  \ifx\@acmBadgeR\@empty
    \gdef\@acmBadgeR{%
      \smash{%
        \raisebox{0.5\height}{%
          \href{#1}{\includegraphics[width=\@ACM@badge@width]{#2}}}}}%
  \else
    \g@addto@macro{\@acmBadgeR}{%
      \hspace{\@ACM@badge@skip}%
      \smash{%
        \raisebox{0.5\height}{%
          \href{#1}{\includegraphics[width=\@ACM@badge@width]{#2}}}}}%
  \fi}
```

\acmBadgeL Setting the left badge

```
\newcommand\acmBadgeL[2][]{%
  \ifx\@acmBadgeL\@empty
    \gdef\@acmBadgeL{%
      \smash{%
        \raisebox{0.5\height}{%
          \href{#1}{\includegraphics[width=\@ACM@badge@width]{#2}}}}}%
```

```
  \else
    \g@addto@macro{\@acmBadgeL}{%
      \hspace{\@ACM@badge@skip}%
      \smash{%
        \raisebox{0.5\height}{%
          \href{#1}{\includegraphics[width=\@ACM@badge@width]{#2}}}}}%
  \fi}
```

`\acmBadge` Just a syntax sugar for `\acmBadgeR`

```
\let\acmBadge=\acmBadgeR
```

`\startPage` The start page of the paper

```
\def\startPage#1{\def\@startPage{#1}}
\startPage{}
```

`\terms` Terms are obsolete. We use CCS now.

```
\def\terms#1{\ClassWarning{\@classname}{The command \string\terms{} is
    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.

```
\def\keywords#1{\def\@keywords{#1}}
\let\@keywords\@empty

\AtEndDocument{\if@ACM@nonacm\else\ifx\@keywords\@empty
  \ifnum\getrefnumber{TotPages}>2\relax
  \ClassWarningNoLine{\@classname}{ACM keywords are mandatory
    for papers over two pages}%
  \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

```
\renewenvironment{abstract}{\Collect@Body\@saveabstract}{}
```

`\@saveabstract` And saving the abstract

```
\long\def\@saveabstract#1{\if@ACM@maketitle@typeset
  \ClassError{\@classname}{Abstract must be defined before maketitle
    command. Please move it!}\fi
  \long\gdef\@abstract{#1}}
\@saveabstract{}
```

`\@lempty` The long version of `\@empty` (to compare with `\@abstract`)

```
\long\def\@lempty{}
```

`\if@ACM@printccs` Whether to print CCS

```
\define@boolkey+{@ACM@topmatter@}[@ACM@]{printccs}[true]{%
  \if@ACM@printccs
    \ClassInfo{\@classname}{Printing CCS}%
  \else
    \ClassInfo{\@classname}{Suppressing CCS}%
  \fi}{\ClassError{\@classname}{The option printccs can be either true or false}}
```

\if@ACM@printacmref Whether to print the ACM bibstrip

```
\define@boolkey+{@ACM@topmatter@}[@ACM@]{printacmref}[true]{%
  \if@ACM@printacmref
    \ClassInfo{\@classname}{Printing bibformat}%
  \else
    \ClassInfo{\@classname}{Suppressing bibformat}%
 \fi}{\ClassError{\@classname}{The option printacmref can be either true or false}}

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

\if@ACM@printfolios Whether to print folios

```
\define@boolkey+{@ACM@topmatter@}[@ACM@]{printfolios}[true]{%
  \if@ACM@printfolios
    \ClassInfo{\@classname}{Printing folios}%
  \else
    \ClassInfo{\@classname}{Suppressing folios}%
 \fi}{\ClassError{\@classname}{The option printfolios can be either true or false}}
```

\@ACM@authorsperrow The number of authors per row. 0 means use the default algorithm.

```
\define@cmdkey{@ACM@topmatter@}[@ACM@]{authorsperrow}[0]{%
  \IfInteger{#1}{\ClassInfo{\@classname}{Setting authorsperrow to
      #1}}{\ClassWarning{\@classname}{The parameter authorsperrow must be
      numerical. Ignoring the input #1}\gdef\@ACM@authorsperrow{0}}}
```

\settopmatter The usual syntactic sugar

```
\def\settopmatter#1{\setkeys{@ACM@topmatter@}{#1}}
```

Now the settings

```
\settopmatter{printccs=true, printacmref=true}
\if@ACM@manuscript
  \settopmatter{printfolios=true}
\else
  \if@ACM@journal
    \settopmatter{printfolios=true}
  \else
    \settopmatter{printfolios=false}
  \fi
\fi
\settopmatter{authorsperrow=0}
```

\@received The container for the paper history

```
\def\@received{}
```

\received The \received command

```
\newcommand\received[2][]{\def\@tempa{#1}%
  \ifx\@tempa\@empty
```

```
    \ifx\@received\@empty
      \gdef\@received{Received #2}%
    \else
      \g@addto@macro{\@received}{; revised #2}%
    \fi
  \else
    \ifx\@received\@empty
      \gdef\@received{#1 #2}%
    \else
      \g@addto@macro{\@received}{; #1 #2}%
    \fi
  \fi}
\AtEndDocument{%
  \ifx\@received\@empty\else
    \par\bigskip\noindent{\small\normalfont\@received\par}%
  \fi}
```

\acmArticleType Article type. We set up the color.

```
\define@choicekey+{ACM}{articletype}[\ACM@ArticleType\ACM@ArticleType@nr]{%
  Research,Review,Discussion,Invited,Position}[Review]{%
  \ifcase\ACM@ArticleType@nr
  \relax % Research
     \colorlet{@ACM@Article@color}{ACMBlue}%
  \or % Review
     \colorlet{@ACM@Article@color}{ACMOrange}%
  \or % Discussion
     \colorlet{@ACM@Article@color}{ACMGreen}%
  \or % Invited
     \colorlet{@ACM@Article@color}{ACMPurple}%
  \or % Position
     \colorlet{@ACM@Article@color}{ACMRed}%
  \fi
}{%
 \ClassError{\@classname}{Article Type must be Research, Review,\MessageBreak
   Discussion, Invited, or Position}}
\def\acmArticleType#1{\setkeys{ACM}{articletype=#1}}
\if@ACM@acmcp
\acmArticleType{Research}%
\fi

```

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

```
\newenvironment{@ACM@color@frame}{%
  \def\FrameCommand{\hspace*{-6.5pc}%
    \colorbox{@ACM@Article@color!10!white}}%
  \MakeFramed {\advance\hsize
    -6.5pc\relax\FrameRestore}}{\zsaveposy{@ACM@acmcpframe@y}%
  \endMakeFramed}
```

\acmCodeDataLink The code link

```
\def\acmCodeLink#1{%
  \ifx\@acmCodeDataLink\@empty
     \gdef\@acmCodeDataLink{\url{#1}}%
  \else
```

```
    \g@addto@macro{\@acmCodeDataLink}{\\ \url{#1}}%
  \fi}
\def\@acmCodeDataLink{}
```

`\acmContributions` The authors' contrubution statement

```
\def\acmContributions#1{\gdef\@acmContributions{#1}}
\acmContributions{}
```

`\acmDataLink` The code link

```
\let\acmDataLink\acmCodeLink
```

3.17 Concepts system

We exclude CCSXML stuff generated by the ACM system:

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

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

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

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

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

```
\def\textrightarrow{$\rightarrow$}
\def\ccsdesc@parse#1~#2~#3~{%
  \stepcounter{@concepts}%
  \expandafter\ifx\csname CCS@General@#2\endcsname\relax
    \expandafter\gdef\csname CCS@General@#2\endcsname{\textbullet\
      \textbf{#2}}%
    \expandafter\gdef\csname CCS@Punctuation@#2\endcsname{; }%
    \expandafter\gdef\csname CCS@Specific@#2\endcsname{}%
  \g@addto@macro{\@concepts}{\csname CCS@General@#2\endcsname
    \csname CCS@Punctuation@#2\endcsname
    \csname CCS@Specific@#2\endcsname}%
  \fi
  \ifx#3\relax\relax\else
    \expandafter\gdef\csname CCS@Punctuation@#2\endcsname{
      \textrightarrow\ }%
   \expandafter\g@addto@macro\expandafter{\csname CCS@Specific@#2\endcsname}{%
     \addtocounter{@concepts}{-1}%
     \ifnum#1>499\textbf{#3}\else
     \ifnum#1>299\textit{#3}\else
     #3\fi\fi\ifnum\value{@concepts}=0.\else; \fi}%
  \fi
\ccsdesc@parse@finish}

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

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

```
\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

```
\newif\if@printcopyright
\@printcopyrighttrue
```

\if@printpermission Whether to print the permission block

```
\newif\if@printpermission
\@printpermissiontrue
```

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

```
\newif\if@acmowned
\@acmownedtrue
```

Keys:

```
\define@choicekey*{ACM@}{acmcopyrightmode}[%
  \acm@copyrightinput\acm@copyrightmode]{none,%
    acmcopyright,acmlicensed,rightsretained,%
    usgov,usgovmixed,cagov,cagovmixed,licensedusgovmixed,%
    licensedcagov,licensedcagovmixed,othergov,licensedothergov,%
    iw3c2w3,iw3c2w3g,cc}{%
  \@printpermissiontrue
  \@printcopyrighttrue
  \@acmownedtrue
  \ifnum\acm@copyrightmode=0\relax % none
   \@printpermissionfalse
   \@printcopyrightfalse
   \@acmownedfalse
  \fi
  \ifnum\acm@copyrightmode=2\relax % acmlicensed
   \@acmownedfalse
  \fi
  \ifnum\acm@copyrightmode=3\relax % rightsretained
   \@acmownedfalse
  \fi
  \ifnum\acm@copyrightmode=4\relax % usgov
   \@printpermissiontrue
   \@printcopyrightfalse
   \@acmownedfalse
  \fi
  \ifnum\acm@copyrightmode=6\relax % cagov
   \@acmownedfalse
  \fi
  \ifnum\acm@copyrightmode=8\relax % licensedusgovmixed
   \@acmownedfalse
  \fi
  \ifnum\acm@copyrightmode=9\relax % licensedcagov
   \@acmownedfalse
```

```
  \fi
  \ifnum\acm@copyrightmode=10\relax % licensedcagovmixed
   \@acmownedfalse
  \fi
  \ifnum\acm@copyrightmode=11\relax % othergov
   \@acmownedtrue
  \fi
  \ifnum\acm@copyrightmode=12\relax % licensedothergov
   \@acmownedfalse
  \fi
  \ifnum\acm@copyrightmode=13\relax % iw3c2w3
   \@acmownedfalse
  \fi
  \ifnum\acm@copyrightmode=14\relax % iw3c2w3g
   \@acmownedfalse
  \fi
  \ifnum\acm@copyrightmode=15\relax % cc
   \@acmownedfalse
  \fi}
```

`\setcopyright` This is the syntactic sugar around setting keys.

```
\def\setcopyright#1{\setkeys{ACM@}{acmcopyrightmode=#1}}
\setcopyright{acmlicensed}
```

`\setcctype` The type of Creative Commons license used

```
\newcommand\setcctype[2][4.0]{%
  \def\ACM@cc@version{#1}%
  \def\ACM@cc@type{#2}}
\setcctype{by}
```

`\@copyrightowner` Here is the owner of the copyright

```
\def\@copyrightowner{%
  \ifcase\acm@copyrightmode\relax % none
  \or % acmcopyright
  ACM\@.
  \or % acmlicensed
  Copyright held by the owner/author(s). Publication rights licensed to
  ACM\@.
  \or % rightsretained
  Copyright held by the owner/author(s).
  \or % usgov
  \or % usgovmixed
  Copyright held by the owner/author(s).
  \or % cagov
  Copyright Crown in Right of Canada.
  \or %cagovmixed
  Copyright held by the owner/author(s).
  \or %licensedusgovmixed
  Copyright held by the owner/author(s). Publication rights licensed to
  ACM\@.
  \or % licensedcagov
  Copyright held by the owner/author(s).
  \or %licensedcagovmixed
  Copyright held by the owner/author(s). Publication rights licensed to
```

```
ACM\@.
\or % othergov
Copyright held by the owner/author(s).
\or % licensedothergov
Copyright held by the owner/author(s). Publication rights licensed to
ACM\@.
\or % ic2w3www
IW3C2 (International World Wide Web Conference Committee), published
under Creative Commons CC-BY~4.0 License.
\or % ic2w3wwwgoogle
IW3C2 (International World Wide Web Conference Committee), published
under Creative Commons CC-BY-NC-ND~4.0 License.
\or % cc
Copyright held by the owner/author(s).
\fi}
```

`\@formatdoi` Print a clickable DOI

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

`\@ACM@copyright@check@cc` This macro is no longer needed due to the change in ACM policy.

`\@copyrightpermission` The canned permission block.

```
\def\@copyrightpermission{%
 \ifcase\acm@copyrightmode\relax % none
 \or % acmcopyright
  Permission to make digital or hard copies of all or part of this
  work for personal or classroom use is granted without fee provided
  that copies are not made or distributed for profit or commercial
  advantage and that copies bear this notice and the full citation on
  the first page. Copyrights for components of this work owned by
  others than ACM must be honored. Abstracting with credit is
  permitted. To copy otherwise, or republish, to post on servers or
  to redistribute to lists, requires prior specific permission
  and\hspace*{.5pt}/or
  a fee. Request permissions from permissions@acm.org.
 \or % acmlicensed
  Permission to make digital or hard copies of all or part of this
  work for personal or classroom use is granted without fee provided
  that copies are not made or distributed for profit or commercial
  advantage and that copies bear this notice and the full citation on
  the first page. Copyrights for components of this work owned by
  others than the author(s) must be honored. Abstracting with credit
  is permitted. To copy otherwise, or republish, to post on servers
  or to redistribute to lists, requires prior specific permission
  and\hspace*{.5pt}/or a fee. Request permissions from
  permissions@acm.org.
 \or % rightsretained
  Permission to make digital or hard copies of all or part of this
  work for personal or classroom use is granted without fee provided
  that copies are not made or distributed for profit or commercial
  advantage and that copies bear this notice and the full citation on
  the first page. Copyrights for third-party components of this work
  must be honored. For all other uses, contact the
  owner\hspace*{.5pt}/author(s).
```

```
\or % usgov
 This paper is authored by an employee(s) of the United States
 Government and is in the public domain. Non-exclusive copying or
 redistribution is allowed, provided that the article citation is
 given and the authors and agency are clearly identified as its
 source. Request permissions from
 owner\hspace*{.5pt}/author(s).
\or % usgovmixed
 ACM acknowledges that this contribution was authored or co-authored
 by an employee, contractor, or affiliate of the United States
 government. As such, the United States government retains a
 nonexclusive, royalty-free right to publish or reproduce this
 article, or to allow others to do so, for government purposes
 only. Request permissions from owner\hspace*{.5pt}/author(s).
\or % cagov
 This article was authored by employees of the Government of
 Canada. As such, the Canadian government retains all interest in
 the copyright to this work and grants to ACM a nonexclusive,
 royalty-free right to publish or reproduce this article, or to
 allow others to do so, provided that clear attribution is given
 both to the authors and the Canadian government agency employing
 them. Permission to make digital or hard copies for personal or
 classroom use is granted. Copies must bear this notice and the full
 citation on the first page. Copyrights for components of this work
 owned by others than the Canadian Government must be honored. To
 copy otherwise, distribute, republish, or post, requires prior
 specific permission and/or a fee. Request permissions from
 owner\hspace*{.5pt}/author(s).
\or % cagovmixed
 ACM acknowledges that this contribution was co-authored by an
 affiliate of the national government of Canada. As such, the Crown
 in Right of Canada retains an equal interest in the
 copyright. Reprints must include clear attribution to ACM and the
 author's government agency affiliation. Permission to make digital
 or hard copies for personal or classroom use is granted. Copies
 must bear this notice and the full citation on the first
 page. Copyrights for components of this work owned by others than
 ACM must be honored. To copy otherwise, distribute, republish, or
 post, requires prior specific permission and/or a fee. Request
 permissions from owner\hspace*{.5pt}/author(s).
\or % licensedusgovmixed
 Publication rights licensed to ACM\@. ACM acknowledges that this
 contribution was authored or co-authored by an employee, contractor
 or affiliate of the United States government. As such, the
 Government retains a nonexclusive, royalty-free right to publish or
 reproduce this article, or to allow others to do so, for Government
 purposes only. Request permissions from
 owner\hspace*{.5pt}/author(s).
\or % licensedcagov
 This article was authored by employees of the Government of
 Canada. As such, the Canadian government retains all interest in
 the copyright to this work and grants to ACM a nonexclusive,
 royalty-free right to publish or reproduce this article, or to
 allow others to do so, provided that clear attribution is given
```

```
  both to the authors and the Canadian government agency employing
  them. Permission to make digital or hard copies for personal or
  classroom use is granted. Copies must bear this notice and the full
  citation on the first page. Copyrights for components of this work
  owned by others than the Canadian Government must be honored. To
  copy otherwise, distribute, republish, or post, requires prior
  specific permission and/or a fee. Request permissions from
  owner\hspace*{.5pt}/author(s).
 \or % licensedcagovmixed
  Publication rights licensed to ACM. ACM acknowledges that this
  contribution was authored or co-authored by an employee, contractor
  or affiliate of the national government of Canada. As such, the
  Government retains a nonexclusive, royalty-free right to publish or
  reproduce this article, or to allow others to do so, for Government
  purposes only. Request permissions from
  owner\hspace*{.5pt}/author(s).
 \or % othergov
  ACM acknowledges that this contribution was authored or co-authored
  by an employee, contractor or affiliate of a national
  government. As such, the Government retains a nonexclusive,
  royalty-free right to publish or reproduce this article, or to
  allow others to do so, for Government purposes only. Request
  permissions from owner\hspace*{.5pt}/author(s).
 \or % licensedothergov
  Publication rights licensed to ACM\@. ACM acknowledges that this
  contribution was authored or co-authored by an employee, contractor
  or affiliate of a national government. As such, the Government
  retains a nonexclusive, royalty-free right to publish or reproduce
  this article, or to allow others to do so, for Government purposes
  only. Request permissions from owner\hspace*{.5pt}/author(s).
\or % iw3c2w3
  This paper is published under the Creative Commons Attribution~4.0
  International (CC-BY~4.0) license. Authors reserve their rights to
  disseminate the work on their personal and corporate Web sites with
  the appropriate attribution.
\or % iw3c2w3g
  This paper is published under the Creative Commons
  Attribution-NonCommercial-NoDerivs~4.0 International
  (CC-BY-NC-ND~4.0) license. Authors reserve their rights to
  disseminate the work on their personal and corporate Web sites with
  the appropriate attribution.
\or % CC
  \IfEq{\ACM@cc@type}{zero}{%
    \def\ACM@CC@Url{https://creativecommons.org/publicdomain/zero/1.0}}{%
\edef\ACM@CC@Url{https://creativecommons.org/licenses/\ACM@cc@type/\ACM@cc@version}}%
 \href{\ACM@CC@Url}{\includegraphics[height=5ex]{doclicense-CC-\ACM@cc@type-88x31}}\\
  \href{\ACM@CC@Url}{%
  This work is licensed under a Creative Commons
  \IfEq{\ACM@cc@type}{zero}{CC0 1.0 Universal}{%
    \IfEq{\ACM@cc@type}{by}{Attribution}{}%
    \IfEq{\ACM@cc@type}{by-sa}{Attribution-ShareAlike}{}%
    \IfEq{\ACM@cc@type}{by-nd}{Attribution-NoDerivatives}{}%
    \IfEq{\ACM@cc@type}{by-nc}{Attribution-NonCommercial}{}%
    \IfEq{\ACM@cc@type}{by-nc-sa}{Attribution-NonCommercial-ShareAlike}{}%
```

```
    \IfEq{\ACM@cc@type}{by-nc-nd}{Attribution-NonCommercial-NoDerivatives}{}%
      ~\IfEq{\ACM@cc@version}{4.0}{4.0 International}{3.0 Unported}%
    }
    License.}%
 \fi}
```

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

```
\def\copyrightyear#1{\def\@copyrightyear{#1}}
\copyrightyear{\@acmYear}
```

`\@teaserfigures` The teaser figures container

```
\def\@teaserfigures{}
```

`teaserfigure` The teaser figure

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

`\@saveteaser` Saving the teaser

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

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

```
\renewcommand{\thanks}[1]{%
  \@ifnotempty{#1}{%
    \if@ACM@anonymous
      \g@addto@macro\thankses{\thanks{A note}}%
   \else
    \g@addto@macro\thankses{\thanks{#1}}%
   \fi}}
```

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

```
\newcommand{\anon}[2][ANONYMIZED]{%
  \if@ACM@anonymous%
    {\color{ACMOrange}#1}%
  \else%
    #2%
  \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

```
\ifx\@beginmaketitlehook\@undefined
  \let\@beginmaketitlehook\@empty
\fi
```

`\AtBeginMaketitle` Adding to the hook

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

3.20 ACM Engage top matter

\@acmengagemetadata The special metadata for ACM engage course materials

```
\def\@acmengagemetadata{}
```

\setengagemetadata Adding topic to engage metadata

```
\def\setengagemetadata#1#2{%
  \g@addto@macro{\@acmengagemetadata}{%
    \@setengagemetadata{#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*⟩`]`.

```
\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.

```
\def\maketitle{\@beginmaketitlehook
  \@ACM@maketitle@typesettrue
  \if@ACM@anonymous
    % Anonymize omission of \author-s
    \ifnum\num@authorgroups=0\author{}\fi
  \fi
  \begingroup
  \let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig
  \let\@footnotemark\@footnotemark@nolink
  \let\@footnotetext\@footnotetext@nolink
  \renewcommand\thefootnote{\@fnsymbol\c@footnote}%
  \hsize=\textwidth
  \def\@makefnmark{\hbox{\@textsuperscript{\@thefnmark}}}%
  \@mktitle\if@ACM@sigchiamode\else\@mkauthors\fi\@mkteasers
  \@printtopmatter
  \if@ACM@sigchiamode\@mkauthors\fi
  \setcounter{footnote}{0}%
  \def\@makefnmark{\hbox{\@textsuperscript{\normalfont\@thefnmark}}}%
  \@titlenotes
  \@subtitlenotes
  \@authornotes
  \let\@makefnmark\relax
  \let\@thefnmark\relax
  \let\@makefntext\noindent
  \ifx\@empty\thankses\else
    \footnotetextauthorsaddresses{%
      \def\par{\let\par\@par}\parindent\z@\@setthanks}%
  \fi
  \if@ACM@acmcp\else
    \ifx\@empty\@authorsaddresses\else
```

```
      \if@ACM@anonymous\else
        \if@ACM@journal@bibstrip@or@tog
          \footnotetextauthorsaddresses{%
            \def\par{\let\par\@par}\parindent\z@\@setauthorsaddresses}%
        \fi
      \fi
  \fi
\fi
\if@ACM@nonacm
  \ifnum\acm@copyrightmode=15\relax % cc
     \footnotetextcopyrightpermission{\@copyrightpermission}%
  \fi
\else
  \if@ACM@acmcp\else
  \footnotetextcopyrightpermission{%
  \if@ACM@authordraft
      \raisebox{-2ex}[\z@][\z@]{\makebox[0pt][l]{\large\bfseries
          Unpublished working draft. Not for distribution.}}%
     \color[gray]{0.9}%
  \fi
  \parindent\z@\parskip0.1\baselineskip
  \if@ACM@authorversion\else
    \if@printpermission\@copyrightpermission\par\fi
  \fi
  \if@ACM@manuscript\else
     \if@ACM@journal@bibstrip\else % Print the conference information
       \if@ACM@engage
          {\itshape \@acmBooktitle, \@acmYear.}\par
       \else
       {\itshape \acmConference@shortname, \acmConference@venue}\par
       \fi
     \fi
  \fi
  \if@printcopyright
    \copyright\ \@copyrightyear\ \@copyrightowner\\
  \else
    \ifx\@copyrightyear\@empty\else
      \@copyrightyear.\
    \fi
  \fi
  \if@ACM@manuscript
    Manuscript submitted to ACM\\
  \else
    \if@ACM@authorversion
        This is the author's version of the work. It is posted here for
        your personal use. Not for redistribution. The definitive Version
        of Record was published in
        \if@ACM@journal@bibstrip
          \emph{\@journalName}%
        \else
          \emph{\@acmBooktitle}%
        \fi
        \ifx\@acmDOI\@empty
        .
```

```
          \else
            , \@formatdoi{\@acmDOI}.
          \fi\\
        \else
          \if@ACM@nonacm\else
            \if@ACM@journal@bibstrip
              ACM~\@permissionCodeTwo/\@acmYear/\@acmMonth-ART\@acmArticle\\
              \@formatdoi{\@acmDOI}%
            \else % Conference
              \ifx\@acmISBN\@empty\else ACM~ISBN~\@acmISBN\\\fi
              \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi%
            \fi
          \fi
        \fi
      \fi}%
    \fi
    \fi
\endgroup
\if@ACM@engage\@typesetengagemetadata\fi
\setcounter{footnote}{0}%
\@mkabstract
\ifx\@translatedabstracts\@empty\else
\@translatedabstracts\fi
\if@ACM@printccs
\ifx\@concepts\@empty\else\bgroup
    {\@specialsection{CCS Concepts}%
       \noindent\@concepts\par}\egroup
    \fi
 \fi
 \if@ACM@acmcp\else
    \ifx\@keywords\@empty\else\bgroup
       {\@specialsection{\keywordsname}%
          \noindent\@keywords\par}\egroup
    \fi
   \ifx\@translatedkeywords\@empty\else
      \@translatedkeywords
   \fi
\fi
\let\metadata@authors=\authors
\nxandlist{, }{, }{, }\metadata@authors
\def\@ACM@checkaffil{}%
\hypersetup{%
  pdfauthor={\metadata@authors},
  pdftitle={\@title},
  pdfsubject={\@concepts},
  pdfkeywords={\@keywords},
  pdfcreator={LaTeX with acmart
    \csname ver@\@classname.cls\endcsname\space
    and hyperref
    \csname ver@hyperref.sty\endcsname}}%
\andify\authors
\andify\shortauthors
\global\let\authors=\authors
\global\let\shortauthors=\shortauthors
```

```
  \if@ACM@printacmref
     \@mkbibcitation
  \fi
  \global\@topnum\z@ % this prevents floats from falling
                     % at the top of page 1
  \global\@botnum\z@ % we do not want them to be on the bottom either
  \@printendtopmatter
  \@afterindentfalse
  \@afterheading
  \if@ACM@acmcp
    \set@ACM@acmcpbox
    \AtEndDocument{\end@ACM@color@frame}%
    \@ACM@color@frame
  \fi
}
```

\set@ACM@acmcpbox Setting infobox for acmcp

```
\newbox\@ACM@acmcpbox
\def\set@ACM@acmcpbox{%
  \bgroup
  \hsize=5pc
  \global\setbox\@ACM@acmcpbox=\vbox{%
    \setlength{\parindent}{\z@}%
    {\includegraphics[width=\hsize]{acm-jdslogo}\par}%
    \scriptsize
    \ifnum\getrefnumber{TotPages}>1\else
      \zrefused{@ACM@acmcpbox@y}%
      \zrefused{@ACM@acmcpframe@y}%
      \@tempdima=\dimexpr\zposy{@ACM@acmcpbox@y}sp -
      \zposy{@ACM@acmcpframe@y}sp+0.3\FrameSep+
      \@ACM@acmcp@delta\relax
      \ifdim\@tempdima>0pt\relax
         \vspace*{\@tempdima}%
         \protected@write\@auxout{}%
         {\string\global\@ACM@acmcp@delta=\the\@tempdima\relax}%
      \fi
    \fi
    \ifx\@acmCodeDataLink\@empty\else\bigskip
    Code and data links:\\ \@acmCodeDataLink\par\bigskip
    \fi
    \ifx\@keywords\@empty\else\bigskip
      Keywords: \@keywords\par
    \fi
    \ifx\@acmContributions\@empty\else\bigskip
      \@acmContributions\par
    \fi
    \ifx\@empty\@authorsaddresses\else\bigskip\@setauthorsaddresses\fi
    \zsaveposy{@ACM@acmcpbox@y}%
    \par
  }
\egroup}
```

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

```
\def\@specialsection#1{%
```

```
  \let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig
  \ifcase\ACM@format@nr
  \relax % manuscript
    \par\medskip\small\noindent#1: %
  \or % acmsmall
    \par\medskip\small\noindent#1: %
  \or % acmlarge
    \par\medskip\small\noindent#1: %
  \or % acmtog
    \par\medskip\small\noindent#1: %
  \or % sigconf
    \section*{#1}%
  \or % siggraph
    \section*{#1}%
  \or % sigplan
     \noindentparagraph*{#1:~}%
  \or % sigchi
    \section*{#1}%
  \or % sigchi-a
    \section*{#1}%
  \or % acmengage
    \section*{#1}%
  \or % acmcp
    \section*{#1}%
    \fi
  \let\@vspace\@vspace@acm
  \let\@vspacer\@vspacer@acm
}
```

`\@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.

```
\def\@printtopmatter{%
  \ifx\@startPage\@empty
     \gdef\@startPage{1}%
  \else
     \setcounter{page}{\@startPage}%
  \fi
  \@tempdima=\ht\mktitle@bx
  \advance\@tempdima by \dp\mktitle@bx
  \ifdim\@tempdima>0.9\textheight
    \loop
      \setbox\@tempboxa=\vsplit \mktitle@bx to 0.9\textheight
      \thispagestyle{firstpagestyle}%
      \noindent\unvbox\@tempboxa
      \clearpage
      \@tempdima=\ht\mktitle@bx
      \advance\@tempdima by \dp\mktitle@bx
    \ifdim\@tempdima>0.9\textheight\repeat
  \fi
  \thispagestyle{firstpagestyle}%
  \noindent
```

```
  \ifcase\ACM@format@nr
  \relax % manuscript
    \box\mktitle@bx\par
  \or % acmsmall
    \box\mktitle@bx\par
  \or % acmlarge
    \box\mktitle@bx\par
  \or % acmtog
    \twocolumn[\box\mktitle@bx]%
  \or % sigconf
    \twocolumn[\box\mktitle@bx]%
  \or % siggraph
    \twocolumn[\box\mktitle@bx]%
  \or % sigplan
    \twocolumn[\box\mktitle@bx]%
  \or % sigchi
    \twocolumn[\box\mktitle@bx]%
  \or % sigchi-a
    \par\box\mktitle@bx\par\bigskip
  \or % acmengage
    \twocolumn[\box\mktitle@bx]%
  \or % acmcp
     \box\mktitle@bx\par
  \fi
}
```

`\@mktitle` The title of the article

```
\def\@mktitle{%
  \ifcase\ACM@format@nr
  \relax % manuscript
    \@mktitle@i
  \or % acmsmall
    \@mktitle@i
  \or % acmlarge
    \@mktitle@i
  \or % acmtog
    \@mktitle@i
  \or % sigconf
    \@mktitle@iii
  \or % siggraph
    \@mktitle@iii
  \or % sigplan
    \@mktitle@iii
  \or % sigchi
    \@mktitle@iii
  \or % sigchi-a
    \@mktitle@iv
  \or % acmengage
    \@mktitle@iii
  \or % acmcp
    \@mktitle@i
  \fi
}
```

\@titlefont The font to typeset the title

```
\def\@titlefont{%
  \ifcase\ACM@format@nr
  \relax % manuscript
    \LARGE\sffamily\bfseries
  \or % acmsmall
    \LARGE\sffamily\bfseries
  \or % acmlarge
    \LARGE\sffamily\bfseries
  \or % acmtog
    \Huge\sffamily
  \or % sigconf
    \Huge\sffamily\bfseries
  \or % siggraph
    \Huge\sffamily\bfseries
  \or % sigplan
    \Huge\bfseries
  \or % sigchi
    \Huge\sffamily\bfseries
  \or % sigchi-a
     \Huge\bfseries
  \or % acmengage
    \Huge\sffamily\bfseries
  \or % acmcp
    \LARGE\sffamily\bfseries
  \fi}
```

\@subtitlefont The font to typeset the subtitle

```
\def\@subtitlefont{\normalsize
  \ifcase\ACM@format@nr
  \relax % manuscript
    \mdseries
  \or % acmsmall
    \mdseries
  \or % acmlarge
    \mdseries
  \or % acmtog
     \LARGE
  \or % sigconf
     \LARGE\mdseries
  \or % siggraph
     \LARGE\mdseries
  \or % sigplan
     \LARGE\mdseries
  \or % sigchi
     \LARGE\mdseries
  \or % sigchi-a
     \mdseries
  \or % acmengage
     \LARGE\mdseries
  \or % acmcp
    \mdseries
  \fi}
```

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

```
\def\@mktitle@i{\hsize=\textwidth
  \if@ACM@acmcp
    \advance\hsize by -6pc%
  \fi
  \@ACM@title@width=\hsize
  \setbox\mktitle@bx=\vbox{\noindent\@titlefont
    \parbox[t]{\@ACM@title@width}{\raggedright
      \@titlefont\noindent
      \@title\@translatedtitle%
  \ifx\@subtitle\@empty\else
    \par\noindent{\@subtitlefont\@subtitle\@translatedsubtitle}%
  \fi}%
  \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.

```
\def\@mktitle@iii{\hsize=\textwidth
    \setbox\mktitle@bx=\vbox{\@titlefont\centering
      \@ACM@title@width=\hsize
      \parbox[t]{\@ACM@title@width}{\centering\@titlefont
        \@title\@translatedtitle%
        \ifx\@subtitle\@empty\else
          \par\noindent{\@subtitlefont\@subtitle\@translatedsubtitle}
        \fi
      }%
      \par\bigskip}}%
```

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

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

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

```
  \fi\fi
  #1}
```

\institution
\position
\department
\streetaddress
\city
\state
\postcode
\country

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

```
\def\streetaddress#1{\ClassWarning{\@classname}{ACM no longer collects
  authors' postal addresses.  I am ignoring your street
  address}\unskip\ignorespaces}
\def\postcode#1{\ClassWarning{\@classname}{ACM no longer collects
  authors' postal addresses.  I am ignoring your postal
  code}\unskip\ignorespaces}
\if@ACM@journal
  \def\position#1{\unskip\ignorespaces}
  \def\institution#1{\global\@ACM@instpresenttrue
    \unskip~#1\ignorespaces}
  \def\city#1{\global\@ACM@citypresenttrue\unskip\ignorespaces}
  \def\state#1{\unskip\ignorespaces}
  \newcommand\department[2][0]{\unskip\ignorespaces}
  \def\country#1{\StrDel{#1}{ }[\@tempa]%
    \ifx\@tempa\@empty\else
    \global\@ACM@countrypresenttrue\fi
    \if@ACM@affiliation@obeypunctuation\else, \fi#1\ignorespaces}
\else
  \def\position#1{\if@ACM@affiliation@obeypunctuation#1\else#1\par\fi}%
  \def\institution#1{\global\@ACM@instpresenttrue
    \if@ACM@affiliation@obeypunctuation#1\else#1\par\fi}%
  \newcommand\department[2][0]{\if@ACM@affiliation@obeypunctuation
    #2\else#2\par\fi}%
  \def\city#1{\global\@ACM@citypresenttrue\@ACM@addtoaddress{#1}}%
  \let\state\@ACM@addtoaddress
  \def\country#1{\global\@ACM@countrypresenttrue\@ACM@addtoaddress{#1}}%
\fi
```

\@mkauthors

Typesetting the authors

```
\def\@mkauthors{\begingroup
  \hsize=\textwidth
  \ifcase\ACM@format@nr
  \relax % manuscript
    \@mkauthors@i
  \or % acmsmall
    \@mkauthors@i
  \or % acmlarge
    \@mkauthors@i
  \or % acmtog
    \@mkauthors@i
  \or % sigconf
    \@mkauthors@iii
  \or % siggraph
    \@mkauthors@iii
  \or % sigplan
    \@mkauthors@iii
  \or % sigchi
    \@mkauthors@iii
```

```
  \or % sigchi-a
    \@mkauthors@iv
  \or % acmengage
    \@mkauthors@iii
  \or % acmcp
    \@mkauthors@i
  \fi
  \endgroup
}
```

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

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

`\@affiliationfont` Font for affiliations

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

Adjusting fonts for different formats

```
\ifcase\ACM@format@nr
\relax % manuscript
\or % acmsmall
  \def\@authorfont{\large\sffamily}
  \def\@affiliationfont{\small\normalfont}
\or % acmlarge
\or % acmtog
  \def\@authorfont{\LARGE\sffamily}
  \def\@affiliationfont{\large}
\or % sigconf
  \def\@authorfont{\LARGE}
  \def\@affiliationfont{\large}
\or % siggraph
  \def\@authorfont{\normalsize\normalfont}
  \def\@affiliationfont{\normalsize\normalfont}
\or % sigplan
  \def\@authorfont{\Large\normalfont}
  \def\@affiliationfont{\normalsize\normalfont}
\or % sigchi
  \def\@authorfont{\bfseries}
  \def\@affiliationfont{\mdseries}
\or % sigchi-a
  \def\@authorfont{\bfseries}
  \def\@affiliationfont{\mdseries}
\or % acmengage
  \def\@authorfont{\LARGE}
  \def\@affiliationfont{\large}
\or % acmcp
  \def\@authorfont{\large\sffamily}
  \def\@affiliationfont{\small\normalfont}
\fi
```

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

```
\def\@typeset@author@line{%
  \andify\@currentauthors\par\noindent
  \@currentauthors\def\@currentauthors{}%
```

```
  \ifx\@currentaffiliations\@empty\else
    \andify\@currentaffiliations
      \unskip, {\@currentaffiliations}\par
  \fi
  \def\@currentaffiliations{}}
```

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

```
\newif\if@ACM@instpresent
\@ACM@instpresenttrue
```

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

```
\newif\if@ACM@citypresent
\@ACM@citypresenttrue
```

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

```
\newif\if@ACM@countrypresent
\@ACM@countrypresenttrue
```

`\@ACM@resetaffil` Reset affiliation flags

```
\def\@ACM@resetaffil{%
  \global\@ACM@instpresentfalse
  \global\@ACM@citypresentfalse
  \global\@ACM@countrypresentfalse
}
```

`\@ACM@checkaffil` Check affiliation flags

```
\def\@ACM@checkaffil{%
  \if@ACM@instpresent\else
  \ClassWarningNoLine{\@classname}{No institution present for an affiliation}%
  \fi
  \if@ACM@citypresent\else
  \ClassWarningNoLine{\@classname}{No city present for an affiliation}%
  \fi
  \if@ACM@countrypresent\else
  \ClassError{\@classname}{No country present for an affiliation}{ACM
    requires each author to indicate their country using country macro.}%
  \fi
}
```

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

```
\def\@mkauthors@i{%
  \def\@currentauthors{}%
  \def\@currentaffiliations{}%
  \global\let\and\@typeset@author@line
  \def\@author##1{%
    \ifx\@currentauthors\@empty
      \gdef\@currentauthors{\@authorfont\MakeUppercase{##1}}%
    \else
       \g@addto@macro{\@currentauthors}{\and\MakeUppercase{##1}}%
    \fi
    \gdef\and{}}%
  \def\email##1##2{}%
```

```
\def\affiliation##1##2{%
  \def\@tempa{##2}\ifx\@tempa\@empty\else
     \ifx\@currentaffiliations\@empty
        \gdef\@currentaffiliations{%
          \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
          \setkeys{@ACM@affiliation@}{##1}%
          \@ACM@resetaffil
          \@affiliationfont##2\@ACM@checkaffil}%
     \else
       \g@addto@macro{\@currentaffiliations}{\and
         \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
         \setkeys{@ACM@affiliation@}{##1}\@ACM@resetaffil
         ##2\@ACM@checkaffil}%
    \fi
  \fi
   \global\let\and\@typeset@author@line}%
\if@ACM@acmcp
  \advance\hsize by -6pc%
\fi
\global\setbox\mktitle@bx=\vbox{\noindent\unvbox\mktitle@bx\par\medskip
  \noindent\addresses\@typeset@author@line
 \par\medskip}%
}
```

`\@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

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

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

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

`\author@bx@sep` The separation between author boxes

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

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

```
\def\@typeset@author@bx{\bgroup\hsize=\author@bx@wd
  \def\and{\par}\normalbaselines
  \global\setbox\author@bx=\vtop{\if@ACM@sigchiamode\else\centering\fi
    \@authorfont\@currentauthors\par\@affiliationfont
    \@currentaffiliation}\egroup
  \box\author@bx\hspace{\author@bx@sep}%
  \gdef\@currentauthors{}%
  \gdef\@currentaffiliation{}}
```

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

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

```
  \author@bx@wd=\textwidth\relax
  \advance\author@bx@wd by -\author@bx@sep\relax
  \ifnum\@ACM@authorsperrow>0\relax
    \divide\author@bx@wd by \@ACM@authorsperrow\relax
  \else
    \ifcase\num@authorgroups
    \relax % 0?
    \or  % 1=one author per row
    \or  % 2=two authors per row
       \divide\author@bx@wd by \num@authorgroups\relax
    \or  % 3=three authors per row
       \divide\author@bx@wd by \num@authorgroups\relax
    \or  % 4=two authors per row (!)
       \divide\author@bx@wd by 2\relax
    \else % three authors per row
       \divide\author@bx@wd by 3\relax
    \fi
  \fi
  \advance\author@bx@wd by -\author@bx@sep\relax
```

Now, parsing of \addresses:

```
  \gdef\@currentauthors{}%
  \gdef\@currentaffiliation{}%
  \def\@author##1{\ifx\@currentauthors\@empty
    \gdef\@currentauthors{\par##1}%
  \else
    \g@addto@macro\@currentauthors{\par##1}%
  \fi
  \gdef\and{}}%
  \def\email##1##2{\ifx\@currentaffiliation\@empty
    \gdef\@currentaffiliation{\bgroup
      \mathchardef\UrlBreakPenalty=10000\nolinkurl{##2}\egroup}%
  \else
    \g@addto@macro\@currentaffiliation{\par\bgroup
      \mathchardef\UrlBreakPenalty=10000\nolinkurl{##2}\egroup}%
  \fi}%
  \def\affiliation##1##2{\ifx\@currentaffiliation\@empty
    \gdef\@currentaffiliation{%
      \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
      \setkeys{@ACM@affiliation@}{##1}\@ACM@resetaffil
      ##2\@ACM@checkaffil}%
  \else
    \g@addto@macro\@currentaffiliation{\par
      \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
      \setkeys{@ACM@affiliation@}{##1}\@ACM@resetaffil
      ##2\@ACM@checkaffil}%
  \fi
  \global\let\and\@typeset@author@bx
}%
```

Actual typesetting is done by the \and macro:

```
  \hsize=\textwidth
  \global\setbox\mktitle@bx=\vbox{\noindent
    \unvbox\mktitle@bx\par\medskip\leavevmode
    \lineskip=1pc\relax\centering\hspace*{-1em}%
```

```
    \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 overriden.

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

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

```
  \author@bx@wd=\columnwidth\relax
  \advance\author@bx@wd by -\author@bx@sep\relax
  \ifnum\@ACM@authorsperrow>0\relax
    \divide\author@bx@wd by \@ACM@authorsperrow\relax
  \else
    \ifcase\num@authorgroups
    \relax % 0?
    \or  % 1=one author per row
    \else  % 2=two authors per row
       \divide\author@bx@wd by 2\relax
    \fi
  \fi
  \advance\author@bx@wd by -\author@bx@sep\relax
```

Now, parsing of \addresses:

```
  \gdef\@currentauthors{}%
  \gdef\@currentaffiliation{}%
  \def\@author##1{\ifx\@currentauthors\@empty
    \gdef\@currentauthors{\par##1}%
  \else
    \g@addto@macro\@currentauthors{\par##1}%
  \fi
  \gdef\and{}}%
  \def\email##1##2{\ifx\@currentaffiliation\@empty
    \gdef\@currentaffiliation{\nolinkurl{##2}}%
  \else
    \g@addto@macro\@currentaffiliation{\par\nolinkurl{##2}}%
  \fi}%
  \def\affiliation##1##2{\ifx\@currentaffiliation\@empty
    \gdef\@currentaffiliation{%
      \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
      \setkeys{@ACM@affiliation@}{##1}\@ACM@resetaffil
      ##2\@ACM@checkaffil}%
  \else
    \g@addto@macro\@currentaffiliation{\par
      \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
      \setkeys{@ACM@affiliation@}{##1}\@ACM@resetaffil
      ##2\@ACM@checkaffil}%
  \fi
  \global\let\and\@typeset@author@bx}%
%
```

Actual typesetting is done by the \and macro

```
    \bgroup\hsize=\columnwidth
    \par\raggedright\leftskip=\z@
```

```
    \lineskip=1pc\noindent
    \addresses\let\and\@typeset@author@bx\and\par\bigskip\egroup}
```

\@mkauthorsaddresses Typesetting authors' addresses in the footnote style

```
\def\@mkauthorsaddresses{%
  \ifnum\num@authors>1\relax
  Authors' \else Author's \fi
  Contact Information:
  \bgroup
  \def\streetaddress##1{\ClassWarning{\@classname}{ACM no longer collects
  authors' postal addresses.  I am ignoring your street
  address}\unskip\ignorespaces}%
  \def\postcode##1{\ClassWarning{\@classname}{ACM no longer collects
  authors' postal addresses.  I am ignoring your postal
  code}\unskip\ignorespaces}%
  \def\position##1{\unskip\ignorespaces}%
  \gdef\@ACM@institution@separator{, }%
 \def\institution##1{\unskip\@ACM@institution@separator ##1\gdef\@ACM@institution@separator{ and }
  \def\city##1{\unskip, ##1}%
  \def\state##1{\unskip, ##1}%
  \renewcommand\department[2][0]{\unskip\@addpunct, ##2}%
  \def\country##1{\unskip, ##1}%
  \def\and{\unskip; \gdef\@ACM@institution@separator{, }}%
  \def\@author##1{##1}%
  \def\email##1##2{\unskip, \nolinkurl{##2}}%
  \addresses
  \egroup}

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

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

```
\def\@setaddresses{}
```

\@authornotemark Adding a footnote mark to authors. This version adds a "normal" footnote mark.

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

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

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

\@mkteasers Typesetting the teasers

```
\def\@mkteasers{%
  \ifx\@teaserfigures\@empty\else
    \def\@teaser##1{\par\bigskip\bgroup
      \captionsetup{type=figure}##1\egroup\par}
    \global\setbox\mktitle@bx=\vbox{\noindent\unvbox\mktitle@bx\par
      \noindent\@Description@presentfalse
      \@teaserfigures\par\if@Description@present\else
         \global\@undescribed@imagestrue
         \ClassWarning{\@classname}{A possible image without
           description}\fi
```

```
    \medskip}%
  \fi}
```

`\@mkabstract` Typesetting the abstract

```
\def\@mkabstract{\bgroup
  \ifx\@abstract\@lempty\else
  {\phantomsection\addcontentsline{toc}{section}{\abstractname}%
    \if@ACM@journal
       \everypar{\setbox\z@\lastbox\everypar{}}\small
    \else
      \section*{\abstractname}%
    \fi
   \ignorespaces\@abstract\par}%
  \fi\egroup}
```

`\@mktranslatedabstract` Typesetting a translated abstract

```
\def\@mktranslatedabstract#1{\selectlanguage{#1}%
    \if@ACM@journal
       \everypar{\setbox\z@\lastbox\everypar{}}\small
    \else
       \section*{\abstractname}%
    \fi
   \ignorespaces}
```

`\@mkbibcitation` Print the `bibcitation` format

```
\def\@mkbibcitation{\bgroup
  \let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig
 \def\@pages@word{\ifnum\getrefnumber{TotPages}=1\relax page\else pages\fi}%
  \def\footnotemark{}%
  \def\\{\unskip{} \ignorespaces}%
  \def\footnote{\ClassError{\@classname}{Please do not use footnotes
      inside a \string\title{} or \string\author{} command! Use
      \string\titlenote{} or \string\authornote{} instead!}}%
  \def\@article@string{\ifx\@acmArticle\@empty{\ }\else,
    Article~\@acmArticle\ \fi}%
  \par\medskip\small\noindent{\bfseries ACM Reference Format:}\par\nobreak
  \noindent\bgroup
    \def\\{\unskip{}, \ignorespaces}\authors\egroup. \@acmYear. \@title
  \ifx\@subtitle\@empty. \else: \@subtitle. \fi
  \if@ACM@nonacm\else
    % The 'nonacm' option disables 'printacmref' by default,
    % and the present \@mkbibcitation definition is never used
    % in this case. The conditional remains useful if the user
    % explicitly sets \settopmatter{printacmref=true}.
    \if@ACM@journal@bibstrip
       \textit{\@journalNameShort}
       \@acmVolume, \@acmNumber \@article@string (\@acmPubDate),
       \ref{TotPages}~\@pages@word.
    \else
       In \textit{\@acmBooktitle}%
       \ifx\@acmEditors\@empty\textit{.}\else
         \andify\@acmEditors\textit{, }\@acmEditors~\@editorsAbbrev.%
       \fi\
```

```
      ACM, New York, NY, USA%
        \@article@string\unskip, \ref{TotPages}~\@pages@word.
    \fi
  \fi
  \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi
\par\egroup}
```

`\@printendtopmatter` End the top matter

```
\def\@printendtopmatter{%
  \let\@vspace\@vspace@orig
  \let\@vspacer\@vspacer@orig
  \par\bigskip
  \let\@vspace\@vspace@acm
  \let\@vspacer\@vspacer@acm
  }
```

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

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

`\@setauthorsaddresses`

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

`\@typesetengagemetadata` Typesetting special metadata for ACM Engage

```
\def\@typesetengagemetadata{%
  \def\@setengagemetadata##1##2{\par\noindent\textbf{##1} ##2\par}%
  \@acmengagemetadata}
```

¡*tagged¿ We stop tagging inside maketitle for now. Ulrike's code again.

```
\ExplSyntaxOn
\AddToHook{cmd/maketitle/before}
 {\tagstructbegin{tag=Title}\tagmcbegin{} \tag_stop:}
\AddToHook{cmd/maketitle/after}
 {\tag_start:\tagmcend\tagstructend }
\ExplSyntaxOff
```

¡/tagged¿

3.22 Headers and Footers

We use `fancyhdr` for our headers and footers:

```
\RequirePackage{fancyhdr}
```

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

```
\let\ACM@ps@plain\ps@plain
\let\ACM@ps@myheadings\ps@myheadings
\let\ACM@ps@headings\ps@headings
\def\ACM@restore@pagestyle{%
  \let\ps@plain\ACM@ps@plain
  \let\ps@myheadings\ACM@ps@myheadings
  \let\ps@headings\ACM@ps@headings}
\AtBeginDocument{\ACM@restore@pagestyle}
```

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

```
\if@ACM@review
  \newsavebox{\ACM@linecount@bx}
  \newlength\ACM@linecount@bxht
  \newcount\ACM@linecount
  \ACM@linecount\@ne\relax
  \def\ACM@mk@linecount{%
    \savebox{\ACM@linecount@bx}[4em][t]{\parbox[t]{4em}{\normalfont
        \normalsize
        \setlength{\ACM@linecount@bxht}{0pt}%
        \loop{\color{red}\scriptsize\the\ACM@linecount}\\
        \global\advance\ACM@linecount by \@ne
        \addtolength{\ACM@linecount@bxht}{\baselineskip}%
        \ifdim\ACM@linecount@bxht<\textheight\repeat
        {\color{red}\scriptsize\the\ACM@linecount}\hfill
        \global\advance\ACM@linecount by \@ne}}}
\fi
```

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

```
\def\ACM@linecountL{%
  \if@ACM@review
  \ACM@mk@linecount
  \begin{picture}(0,0)%
    \put(-26,-22){\usebox{\ACM@linecount@bx}}%
  \end{picture}%
  \fi}
```

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

```
\def\ACM@linecountR{%
  \if@ACM@review
    \ifcase\ACM@format@nr
    \relax % manuscript
         \relax
       \or % acmsmall
         \relax
       \or % acmlarge
         \relax
       \or % acmtog
          \ACM@mk@linecount
       \or % sigconf
          \ACM@mk@linecount
       \or % siggraph
          \ACM@mk@linecount
       \or % sigplan
          \ACM@mk@linecount
       \or % sigchi
          \ACM@mk@linecount
       \or % sigchi-a
          \ACM@mk@linecount
       \or % acmengage
          \ACM@mk@linecount
       \or % acmcp
         \relax
    \fi
```

```
    \begin{picture}(0,0)%
      \put(20,-22){\usebox{\ACM@linecount@bx}}%
     \end{picture}%
  \fi}
```

\ACM@timestamp The timestamp system

```
\if@ACM@timestamp
  % Subtracting 30 from \time gives us the effect of rounding down despite
  % \numexpr rounding to nearest
  \newcounter{ACM@time@hours}
  \setcounter{ACM@time@hours}{\numexpr (\time - 30) / 60 \relax}
  \newcounter{ACM@time@minutes}
 \setcounter{ACM@time@minutes}{\numexpr \time - \theACM@time@hours * 60 \relax}
  \newcommand\ACM@timestamp{%
    \footnotesize%
    \ifx\@acmSubmissionID\@empty\relax\else
    Submission ID: \@acmSubmissionID.{ }%
    \fi
    \the\year-\two@digits{\the\month}-\two@digits{\the\day}{ }%
    \two@digits{\theACM@time@hours}:\two@digits{\theACM@time@minutes}{. }%
    Page \thepage\ of \@startPage--\pageref*{TotPages}.%
  }
\fi
```

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

```
\def\@shortauthors{%
  \if@ACM@anonymous
    Anon.
    \ifx\@acmSubmissionID\@empty\else Submission Id: \@acmSubmissionID\fi
  \else\shortauthors\fi}
```

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

```
\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

```
\AtBeginDocument{%
\fancypagestyle{standardpagestyle}{%
  \fancyhf{}%
  \renewcommand{\headrulewidth}{\z@}%
  \renewcommand{\footrulewidth}{\z@}%
  \def\@acmArticlePage{%
    \ifx\@acmArticle\empty%
      \if@ACM@printfolios\thepage\fi%
    \else%
      \@acmArticle\if@ACM@printfolios:\thepage\fi%
    \fi%
  }%
  \if@ACM@journal@bibstrip@or@tog
    \ifcase\ACM@format@nr
    \relax % manuscript
      \fancyhead[LE]{\ACM@linecountL\if@ACM@printfolios\thepage\fi}%
```

```
    \fancyhead[RO]{\if@ACM@printfolios\thepage\fi}%
    \fancyhead[RE]{\@shortauthors}%
    \fancyhead[LO]{\ACM@linecountL\shorttitle}%
    \if@ACM@nonacm\else%
      \fancyfoot[RO,LE]{\footnotesize Manuscript submitted to ACM}
    \fi%
  \or % acmsmall
    \fancyhead[LE]{\ACM@linecountL\@headfootfont\@acmArticlePage}%
    \fancyhead[RO]{\@headfootfont\@acmArticlePage}%
    \fancyhead[RE]{\@headfootfont\@shortauthors}%
    \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
    \if@ACM@nonacm\else%
   \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
     \@acmNumber, Article \@acmArticle.  Publication date: \@acmPubDate.}%
    \fi
  \or % acmlarge
    \fancyhead[LE]{\ACM@linecountL\@headfootfont
    \@acmArticlePage\quad\textbullet\quad\@shortauthors}%
    \fancyhead[LO]{\ACM@linecountL}%
    \fancyhead[RO]{\@headfootfont
      \shorttitle\quad\textbullet\quad\@acmArticlePage}%
    \if@ACM@nonacm\else%
   \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
     \@acmNumber, Article \@acmArticle.  Publication date: \@acmPubDate.}%
    \fi
  \or % acmtog
    \fancyhead[LE]{\ACM@linecountL\@headfootfont
      \@acmArticlePage\quad\textbullet\quad\@shortauthors}%
    \fancyhead[LO]{\ACM@linecountL}%
    \fancyhead[RE]{\ACM@linecountR}%
    \fancyhead[RO]{\@headfootfont
      \shorttitle\quad\textbullet\quad\@acmArticlePage\ACM@linecountR}%
    \if@ACM@nonacm\else
      \if@ACM@journal@bibstrip
        \fancyfoot[RO,LE]{\footnotesize \@journalNameShort,
          Vol. \@acmVolume, No.~\@acmNumber, Article \@acmArticle.
          Publication date: \@acmPubDate.}%
      \else
        \fancyfoot[RO,LE]{\footnotesize \acmConference@shortname,
          \acmConference@date, \acmConference@venue.}%
       \fi
    \fi
  \else % Proceedings
    \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
    \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
    \fancyhead[RE]{\@headfootfont\@shortauthors\ACM@linecountR}%
    \if@ACM@nonacm
      \fancyhead[LE]{\ACM@linecountL}%
      \fancyhead[RO]{\ACM@linecountR}%
    \else%
      \if@ACM@engage
        \fancyhead[LE]{\ACM@linecountL\@headfootfont\footnotesize
          EngageCSEdu. \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi}%
        \fancyhead[RO]{\@headfootfont
```

```
            EngageCSEdu. \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi
            \ACM@linecountR}%
        \else
          \fancyhead[LE]{\ACM@linecountL\@headfootfont\footnotesize
            \acmConference@shortname,
            \acmConference@date, \acmConference@venue}%
          \fancyhead[RO]{\@headfootfont
            \acmConference@shortname,
            \acmConference@date, \acmConference@venue\ACM@linecountR}%
         \fi
      \fi
    \fi
  \else % Proceedings
    \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
    \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
    \fancyhead[RE]{\@headfootfont\@shortauthors\ACM@linecountR}%
    \if@ACM@nonacm
      \fancyhead[LE]{\ACM@linecountL}%
      \fancyhead[RO]{\ACM@linecountR}%
    \else%
      \if@ACM@engage
        \fancyhead[LE]{\ACM@linecountL\@headfootfont
          EngageCSEdu. \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi}%
        \fancyhead[RO]{\@headfootfont
          EngageCSEdu. \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi
          \ACM@linecountR}%
      \else
        \fancyhead[LE]{\ACM@linecountL\@headfootfont
          \acmConference@shortname,
          \acmConference@date, \acmConference@venue}%
        \fancyhead[RO]{\@headfootfont
          \acmConference@shortname,
          \acmConference@date, \acmConference@venue\ACM@linecountR}%
       \fi
    \fi
  \fi
  \if@ACM@sigchiamode
     \fancyheadoffset[L]{\dimexpr(\marginparsep+\marginparwidth)}%
  \fi
  \if@ACM@timestamp
     \fancyfoot[LO,RE]{\ACM@timestamp}
  \fi
  \if@ACM@acmcp
  \renewcommand{\footrulewidth}{0.1\p@}%
  \fancyheadoffset[L]{46pt}%
  \fancyhead[L]{\makebox[\z@][l]{%
      \raisebox{-\dimexpr(0.2\textheight*(\ACM@ArticleType@nr-2))}{%
      \rotatebox{90}{\colorbox{@ACM@Article@color}{\color{white}%
          \strut\ACM@ArticleType~Article}}}}%
    \ACM@linecountL}%
  \fancyhead[R]{\makebox[\z@][r]{\box\@ACM@acmcpbox}}%
  \fancyfoot[L,C]{}%
  \fancyfoot[R]{\footnotesize
    \@journalName, Volume~\@acmVolume, Issue~\@acmNumber,
```

```
    \ifx\@acmArticle\@empty\else Article~\@acmArticle\fi\space
    (\@acmPubDate)\ifx\@acmDOI\@empty\else\\\@formatdoi{\@acmDOI}\fi}
  \fi
}%
\pagestyle{standardpagestyle}
}
```

\@folio@wd
\@folio@ht
\@folio@blob
\@folio@voffset
\@folio@max

Folio blob width, height, offsets and max number

The macro to typeset the folio blob.

firstpagestyle

The page style for the first page only.

```
\AtBeginDocument{%
\fancypagestyle{firstpagestyle}{%
  \fancyhf{}%
  \renewcommand{\headrulewidth}{\z@}%
  \renewcommand{\footrulewidth}{\z@}%
  \if@ACM@journal@bibstrip@or@tog
    \ifcase\ACM@format@nr
    \relax % manuscript
      \fancyhead[L]{\ACM@linecountL\@acmBadgeL}%
      \fancyhead[R]{\@acmBadgeR}%
      \fancyfoot[RO,LE]{\if@ACM@printfolios\small\thepage\fi}%
      \if@ACM@nonacm\else%
        \fancyfoot[RE,LO]{\footnotesize Manuscript submitted to ACM}%
      \fi%
    \or % acmsmall
      \if@ACM@nonacm\else%
     \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
        \@acmNumber, Article \@acmArticle.  Publication date:
        \@acmPubDate.}%
      \fi%
      \fancyhead[LE]{\ACM@linecountL\@acmBadgeL}%
      \fancyhead[LO]{\ACM@linecountL\@acmBadgeL}%
      \fancyhead[RO]{\@acmBadgeR}%
      \fancyhead[RE]{\@acmBadgeR}%
    \or % acmlarge
      \if@ACM@nonacm\else%
     \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
        \@acmNumber, Article \@acmArticle.  Publication date:
        \@acmPubDate.}%
      \fi%
      \fancyhead[RO]{\@acmBadgeR}%
      \fancyhead[RE]{\@acmBadgeR}%
      \fancyhead[LE]{\ACM@linecountL\@acmBadgeL}%
      \fancyhead[LO]{\ACM@linecountL\@acmBadgeL}%
    \or % acmtog
      \if@ACM@nonacm\else%
        \if@ACM@journal@bibstrip
          \fancyfoot[RO,LE]{\footnotesize \@journalNameShort,
            Vol. \@acmVolume, No.~\@acmNumber, Article \@acmArticle.
            Publication date: \@acmPubDate.}%
        \else
          \fancyfoot[RO,LE]{\footnotesize \acmConference@shortname,
```

```
            \acmConference@date, \acmConference@venue.}%
        \fi
      \fi%
      \fancyhead[L]{\ACM@linecountL\@acmBadgeL}%
      \fancyhead[R]{\@acmBadgeR\ACM@linecountR}%
    \else % Conference proceedings
      \fancyhead[L]{\ACM@linecountL\@acmBadgeL}%
      \fancyhead[R]{\@acmBadgeR\ACM@linecountR}%
      \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
    \fi
  \else
    \fancyhead[L]{\ACM@linecountL\@acmBadgeL}%
    \fancyhead[R]{\@acmBadgeR\ACM@linecountR}%
    \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
  \fi
  \if@ACM@timestamp
    \ifnum\ACM@format@nr=0\relax % Manuscript
    \fancyfoot[LO,RE]{\ACM@timestamp\quad
      \if@ACM@nonacm\else
        \footnotesize Manuscript submitted to ACM
      \fi}
    \else
    \fancyfoot[LO,RE]{\ACM@timestamp}
    \fi
  \fi
  \if@ACM@acmcp
  \renewcommand{\footrulewidth}{0.1\p@}%
  \fancyheadoffset[L]{46pt}%
  \fancyhead[L]{\makebox[\z@][l]{%
      \raisebox{-\dimexpr(0.2\textheight*(\ACM@ArticleType@nr-2))}{%
      \rotatebox{90}{\colorbox{@ACM@Article@color}{\color{white}%
          \strut\ACM@ArticleType~Article}}}}%
    \ACM@linecountL\@acmBadgeL}%
  \fancyhead[R]{\@acmBadgeR\makebox[\z@][r]{\box\@ACM@acmcpbox}}%
  \fancyfoot[L,C]{}%
  \fancyfoot[R]{\footnotesize
    \@journalName, Volume~\@acmVolume, Issue~\@acmNumber,
    \ifx\@acmArticle\@empty\else Article~\@acmArticle\fi\space
    (\@acmPubDate)\ifx\@acmDOI\@empty\else\\\@formatdoi{\@acmDOI}\fi}
  \fi
}}
```

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.

```
\def\ACM@NRadjust#1{%
 \begingroup
  \expandafter\ifx\csname Sectionformat\endcsname\relax
  % do nothing when  \Sectionformat  is unknown
   \def\next{\endgroup #1}%
 \else
  \def\next{\endgroup
   \let\realSectionformat\Sectionformat
   \def\ACM@sect@format@{#1}%
   \let\Sectionformat\ACM@NR@adjustedSectionformat
 %%  next lines added 2018-06-17 to ensure section number is styled
   \let\real@adddotafter\@adddotafter
   \let\@adddotafter\ACM@adddotafter
   #1{}% imposes the styles, but nullifies  \MakeUppercase
   \let\@adddotafter\real@adddotafter
  }%
 \fi \next
}
```

\ACM@NR@adjustedSectionformat

```
\def\ACM@NR@adjustedSectionformat#1#2{%
 \realSectionformat{\ACM@sect@format{#1}}{#2}%
 \let\Sectionformat\realSectionformat}
\DeclareRobustCommand{\ACM@sect@format}{\ACM@sect@format@}
\def\ACM@sect@format@null#1{#1}
\let\ACM@sect@format@\ACM@sect@format@null
\AtBeginDocument{%
 \expandafter\ifx\csname LTX@adddotafter\endcsname\relax
  \let\LTX@adddotafter\@adddotafter
 \fi
}
```

\ACM@adddotafter

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

Sectioning is different for different levels

```
\renewcommand\section{\def\@toclevel{1}%
  \@startsection{section}{1}{\z@}%
  {-.75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
  {.25\baselineskip}%
  {\ACM@NRadjust\@secfont}}
\renewcommand\subsection{\def\@toclevel{2}%
```

```
  \@startsection{subsection}{2}{\z@}%
  {-.75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
  {.25\baselineskip}%
  {\ACM@NRadjust\@subsecfont}}
\renewcommand\subsubsection{\def\@toclevel{3}%
  \@startsection{subsubsection}{3}{\z@}%
  {-.5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
  {-3.5\p@}%
  {\ACM@NRadjust{\@subsubsecfont\@adddotafter}}}
\renewcommand\paragraph{\def\@toclevel{4}%
  \@startsection{paragraph}{4}{\parindent}%
  {-.5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
  {-3.5\p@}%
  {\ACM@NRadjust{\@parfont\@adddotafter}}}
\newcommand\noindentparagraph{\def\@toclevel{4}%
  \@startsection{paragraph}{4}{\z@}%
  {-.5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
  {-3.5\p@}%
  {\ACM@NRadjust{\@parfont}}}
\renewcommand\part{\def\@toclevel{9}%
  \@startsection{part}{9}{\z@}%
  {-10\p@ \@plus -4\p@ \@minus -2\p@}%
  {4\p@}%
  {\ACM@NRadjust\@parfont}}
```

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

```
\def\section@raggedright{\@rightskip\@flushglue
  \rightskip\@rightskip
  \leftskip\z@skip
  \parindent\z@}
```

`\@secfont` `\@subsecfont` `\@subsubsecfont` `\@parfont` Fonts for sections etc. are different for different formats.

```
\def\@secfont{\sffamily\bfseries\section@raggedright}
\def\@subsecfont{\sffamily\bfseries\section@raggedright}
\def\@subsubsecfont{\sffamily\itshape}
\def\@parfont{\itshape}
\setcounter{secnumdepth}{3}
\ifcase\ACM@format@nr
\relax % manuscript
\or % acmsmall
\or % acmlarge
 \def\@secfont{\sffamily\large\section@raggedright}
 \def\@subsecfont{\sffamily\large\section@raggedright}
\or % acmtog
 \def\@secfont{\sffamily\large\section@raggedright}
 \def\@subsecfont{\sffamily\large\section@raggedright}
\or % sigconf
 \def\@secfont{\bfseries\Large\section@raggedright}
 \def\@subsecfont{\bfseries\Large\section@raggedright}
\or % siggraph
 \def\@secfont{\sffamily\bfseries\Large\section@raggedright}
 \def\@subsecfont{\sffamily\bfseries\Large\section@raggedright}
\or % sigplan
 \def\@secfont{\bfseries\Large\section@raggedright}
```

```
 \def\@subsecfont{\bfseries\section@raggedright}
 \def\@subsubsecfont{\bfseries\section@raggedright}
 \def\@parfont{\bfseries\itshape}
 \def\@subparfont{\itshape}
\or % sigchi
 \setcounter{secnumdepth}{1}
 \def\@secfont{\sffamily\bfseries\section@raggedright}
 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
\or % sigchi-a
 \setcounter{secnumdepth}{0}
 \def\@secfont{\sffamily\bfseries\section@raggedright}
 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
\or % acmengage
 \def\@secfont{\bfseries\Large\section@raggedright}
 \def\@subsecfont{\bfseries\Large\section@raggedright}
\or %acmcp
\fi
```

Amasat does not define tocindents for paragraphs and subparagraphs. Here we add them

```
\AtBeginDocument{%
  \@for\@tempa:=-1,0,1,2,3,4,5\do{%
    \@ifundefined{r@tocindent\@tempa}{%
      \@xp\gdef\csname r@tocindent\@tempa\endcsname{0pt}}{}%
  }%
}
\def\@writetocindents{%
  \begingroup
  \@for\@tempa:=-1,0,1,2,3,4,5\do{%
    \immediate\write\@auxout{%
      \string\newlabel{tocindent\@tempa}{%
        \csname r@tocindent\@tempa\endcsname}}%
  }%
  \endgroup}
```

`\@adddotafter` Add punctuation after a sectioning command

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

`\@addspaceafter` Add space after a sectioning command

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

```
\if@ACM@acmcp
   \setcounter{secnumdepth}{-1}%
\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.

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

3.25 Theorems

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

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

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

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

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

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

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

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

Customization of the acmplain theorem style:

```
\ifcase\ACM@format@nr
\relax % manuscript
\or % acmsmall
\or % acmlarge
\or % acmtog
\or % sigconf
\or % siggraph
\or % sigplan
  \def\@acmplainbodyfont{\itshape}
  \def\@acmplainindent{\z@}
  \def\@acmplainheadfont{\bfseries}
  \def\@acmplainnotefont{\normalfont}
\or % sigchi
\or % sigchi-a
\or % acmengage
\or % acmcp
\fi
```

acmplain The acmplain theorem style

```
\newtheoremstyle{acmplain}%
  {.5\baselineskip\@plus.2\baselineskip
    \@minus.2\baselineskip}% space above
  {.5\baselineskip\@plus.2\baselineskip
    \@minus.2\baselineskip}% space below
  {\@acmplainbodyfont}% body font
  {\@acmplainindent}% indent amount
  {\@acmplainheadfont}% head font
  {.}% punctuation after head
  {.5em}% spacing after head
  {\thmname{#1}\thmnumber{ #2}\thmnote{ {\@acmplainnotefont(#3)}}}% head spec
```

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

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

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

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

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

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

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

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

Customization of the acmdefinition theorem style:

```
\ifcase\ACM@format@nr
\relax % manuscript
\or % acmsmall
\or % acmlarge
\or % acmtog
\or % sigconf
\or % siggraph
\or % sigplan
  \def\@acmdefinitionbodyfont{\normalfont}
  \def\@acmdefinitionindent{\z@}
  \def\@acmdefinitionheadfont{\bfseries}
  \def\@acmdefinitionnotefont{\normalfont}
\or % sigchi
\or % sigchi-a
\or % acmengage
\or % acmcp
\fi
```

acmdefinition The acmdefinition theorem style

```
\newtheoremstyle{acmdefinition}%
  {.5\baselineskip\@plus.2\baselineskip
    \@minus.2\baselineskip}% space above
  {.5\baselineskip\@plus.2\baselineskip
    \@minus.2\baselineskip}% space below
  {\@acmdefinitionbodyfont}% body font
  {\@acmdefinitionindent}% indent amount
  {\@acmdefinitionheadfont}% head font
  {.}% punctuation after head
  {.5em}% spacing after head
 {\thmname{#1}\thmnumber{ #2}\thmnote{ {\@acmdefinitionnotefont(#3)}}}% head spec
```

Make acmplain the default theorem style.

```
\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.

```
\AtEndPreamble{%
  \if@ACM@acmthm
  \theoremstyle{acmplain}
  \@ifundefined{theorem}{%
  \newtheorem{theorem}{Theorem}[section]
  }{}
  \@ifundefined{conjecture}{%
```

```
  \newtheorem{conjecture}[theorem]{Conjecture}
  }{}
  \@ifundefined{proposition}{%
  \newtheorem{proposition}[theorem]{Proposition}
  }{}
  \@ifundefined{lemma}{%
  \newtheorem{lemma}[theorem]{Lemma}
  }{}
  \@ifundefined{corollary}{%
  \newtheorem{corollary}[theorem]{Corollary}
  }{}
  \theoremstyle{acmdefinition}
  \@ifundefined{example}{%
  \newtheorem{example}[theorem]{Example}
  }{}
  \@ifundefined{definition}{%
  \newtheorem{definition}[theorem]{Definition}
  }{}
  \fi
  \theoremstyle{acmplain}
}
```

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

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

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

```
\def\@proofindent{\indent}
```

Customization of the proof environment.

```
\ifcase\ACM@format@nr
\relax % manuscript
\or % acmsmall
\or % acmlarge
\or % acmtog
\or % sigconf
\or % siggraph
\or % sigplan
  \def\@proofnamefont{\itshape}
  \def\@proofindent{\noindent}
\or % sigchi
\or % sigchi-a
\or % acmengage
\or % acmcp
\fi
```

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

```
\renewenvironment{proof}[1][\proofname]{\par
  \pushQED{\qed}%
  \normalfont \topsep6\p@\@plus6\p@\relax
  \trivlist
  \item[\@proofindent\hskip\labelsep
        {\@proofnamefont #1\@addpunct{.}}]\ignorespaces
}{%
  \popQED\endtrivlist\@endpefalse
}
```

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.

```
\AtEndPreamble{%
  \if@ACM@pbalance
    \global\@ACM@balancefalse
    \ifcase\ACM@format@nr
    \relax % manuscript
       \or % acmsmall
       \or % acmlarge
       \or % acmtog
          \RequirePackage{pbalance}%
       \or % sigconf
          \RequirePackage{pbalance}%
       \or % siggraph
          \RequirePackage{pbalance}%
       \or % sigplan
          \RequirePackage{pbalance}%
       \or % sigchi
          \RequirePackage{pbalance}%
       \or % sigchi-a
       \or % acmengage
          \RequirePackage{pbalance}%
       \or % acmcp
    \fi
  \fi
  \if@ACM@balance
    \ifcase\ACM@format@nr
    \relax % manuscript
         \global\@ACM@balancefalse
       \or % acmsmall
         \global\@ACM@balancefalse
       \or % acmlarge
         \global\@ACM@balancefalse
       \or % acmtog
          \RequirePackage{balance}%
       \or % sigconf
          \RequirePackage{balance}%
       \or % siggraph
          \RequirePackage{balance}%
       \or % sigplan
          \RequirePackage{balance}%
       \or % sigchi
          \RequirePackage{balance}%
       \or % sigchi-a
          \global\@ACM@balancefalse
       \or % acmengage
          \RequirePackage{balance}%
       \or % acmcp
         \global\@ACM@balancefalse
    \fi
  \fi
}
```

```
\AtEndDocument{%
  \if@ACM@balance
  \if@twocolumn
  \balance
  \fi\fi}
```

3.27 Acknowledgments

\acksname

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

\acks This is a comment-like structure

```
\specialcomment{acks}{%
  \begingroup
  \section*{\acksname}
  \phantomsection\addcontentsline{toc}{section}{\acksname}
}{%
  \endgroup
}
```

\grantsponsor We just typeset the name of the sponsor

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

\grantnum

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

3.28 Conditional typesetting

We use the comment package for conditional typesetting:

```
\AtEndPreamble{%
\if@ACM@screen
  \includecomment{screenonly}
  \excludecomment{printonly}
\else
  \excludecomment{screenonly}
  \includecomment{printonly}
\fi
\if@ACM@anonymous
  \excludecomment{anonsuppress}
  \excludecomment{acks}
\else
  \includecomment{anonsuppress}
\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’.

```
\newcommand\showeprint[2][arxiv]{%
  \def\@tempa{#1}%
  \ifx\@tempa\@empty\def\@tempa{arxiv}\fi
```

```
  \def\@tempb{arxiv}%
  \ifx\@tempa\@tempb\relax
     arXiv:\href{https://arxiv.org/abs/#2}{#2}%
  \else
     \def\@tempb{arXiv}%
     \ifx\@tempa\@tempb\relax
       arXiv:\href{https://arxiv.org/abs/#2}{#2}%
     \else
       #1:#2%
    \fi
  \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.

```
\def\theindex{\@restonecoltrue\if@twocolumn\@restonecolfalse\fi
  \columnseprule\z@ \columnsep 35\p@
  \@indextitlestyle
  \let\item\@idxitem
  \parindent\z@  \parskip\z@\@plus.3\p@\relax
  \raggedright
  \hyphenpenalty\@M
  \footnotesize}
```

3.31 End of Class

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

```
\let\@vspace@orig=\@vspace
\let\@vspacer@orig=\@vspacer
\apptocmd{\@vspace}{\ClassWarning{\@classname}{\string\vspace\space should
    only be used to provide space above/below surrounding
    objects}}{}{}
\apptocmd{\@vspacer}{\ClassWarning{\@classname}{\string\vspace\space should
    only be used to provide space above/below surrounding
    objects}}{}{}
\let\@vspace@acm=\@vspace
\let\@vspacer@acm=\@vspacer
```

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

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


\normalsize\normalfont\frenchspacing
⟨/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 LATEX*, 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
Bib code cleanup (Zack Weinberg) 35
Documentation update (siggraph) . 35
1.49
General: New journal: DTRAP 35
1.53
General: New journals: PACMCGIT, TIOT, TDSCI 35
Rearranged docs 35
1.54
General: Moved footnote stuff before hyperref call (Ross Moore) 35
1.56
General: Documented \Description 35
1.57
General: Booktabs package is now the default 35
1.58
General: Changes in samples (Enrico Gregorio) 35
New journal: HEALTH. TDS is renamed to TDSCI 35
1.60
General: New option: urlbreakonhyphens 35
\if@ACM@urlbreakonhyphens: introduced macro 36
1.62
General: New journal: TELO 35
1.63
General: New journal: FACMP 35
New journal: TQUANT 35
1.63a
General: Move: TQUANT to TQC . . 35
1.64
General: Putting abstract after \maketitle now causes an error . 35
1.65
General: New journal: DGOV 35
1.66
General: ACM reference format is now mandatory for papers over one page; CCS concepts and keywords are now mandatory for papers over two pages 35
Authors' addresses are mandatory for journal articles 35
\@mkauthorsaddresses: Added warning for missing addresses . . 99
\ccsdesc@parse: Added warning for missing concepts 78
\if@ACM@printacmref: Added warning for longer papers 76
\keywords: Added warning for missing keywords 75
1.69
\vspace: Added the changed command to avoid grouping . . . 116
1.70
General: Name change for TDS 60
1.71
General: Bibliography change: volume for @inproceedings is now in brackets together with series . . . 35
LuaTeX now uses the OTF versions of fonts 35
Retired sigchi and sigchi-a 35
1.75
General: Documentation update . . . 35
1.78
General: Documentation update: Word count 35
1.79
General: Updated indormation for TAP, TCPS, TEAC 60
1.80
General: Added DLT and FAC 60
1.82
General: Updated abbreviations and codes for several journals 60
1.84
General: New journals: JDS, GAMES 35, 60
1.85
General: Added CC licenses 35
Added: acmengage 49
New journal: JRC 60
\@mkauthors: Added: acmengage . . 93
\@mktitle: Added: acmengage 90
\@printtopmatter: Added: acmengage 89
\@specialsection: Added: acmengage 88
\@subtitlefont: Added: acmengage 91
\@titlefont: Added: acmengage . . 90
\ACM@linecountR: Added: acmengage 102
format: New format: acmengage . . . 36
\parskip: Added: acmengage 52

1.87
General: New journals: ACMJCSS, JATS, TORS 60
format: New format: acmcp 36
1.88
General: Added ISSN for ACMJCSS . 60
Added ISSN for GAMES 60
Added PACMNET 60
1.89
General: Added PACMMOD 60
Added TOPML 60
\@printtopmatter: Moved badges to top header 89
1.90
General: Added TOPML eISSN 60
1.90a
General: Changes in the sample keywords and concepts 35
1.92
General: Documentation update: use of 'anonymous' throughout 35
Moved hyperxmp again due to kernel update 49
2.04
General: Deleted loading ifdraft due to the new release of hyperxmp . . . 49
Explicitly load ifdraft since hyperxmp tries to load it inside a group 49
2.05
General: New data for TELO 60
2.06
General: Added eISSN for a number of journals 60
2.07
General: Another change for TELO . 60

v1.00
General: First released version 35
v1.01
General: Changed hyperref colors in screen mode (closes https://github.com/borisveytsman/acmart/issues/1) 35
Defined ACM colors 35
Explicitly put draft option (closes https://github.com/borisveytsman/acmart/issues/4) 38
Set headheight to 1pc for all formats (closes https://github.com/borisveytsman/acmart/issues/5) 35
v1.02
General: Added TOPS and TSC (closes https://github.com/borisveytsman/acmart/issues/12) 35
Documentation changes (closes https://github.com/borisveytsman/acmart/issues/13) 35
v1.03
General: Added anonsuppress environment 35
Added authorversion option (closes https://github.com/borisveytsman/acmart/issues/9) 35
\@formatdoi: Added macro 81
\if@ACM@authorversion: Added macro 37
\maketitle: Added special case of authorversion 85
v1.04
General: Updated bibliography for siggraph 35
\acmArticleSeq: Name change by Matthew Fluet 73
\acmDOI: Name change by Matthew Fluet 74
\acmISBN: Name change by Matthew Fluet 74
v1.05
General: Added processing doi numbers for acmsiggraph and doi numbers for sigproc.bib 35
Patched \setcitestyle command; closes https://github.com/borisveytsman/acmart/issues/19 35
v1.06
\@ACM@badge@skip: Added macro . . 74
\@ACM@badge@width: Added macro . 74
\@ACM@title@width: Added macro . 74
\@mktitle@i: Added processing badges 91
Made generic 91
\@mktitle@ii: Now this macro is obsolete 92
\@mktitle@iii: Added processing badges 92
Made more generic 92
\@mktitle@iv: Made more generic . 92
\@printtopmatter: Added processing badges 89
\@subtitlefont: Added macro 91

\@titlefont: Added macro 90
\acmBadgeL: Added macro 74
\acmBadgeR: Added macro 74
\if@ACM@badge: Added macro 74
v1.07
\maketitle: Corrected a bug with abstract footnotes 85
Corrected a bug with permssion and footnotes order 85
v1.08
General: SIGPLAN reformatting by Matthew Fluet 35
Typos corrected (Tobias Pape) . . . 35
v1.09
General: Revert SIGPLAN caption rules 35
v1.10
General: Changes of 'licensedothergov' wording 79
\maketitle: Corrected a bug with doi in manuscript and author vertsion, https://github.com/borisveytsman/acmart/issues/36 85
standardpagestyle: Reversed folios location 103
v1.11
General: Customization of ACM theorem styles and proof environment by Matthew Fluet . . 35
v1.12
General: Added graceful behavior when libertine fonts are absent . . 54
Documentation updates 35
\@marginfigure: Now centering by default 57
\@margintable: Now centering by default 58
\@mkauthors@i: Removed MakeTextUppercase due to a bug with new kernel 95
\@parfont: Moved to \section@raggedright 109
\copyrightpermissionfootnoterule: Added macro 53
\descriptionlabel: Redefined 60
\footnoterule: Made shorter 53
\if@ACM@natbib@override: Added macro 37
\if@ACM@newfonts: Added macro . . 54
\maketitle: Moved thankses to copyrightpermission box 85
\section@raggedright: Introduced macro 109
v1.13
General: Font adjustments for acmsmall 94
Increased font size for ACM Large 40
Print bibliographic information by default for the proceedings 76
\@mpfootnotetext: Made minipage footnotes centered 49
\bibliographystyle: Redefined macro 50
\bibstyle@acmauthoryear: Added macro 43
\bibstyle@acmnumeric: Added macro 44
\if@ACM@printfolios: Added macro 76
standardpagestyle: Added headers for sigs 103
Expanded headers for sigchi-a . . . 103
Suppressed folios if sig 103
v1.14
General: \citestyle updates (Matthew Fluet) 35
Patched \citestyle 42
\bibstyle@acmauthoryear: Moved def of \bibstyle@acmauthoryear before use 43
\bibstyle@acmnumeric: Moved def of \bibstyle@numeric before use . . 44
v1.15
\@ACM@addtoaddress: Added macro 92
\@mkauthors@iii: New authors system 96
\@shortauthors: Introduced macro . 103
\@typeset@author@bx: Moved to separate macro 96
\acks: Added macro 115
\affiliation: Added code for author groups 71
\author: Added code for author groups 70
\city: Added macro 93
\country: Added macro 93
\department: Added macro 93
\grantnum: Added macro 115
\grantsponsor: Added macro 115
\if@insideauthorgroup: Introduced macro 70
\institution: Added macro 93
\num@authorgroups: Renamed 70
\orcid: Introduced macro 72
\position: Added macro 93
\postcode: Added macro 93
\state: Added macro 93
\streetaddress: Added macro 93

standardpagestyle: Better handling of anonymous mode 103
v1.16
General: Formatting header/footer (Matthew Fluet) 35
\@headfootfont: Added macro 103
standardpagestyle: Customize header/footer text font 103
v1.17
General: Slightly decreased margins for sigs 51
\@makefnmark: Redefined 49
\@mkauthors: TOG now uses the same authors block as other journals . . 93
\@mkauthors@ii: Deleted 96
\@mkbibcitation: Added \nobreak 100
Changed format for sigs 100
\acmArticle: The default is now numerical 73
\acmMonth: The default must be numerical. Closes #50. 73
\acmNumber: The default is now numerical 73
\acmVolume: The default is now numerical 73
\acmYear: The default is now numerical 73
\description: Decreased indent . . . 60
\grantnum: Added url 115
\grantsponsor: Renamed 115
\if@ACM@printacmref: Renamed from \if@ACM@printbib 76
standardpagestyle: Added paper title to sigs 103
v1.18
General: Natbib is now the default for all formats 35
\@mkauthors@i: Now we andify affiliations 95
\@typeset@author@line: Added macro 94
v1.19
General: Include 'Abstract', 'Acknowledgements', and 'References' in PDF bookmarks (Matthew Fluet) 35
Include 'References' in PDF bookmarks (Matthew Fluet) 42
\@mkabstract: Include 'Abstract' in PDF bookmarks (Matthew Fluet) 100
\acks: Include 'Acknowledgements' in PDF bookmarks (Matthew Fluet) 115
v1.20
General: Bug fixes for bst 35
\@mkabstract: Deleted spurious space 100
v1.21
\showeprint: Added macro 115
v1.22
General: More bibliography changes for Aptara 35
v1.23
General: Add PACMPL journal option 35
v1.24
General: Add IMWUT journal option 60
v1.25
General: Updated PACMPL 60
v1.26
General: Corrected \shortcite bug . 35
Documentation typos fixed (thanks to Stephen Spencer) 35
v1.27
\if@ACM@printccs: Typo corrected . 75
v1.28
General: Corrected option natbib behavior 44
Got rid of warnings in pdf keywords 49
\ccsdesc@parse: Change from \to to \textrightarrow (Matteo Riondato) 78
v1.29
General: Increased head to 13pt 51
\@mkabstract: Removed spurious indentation (John Wickerson) . . 100
\ccsdesc@parse: Add spacing after bullet and around rightarrow; semicolon separators no longer in bold/italic (John Wickerson) 78
standardpagestyle: Corrected printfolios (Matthew Fluet) 103
v1.30
General: Added \frenchspacing . . . 116
Bibtex style now recognizes https:// in doi 35
Switched to T1: looks like libertine has problems with \l in OT1 . . . 55
Updated IMWUT and PACMPL . . 60
\department: Added optional parameter 93
v1.31
General: Documentation changes . . . 35
\@additionalaffiliation: Added macro 71
\@mkbibcitation: Disabled linebreak 100
\@startsection: Added \tochangmeasure 46
\@starttoc: Redefined macro 48
\@textbottom: Redefined 54

\acmMonth: The default now is the current month (Matteo Riondato) 73
\acmYear: The default now is the current year (Matteo Riondato) . . 73
\additionalaffiliation: Added macro 71
\l@subsection: Redefined macro . . 48
\l@subsubsection: Redefined macro 48
v1.32
General: Added POMACS journal option 35
Format siggraph is now obsolete . 35
\@formatdoi: New doi format 81
v1.33
General: Added acmart-preload-hook 35
Added cmap and glyphtounicode . 54
BibTeX comma before articleno bug corrected 35
BibTeX crossref bug corrected . . . 35
BibTeX numpages bug corrected . 35
Documentation updates 35
Moved \citename definition for non-natbib bibliography, so a package may redefine it 50
Switched to Type 1 fonts for libertine even if OTF-capable engine is used (Kai Mindermann) . 55
\@ACM@addtoaddress: Added obeypunctuation code 92
\@mkauthors@i: Added obeypunctuation code 95
\@mkauthors@iii: Added obeypunctuation code 96
\@mkauthors@iv: Added obeypunctuation code 98
\@subtitlefont: Added \normalsize 91
\ACM@linecountL: Renamed macro . 102
\ACM@linecountR: Added macro . . . 102
\ACM@timestamp: Added current page number 103
Added macro (Michael D. Adams) . 103
Added submission id 103
\acmSubmissionID: Added macro . . 74
\city: Added obeypunctuation code 93
\country: Added obeypunctuation code 93
\department: Added obeypunctuation code 93
\if@ACM@affiliation@obeypunctuation: Added macro 71
\if@ACM@authordraft: Added macro 38
\if@ACM@natbib@override: Deleted macro 37
\if@ACM@timestamp: Added macro (Michael D. Adams) 38
\institution: Added obeypunctuation code 93
firstpagestyle: Added right linecount for two-column formats 106
Added timestamp (Michael D. Adams) 106
\maketitle: Fixed the bug with figures on top and bottom of the title page, thanks to David Epstein 85
\position: Added obeypunctuation code 93
\postcode: Added obeypunctuation code 93
\state: Added obeypunctuation code 93
\streetaddress: Added obeypunctuation code 93
standardpagestyle: Added right linecount for two-column formats 103
Added timestamp (Michael D. Adams) 103
v1.34
\@mkbibcitation: Deleted DOI from doi numbers 100
\ACM@linecount@bx: Rulers now are continuous 102
\ACM@linecountL: Rulers now are continuous 102
\ACM@linecountR: Rulers now are continuous 102
\maketitle: Added date to the bibstrip in conf proceedings 85
Deleted 'DOI' from doi numbers . 85
Rearranged bibstrip 85
The \terms command is now obsolete 85
\terms: The \terms command now just produces a warning 75
v1.35
General: BibTeX bug fixed: et al. . . . 35
If the copyright is set to usgov or rigtsretained, the price is suppressed 79
\bibstyle@acmauthoryear: Square brackets for author-year style . . . 43
v1.36
General: Added PACMHCI journal options 60
Added the possibility to adjust number of author boxes per row in conference formats 35
\@ACM@authorsperrow: Added macro 76

\@mkauthors@iii: Added authorsperrow overrride 96
\@mkauthors@iv: Added authorsperrow overrride 98
\if@ACM@authordraft: Corrected typo, thanks to bargteil 38
v1.37
General: Reduce list indentation (Matthew Fluet) 59
Set \normalparindent; Reduce list indentation (Matthew Fluet) 35
\description: Reduce list indentation (Matthew Fluet) 60
\descriptionlabel: Reduce list indentation (Matthew Fluet) 60
\normalparindent: Set \normalparindent (Matthew Fluet) 53
v1.38
General: Increase default font size for SIGPLAN 35, 40
v1.39
\@@authornotemark: Added macro . 99
\authornotemark: Added macro . . . 73
v1.40
General: Added 'textcase' package . . 42
Added heightrounded to geometry 51
Added new copyright version: licensedcagov 35
Added package cleveref 35
Added Ross Moore code for glyphtounicode 54
Bibliography changes 35
\@copyrightowner: Added new copyright version: licensedcagov . 80
\@copyrightpermission: Added new copyright version: licensedcagov . 81
\@mkauthors@i: Switched to MakeTextUppercase 95
\@parfont: Switched to MakeTextUppercase 109
\ACM@linecount@bx: Work around a bug in xcolor: looks like cmyk colors in boxes do not work . . . 102
\ccdesc@parse@finish: Added macro 79
\city: We now do not print this even in SIG 93
\country: Fixed bugs with extra spaces 93
\l@subsection: Redefined macro . . 48
\postcode: We now do not print this even in SIG 93
\state: We now do not print this even in SIG 93
\streetaddress: We now do not print this even in SIG 93
v1.41
General: Added new badges 35
v1.42
General: Deleted ACM badges 35
v1.43
\@starttoc: Added \makeatletter 48
\country: Added comma before country for journals 93
v1.44
General: Added package refcount . . . 35
Deleted package cleveref 35
Put theorem defs in a separate style 35
\@acmBooktitle: Added macro 69
\@acmEditors: Added macro 69
\@editorsAbbrev: Added macro . . . 69
\@folioblob: Suppress the blob if acmArticleSeq is empty 106
\@mkbibcitation: If the paper has just one page, use 'page' instead of 'pages' 100
\ACM@restore@pagestyle: Added macro 101
\acmArticle: The default is now empty 73
\acmArticleSeq: Now acmArticle might be empty 73
\acmBooktitle: Added macro 69
\editor: Added macro 69
\if@ACM@acmthm: Added macro 36
\maketitle: Empty DOI or ISBN are not printed (by Michael Ekstrand) 85
v1.45
\@folioblob: Switched \bfeseries\sffamily to \sffamily\bfseries 106
\@parfont: Switched \bfeseries\sffamily to \sffamily\bfseries 109
\@titlefont: Switched \bfeseries\sffamily to \sffamily\bfseries 90
v1.46
General: Added etoolbox 35
Bst file bug fixes: label width is calculated correctly 35
Delayed hypersetup since journal options may change screen mode 49
PACM now set screen to true 60
Restore theorem defs to class file . 35

\@mkauthorsaddresses: Introduced macro . . . 99
\@mkbibcitation: Added subtitle . . 100
\@printendtopmatter: Made it \par\bigskip uniformly 101
\@printtopmatter: Deleted rule . . . 89
\@setauthorsaddresses: Introduced macro . . . 101
\ACM@linecount@bx: Rearranged the code to get rid of spurious underfull messages (Benjamin Byholm) . . . 102
\author: Started counting authors . . 70
\authorsaddresses: Introduced macro . . . 72
\country: Corrected spacing for institution . . . 93
\if@ACM@acmthm: Modified description . . . 36
\liningnums: Workaround for compatibility with fontspec 55
\maketitle: Added authors' addresses 85
Thankses go before authors' addresses . . . 85
\num@authors: Introduced macro . . 70
v1.47
General: New journal: THRI 35
v1.48
General: \citeyear no longer behaves like \citeyearpar 50
Code prettying (Michael D. Adams) 35
Initial support for Biblatex (Daniel Thomas) . . . 35
Misc entries in the bibliography no longer produce a separate date . . 35
Typos fixed (Jamie Davis) 35
\@headfootfont: Deleted unnecessary switch (Michael D. Adams) . . . 103
\@mkabstract: Removed spurious indentation if abstract is followed by an empty line . . . 100
\ACM@timestamp: Fromatting change (Michael D. Adams) . . . 103
\if@ACM@review: Review mode now switches on folios . . . 36
\maketitle: Added acmart and version info to pdfcreator tag . . . 85
Added language and doctitle attributes to PDF (Andreas Reichinger) . . . 85
Suppressed empty DOI (Serguei Mokhov) . . . 85
v1.50
\@copyrightpermission: New copyright statements for iw3c2w3[g] . . . 81
v1.51
General: Corrected the bug with price suppression . . . 79
Suppress price if the copyright is set to iw3c2w3 or iw3c2w3g 79
XeTeX now uses OTF fonts (Joachim Breitner) . . . 55
firstpagestyle: We now use journal abbreviation for footers 106
standardpagestyle: We now use journal abbreviation for footers . 103
v1.52
\@copyrightowner: Rewording of licenses . . . 80
\@copyrightpermission: Another rewording of copyright statements for iw3c2w3[g] . . . 81
v1.53
General: Added PACMCGIT, TIOT, TDSCI . . . 60
v1.54
General: Added Ross's patch for sectioning . . . 108
Deleted indent for subsubsection . 108
XeTeX now uses T1 encoding . . . 55
\@mkbibcitation: Bug corrected (Ross Moore) . . . 100
\@shortauthors: Added submission id in anonymous mode 103
\ACM@adddotafter: Added macro . . 108
\ACM@NR@adjustedSectionformat: Added macro . . . 108
\ACM@NRadjust: Added macro 107
\author: Added submission id in anonymous mode . . . 70
\if@ACM@nonacm: Added macro 37
v1.55
General: Now we use purple color for links . . . 49
Table captions for SIGCHI now use the same font size as figure captions (Luis Leiva) . . . 56
Typo corrected (Zack Weinberg) . 42
\@mkbibcitation: Bug corrected . . . 100
\maketitle: Fixes topnum 85
v1.56
General: Looks like XeTeX requires explicit monotype font declaration 55
Make two-column layouts flush (Philip Quinn) . . . 51

\@marginfigure: Added checking for description 57
\@mkteasers: Added check for description 99
\acksname: Added macro (Philip Quinn) 115
\ccsdesc@parse: End the concepts list with a period (Philip Quinn) . 78
\Description: Added macro 56
\if@Description@present: Added macro 55
\if@undescribed@images: Added macro 56
v1.57
\ACM@origbaselinestretch: Added check whether the user changed \baselinestretch 116
\author: Added warning if \author has comma 70
\email: Added warning if \author has comma 71
\if@ACM@balance: Added macro . . . 37
\vspace: Added warning 116
v1.58
General: Added HEALTH. TDSCI is renamed to TDS 60
Suppressed \addtocounter in pdf subject 49
\@dblfloat: Deleted spurious \vspace warning 58
\@marginfigure: Deleted spurious \vspace warning 57
\@margintable: Deleted spurious \vspace warning 58
\@mkbibcitation: Deleted spurious \vspace warning 100
\@printendtopmatter: Deleted spurious \vspace warning 101
\@sidebar: Deleted spurious \vspace warning 57
\maketitle: Original \vspace inside \maketitle 85
\vspace: Preserved old versions as \@vspace@orig and \@vspace@orig 116
v1.59
\acmConference: Setting \@ACM@journal@bibstrip 69
\acmJournal: Setting \@ACM@journal@bibstrip 69
\if@ACM@journal@bibstrip: Introduced macro 39
firstpagestyle: Added logic for conference papers using journal format 106
Moved page styles to \AtBeginDocument 106
standardpagestyle: Added logic for conference papers using journal format 103
Moved page styles to \AtBeginDocument 103
v1.60
\@headfootfont: Moved to footnotesize 103
v1.61
\@typeset@author@bx: Added \normalbaselines 96
v1.64
\ACM@linecount@bx: Bug fix: made the spacing on the left and the right size equal 102
\if@ACM@maketitle@typeset: Introduced macro 60
\maketitle: Added a switch setting to show that \maketitle is typeset . 85
v1.65
\@mkauthorsaddresses: Deleted cs@addpunct 99
v1.66
General: Patching algorithm and algorithm* to prevent spurious space warnings 56
\@specialsection: Suppress warnings about \vspace 88
v1.67
General: Patching lstlisting and lstlisting* to prevent spurious space warnings 56
\@parfont: Deleted redefinitions of sections 109
\@specialsection: Paragraph inside group does not print its argument. Added a bugfix 88
v1.68
General: New command for unindent paras 108
\@specialsection: Deleted grouping altogether 88
v1.69
General: No dots for unindented paragraphs 108
\@printendtopmatter: Deleted grouping 101
\@specialsection: Changed dot to colon for sigplan 88

\ACM@linecountR: Do not increase numbers in one column format . 102
\ccsdesc@parse: Use math right arrow in text 78
v1.71
\l@subsubsection: Bug fixed (thanks to Andrew Black) 48
v1.72
\author: Added \detokenize (Kuldeep S. Meel) 70
\maketitle: Do not andify authors for pdf metadata (Scott Pakin) . . . 85
v1.73
General: Patching minted and minted* to prevent spurious space warnings 56
\@ACM@checkaffil: Added macro . . 95
\@ACM@resetaffil: Added macro . . 95
\@mkauthors@i: Check the presence of required elements for affiliations 95
\@mkauthors@iii: Check the presence of required elements for affiliations 96
\@mkauthors@iv: Check the presence of required elements for affiliations 98
\city: Check the presence in affil . . 93
\country: Check the presence in affil 93
\if@ACM@citypresent: Added macro 95
\if@ACM@countrypresent: Added macro 95
\if@ACM@instpresent: Added macro 95
\institution: Check the presence in affil 93
\maketitle: Do not check again the presense of address fields 85
v1.74
General: Changed the order of font loading 55
v1.75
\@ACM@checkaffil: Changed warning to error for country 95
\@beginmaketitlehook: Introduced macro 84
\AtBeginMaketitle: Introduced macro 84
\maketitle: Added \@beginmaketitlehook 85
v1.76
General: Moved hyperxmp before hyperref, see https://github.com/borisveytsman/acmart/issues/425 49
\author: Added code for orcid links . 70
\if@ACM@pbalance: Added macro . . 37
\maketitle: Put \par inside group for keywords 85
\orcid: Added code for orcid links . . 72
standardpagestyle: Fixed bug with no line numbers for nonacm . . . 103
v1.77
\@mkauthorsaddresses: New separator of institutions 99
v1.78
\@mkauthors@i: Unboxing \mktitle@bx 95
\@mkauthors@iii: Unboxing \mktitle@bx 96
\@mkteasers: Unboxing \mktitle@bx 99
\@printtopmatter: Added processing the overflowing title box 89
\@specialsection: Again suppressed \vspace warning 88
v1.82
\anon: Introduced macro 84
v1.83
General: Use babel for multilanguage papers 44
\@mkabstract: I13n 100
\@mktitle@i: Added \translatedtitle and \translatedsubtitle 91
\@mktitle@iii: Added \translatedtitle and \translatedsubtitle 92
\@mktitle@iv: Added \translatedtitle and \translatedsubtitle 92
\@mktranslatedabstract: Added macro 100
\@mktranslatedkeywords: Added macro 72
\@translatedabstracts: Added macro 45
\@translatedkeywords: Added macro 45
\@translatedsubtitle: Added macro 45
\@translatedtitle: Added macro . 45
\ACM@lang@check: Added macro . . . 45
\ACM@languages: Introduced macro . 38
\maketitle: I13n 85
translatedabstract: Added macro 45
\translatedkeywords: Added macro 45
\translatedsubtitle: Added macro 45
\translatedtitle: Added macro . . 45

v1.85
General: Added CC licenses 79
\@acmengagemetadata: Introduced macro 85
\@copyrightowner: Added CC licenses 80
\@copyrightpermission: Added CC licenses 81
\@parfont: Added: acmengage 109
\@typesetengagemetadata: Introduced macro 101
\if@ACM@engage: Introduced macro . 39
\maketitle: acmengage 85
\setcctype: Added macro 80
\setengagemetadata: Introduced macro 85
v1.86
\country: Error if country is empty . 93
standardpagestyle: Special treatment of ACM Engage materials 103
v1.87
General: Added 'framed' package for acmcp 42
No numbering sections for ACMCP 110
\@ACM@color@frame: Introduced macro 77
\@ACM@copyright@check@cc: Added macro 81
\@copyrightpermission: CC licenses now are allowed only for non-acm or ACM engage publications 81
\@mkauthors@i: Special treatment for acmcp 95
\@mktitle@i: Special treatment for acmcp 91
\acmArticleType: Introduced macro 77
\acmCodeDataLink: Added possibility to have several links 77
Introduced macro 77
\acmDataLink: Introduced macro . . 78
Now this is the same as the code link 78
\if@ACM@acmcp: Introduced macro . . 39
firstpagestyle: Special treatment for acmcp 106
\maketitle: CC license are allowed for non-acm publications 85
\set@ACM@acmcpbox: Added macro . 88
standardpagestyle: Special treatment of ACMCP 103
v1.88
\@mktitle@i: Moved down title for acmcp 91
v1.89
General: Added 'zref-savepos' package for acmcp 42
\@ACM@acmcp@delta: Added dimen . 42
\@ACM@badge@skip: Redefined macro 74
\@ACM@color@frame: Added saving the position of the bottom 77
\@acmBadgeL: Introduced macro . . . 74
\@acmBadgeR: Introduced macro . . . 74
\@mktitle@i: Moved badges to top header 91
Moved up acmcp title 91
\@mktitle@iii: Moved badges to top header 92
\acmBadge: Added macro 75
\acmBadgeL: Redefined macro 74
\acmBadgeR: Redefined macro 74
\if@ACM@badge: Deleted macro 74
firstpagestyle: Moved badges here 106
\set@ACM@acmcpbox: Added logo . . . 88
Added zref position of the bottom 88
v1.91
\acmContributions: Restored the macro 78
standardpagestyle: Redesigned ACMP labels 103
v1.93
General: Added PACMSE journal option 35
v2.00
General: Deleted acmPrice 79
\@ACM@copyright@check@cc: Moved to warning 81
\@copyrightowner: Changed wording 80
\@folio@ht: Obsoleted macro 106
\@folio@max: Obsoleted macro 106
\@folio@voffset: Obsoleted macro . 106
\@folio@wd: Obsoleted macro 106
\@folioblob: Obsoleted macro 106
\@sect@kernel: Added macro 41
\@ssect@kernel: Added macro 41
\@startsection@kernel: Added macro 40
\@xsect@kernel: Added macro 40
\acmPrice: Deleted macro 73
firstpagestyle: Deleted blobs 106
\maketitle: Added "ACM" for papers 85
Deleted acmPrice 85
v2.01
General: Documentation update: POMACS uses acmsmall 35
\acmBooktitle: Moved default conference title to conference setting 69

\acmPrice: Now the macro produces a warning 73
v2.02
\acmConference: Moved here setting the conference title for bibstrip . . 69
v2.03
General: Added documentation about samples 35
\acmConference: Made setting bibstrip overriding journal 69
\if@ACM@journal@bibstrip@or@tog: Introduced macro 39
firstpagestyle: Special treatment of tog 106
\maketitle: Special processing for conferences in TOG 85
standardpagestyle: Special treatment of ACM TOG 103
v2.04
General: eISSN is printed, rather than pSSN 69
\@copyrightowner: Changed wording 80
v2.06
\@mkauthorsaddresses: \streetaddress and \postcode now produce warnings 99
\postcode: We now do not collect postal information anymore 93
\streetaddress: We now do not collect postal information anymore 93
v2.08
\@parfont: Deleted uppercasing . . . 109
v2.09
General: Saved the old definitions (Ulrike's code 40
\@ACM@copyright@check@cc: Deleted macro 81
\@copyrightpermission: Deleted checking whether CC licenses are allowed 81
v2.10
General: Added tocindent for paragraphs and subparagraphs . 110
v2.11
\@copyrightpermission: Changed URL for CC licenses 81
\maketitle: Deleted conference date from bibstrip 85
v2.12
General: Removed 'textcase' package 42
Use unicode-math and libertinus for Unicode engines 55

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

\- 634
\@ . . . 1977, 1980, 1992, 1997, 2002, 2086, 2123
\@@authornotemark 1698, 2856
\@@par 496, 552
\@ACM@acmcp@delta 286, 2352, 2356
\@ACM@acmcpbox 2339, 2343, 3144, 3229
\@ACM@acmcpfalse . . . 172
\@ACM@acmcptrue 230
\@ACM@addtoaddress . 2555, 2586, 2587, 2588
\@ACM@authorsperrow 1803, 2732, 2733, 2785, 2786
\@ACM@badge@skip 1728, 1740, 1753
\@ACM@badge@width 1725, 1737, 1743, 1750, 1756
\@ACM@balancefalse 3481, 3505, 3507, 3509, 3521, 3525
\@ACM@checkaffil 2310, 2670, 2701, 2706, 2768, 2773, 2813, 2818
\@ACM@citypresentfalse 2667
\@ACM@citypresenttrue . . . 2573, 2586, 2662
\@ACM@color@frame 1860, 2336
\@ACM@commabox 2555, 2559, 2560
\@ACM@copyright@check@cc 2013
\@ACM@countrypresentfalse 2668
\@ACM@countrypresenttrue . . . 2578, 2588, 2664
\@ACM@engagefalse . . 170
\@ACM@engagetrue . . . 227
\@ACM@institution@separator . . . 2838, 2839, 2844
\@ACM@instpresentfalse 2666
\@ACM@instpresenttrue . . . 2571, 2582, 2660
\@ACM@journal@bibstrip@or@tog 213, 235, 1537
\@ACM@journal@bibstripfalse 237, 1551
\@ACM@journal@bibstriptrue 234, 1536
\@ACM@journalfalse 215, 217, 219, 221, 223, 226
\@ACM@journaltrue . . 206, 208, 210, 212, 229
\@ACM@labelwidth 1031, 1034, 1042, 1047, 1073
\@ACM@maketitle@typesetfalse 1080
\@ACM@maketitle@typesettrue 2186
\@ACM@manuscriptfalse 201
\@ACM@manuscripttrue 199
\@ACM@newfontsfalse 855, 858, 861
\@ACM@newfontstrue . 852
\@ACM@printacmreffalse 97, 231
\@ACM@printfoliostrue 80
\@ACM@resetaffil . . . 2665, 2700, 2705, 2767, 2772, 2812, 2817
\@ACM@reviewtrue . . . 142
\@ACM@screentrue 1207, 1258, 1265, 1282, 1289, 1296
\@ACM@sigchiamodefalse 203
\@ACM@sigchiamodetrue 224
\@ACM@timestamptrue 141
\@ACM@title@width 1727, 2528, 2530, 2539, 2540
\@DeclareACMFormat 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51
\@Description@presentfalse . . 899, 902, 981, 2862
\@Description@presenttrue 893, 896
\@M . 496, 535, 552, 564, 3579
\@abstract 1774, 2870, 2877
\@acmArticle 1705, 1708, 2276, 2895, 2896, 3030, 3033, 3053, 3063, 3075, 3148, 3171, 3181, 3192, 3233
\@acmArticlePage . . . 3029, 3047, 3048, 3057, 3060, 3067, 3071
\@acmArticleSeq 1707
\@acmBadgeL 1731, 1746, 1747, 1752, 3162, 3174, 3175, 3186, 3187, 3199, 3202, 3207, 3228
\@acmBadgeR 1730, 1733, 1734, 1739, 3163, 3176, 3177, 3184, 3185, 3200, 3203, 3208, 3229
\@acmBooktitle . 1552, 1562, 2243, 2266, 2911
\@acmCodeDataLink 1867, 1868, 1870, 1872, 2359, 2360
\@acmContributions . . . 1873, 2365, 2366
\@acmDOI . . 1723, 2268, 2271, 2277, 2280, 2919, 3092, 3094, 3116, 3118, 3149, 3234
\@acmEditors 1565, 1566, 1567, 1570, 2912, 2913
\@acmISBN 1721, 2279
\@acmMonth 1711, 1713, 2276
\@acmNumber 1703, 2908, 3053, 3063, 3075, 3147, 3171, 3181, 3192, 3232
\@acmPubDate 1713, 2908, 3053, 3063, 3076, 3149, 3172, 3182, 3193, 3234
\@acmSubmissionID 1591,

1592, 1611, 1612, 1719, 3010, 3011, 3021
\@acmVolume 1701, 2908, 3052, 3062, 3075, 3147, 3170, 3180, 3192, 3232
\@acmYear . . 1709, 1716, 2159, 2243, 2276, 2899
\@acmdefinitionbodyfont . . . 3392, 3404, 3418
\@acmdefinitionheadfont . . . 3394, 3406, 3420
\@acmdefinitionindent . . . 3393, 3405, 3419
\@acmdefinitionnotefont . . . 3395, 3407, 3423
\@acmengagemetadata . . . 2180, 2182, 2932
\@acmownedfalse 1928, 1931, 1934, 1939, 1942, 1945, 1948, 1951, 1957, 1960, 1963, 1966
\@acmownedtrue 1915, 1924, 1954
\@acmplainbodyfont . . . 3360, 3372, 3386
\@acmplainheadfont . . . 3362, 3374, 3388
\@acmplainindent 3361, 3373, 3387
\@acmplainnotefont . . . 3363, 3375, 3391
\@adddotafter 3248, 3249, 3251, 3263, 3281, 3286, 3354
\@additionalaffiliation 1637, 1638
\@addpunct . 2842, 2928, 2929, 3354, 3355, 3475
\@addspaceafter 3355
\@affiliationfont 2619, 2624, 2628, 2631, 2634, 2637, 2640, 2643, 2646, 2649, 2701, 2724
\@afterheading . 527, 2332
\@afterindentfalse 473, 2331
\@afterindenttrue . . 471
\@article@string 2895, 2908, 2916
\@author 1590, 1596, 1603, 2686, 2751, 2798, 2845
\@authorfont 2618, 2623, 2627, 2630, 2633, 2636, 2639, 2642, 2645, 2648, 2688, 2724
\@authornotemark 1689, 1696, 2855
\@authornotes 1686, 1690, 2206
\@authorsaddresses 1661, 2215, 2368, 2850, 2929
\@auxout . . 670, 2355, 3349
\@begindocumenthook 666
\@beginmaketitlehook . . . 2176, 2179, 2185
\@botnum 2329
\@citestyle 320
\@classname 25, 26, 28, 34, 37, 40, 53, 55, 57, 58, 61, 63, 65, 66, 69, 71, 73, 74, 77, 79, 82, 83, 86, 88, 90, 91, 94, 96, 102, 103, 106, 107, 110, 111, 114, 116, 118, 119, 122, 124, 126, 127, 130, 132, 134, 135, 138, 140, 144, 145, 163, 174, 177, 180, 183, 186, 269, 431, 455, 853, 856, 859, 898, 907, 910, 984, 1208, 1259, 1266, 1283, 1290, 1297, 1531, 1533, 1581, 1636, 1648, 1717, 1761, 1767, 1772, 1779, 1781, 1782, 1785, 1787, 1788, 1791, 1799, 1801, 1802, 1804, 1805, 1853, 1906, 2317, 2563, 2566, 2672, 2675, 2678, 2831, 2834, 2851, 2865, 2892, 3583, 3586, 3593
\@clubpenalty 541
\@concepts . 1878, 1890, 1904, 2294, 2296, 2314
\@copyrightowner 1974, 2250
\@copyrightpermission . . . 2013, 2226, 2238
\@copyrightyear 2158, 2250, 2252, 2253
\@currbox . 1010, 1011, 1012
\@currentaffiliation 2725, 2728, 2750, 2757, 2758, 2761, 2764, 2765, 2770, 2797, 2804, 2805, 2807, 2809, 2810, 2815
\@currentaffiliations 2654, 2655, 2656, 2658, 2684, 2696, 2697, 2703
\@currentauthors 2652, 2653, 2683, 2687, 2688, 2690, 2724, 2727, 2749, 2751, 2752, 2754, 2796, 2798, 2799, 2801, 2855, 2856
\@currentlabel . 584, 598
\@dblarg 482
\@dblfloat 993
\@department . . 1641, 1642
\@dotsep 3359
\@editorsAbbrev 1564, 1569, 2913
\@empty . 157, 243, 390, 430, 486, 1548, 1552, 1566, 1588, 1591, 1609, 1611, 1616, 1617, 1623, 1733, 1746, 1764, 1765, 1821, 1822, 1828, 1835, 1867, 1878, 1904, 2177, 2210, 2215, 2252, 2268, 2279, 2280, 2291, 2294, 2300, 2304, 2359, 2362, 2365, 2368, 2404, 2533, 2542, 2551, 2577, 2654, 2687, 2695, 2696, 2751, 2757, 2764, 2798, 2804, 2809, 2850, 2858, 2895, 2900, 2912, 2919, 3010, 3021, 3092, 3094, 3116, 3118, 3148, 3149, 3233, 3234, 3363, 3395, 3544, 3561

\@endfloatbox 996
\@endpefalse 3477
\@endwidefloatbox 996, 1004
\@finalstrut . . . 589, 602
\@float 998
\@flushglue 3297
\@fnsymbol 2196
\@folio@ht 3154
\@folio@max 3154
\@folio@voffset 3154
\@folio@wd 3154
\@folioblob 3154
\@footnotemark . 605, 2194
\@footnotemark@nolink 605, 2194
\@footnotetext 580, 606, 2195
\@footnotetext@nolink 606, 2195
\@for 296, 3341, 3348
\@formatdoi 2012, 2271, 2277, 2280, 2919, 3092, 3094, 3116, 3118, 3149, 3234
\@fps 997
\@fpsadddefault 997
\@gobble 318, 362
\@hangfrom 495, 551
\@headfootfont 3023, 3047, 3048, 3049, 3050, 3056, 3059, 3066, 3070, 3084, 3085, 3091, 3093, 3097, 3100, 3108, 3109, 3115, 3117, 3121, 3124
\@idxitem 3576
\@ifnextchar 1641
\@ifnotempty 2164
\@ifnum 334, 336
\@ifstar 480
\@ifundefined . . 3342, 3428, 3431, 3434, 3437, 3440, 3444, 3447
\@iiiparbox 816
\@indextitlestyle . . 3575
\@input 567
\@insideauthorgroupfalse 1579, 1631
\@insideauthorgrouptrue 1586
\@journalCode . . 1081, 1208, 1259, 1266, 1283, 1290, 1297, 1531
\@journalCode@nr 1081, 1156, 1538
\@journalName 1158, 1163, 1167, 1172, 1177, 1182, 1187, 1192, 1197, 1202, 1210, 1215, 1220, 1225, 1230, 1235, 1239, 1244, 1249, 1254, 1261, 1268, 1273, 1278, 1285, 1292, 1299, 1304, 1309, 1314, 1319, 1324, 1329, 1334, 1338, 1343, 1348, 1353, 1358, 1363, 1368, 1372, 1377, 1382, 1387, 1392, 1397, 1402, 1407, 1412, 1417, 1422, 1427, 1432, 1437, 1442, 1447, 1452, 1457, 1462, 1467, 1472, 1477, 1482, 1487, 1492, 1497, 1502, 1507, 1512, 1517, 1522, 1527, 1539, 1540, 2264, 3147, 3232
\@journalNameShort 1159, 1164, 1168, 1173, 1178, 1183, 1188, 1193, 1198, 1204, 1211, 1216, 1221, 1226, 1231, 1236, 1240, 1245, 1250, 1255, 1262, 1269, 1274, 1279, 1286, 1293, 1300, 1305, 1310, 1315, 1320, 1325, 1330, 1335, 1339, 1344, 1349, 1354, 1359, 1364, 1369, 1373, 1378, 1383, 1388, 1393, 1398, 1403, 1408, 1413, 1418, 1423, 1428, 1433, 1438, 1443, 1448, 1453, 1458, 1463, 1468, 1473, 1478, 1483, 1488, 1493, 1498, 1503, 1508, 1513, 1518, 1523, 1528, 1540, 2907, 3052, 3062, 3074, 3170, 3180, 3191
\@keywords 1763, 1764, 1765, 2300, 2302, 2315, 2362, 2363
\@latex@error 364
\@lempty 1776, 2870
\@listI 1055, 1059
\@listi 1052, 1059
\@listii 1060
\@listiii 1063
\@listiv 1065
\@listv 1067
\@listvi 1069
\@m 484
\@makefnmark . . . 579, 604, 2198, 2203, 2207
\@makefntext 579, 588, 601, 2209
\@marginfigure . 976, 977
\@margintable . . 987, 988
\@minipagefalse . 813, 1006
\@minus 3269, 3274, 3279, 3284, 3289, 3294, 3383, 3385, 3415, 3417
\@mkabstract . . 2290, 2869
\@mkauthors 2199, 2201, 2590
\@mkauthors@i 2594, 2596, 2598, 2600, 2614, 2682
\@mkauthors@ii 2717
\@mkauthors@iii 2602, 2604, 2606, 2608, 2612, 2729
\@mkauthors@iv 2610, 2782
\@mkauthorsaddresses 1662, 2826
\@mkbibcitation 2325, 2886
\@mkteasers . . . 2199, 2857
\@mktitle 2199, 2448
\@mktitle@i 2451, 2453, 2455, 2457, 2471, 2524
\@mktitle@ii 2537
\@mktitle@iii 2459, 2461, 2463, 2465, 2469, 2537
\@mktitle@iv . . 2467, 2547
\@mktranslatedabstract 453, 2879

\@mktranslatedkeywords 450, 1663
\@mpargs 816
\@mparswitchfalse . . 762
\@mpfootins 593, 594, 808, 809, 811
\@mpfootnotetext . . . 592
\@ne . 322, 326, 330, 332, 656, 2952, 2958, 2962
\@nil 341
\@nobreakfalse . 529, 573
\@noskipsecfalse . . . 533
\@noskipsectrue 530
\@pages@word 2889, 2909, 2916
\@par 2212, 2219
\@parboxrestore 597
\@parfont 3286, 3291, 3296, 3301
\@permissionCodeOne 1160, 1165, 1169, 1174, 1179, 1184, 1189, 1194, 1199, 1205, 1212, 1217, 1222, 1227, 1232, 1237, 1241, 1246, 1251, 1256, 1263, 1270, 1275, 1280, 1287, 1294, 1301, 1306, 1311, 1316, 1321, 1326, 1331, 1336, 1340, 1345, 1350, 1355, 1360, 1365, 1370, 1374, 1379, 1384, 1389, 1394, 1399, 1404, 1409, 1414, 1419, 1424, 1429, 1434, 1439, 1444, 1449, 1454, 1459, 1464, 1469, 1474, 1479, 1484, 1489, 1494, 1499, 1504, 1509, 1514, 1519, 1524, 1529, 1541, 1542
\@permissionCodeTwo 1161, 1170, 1175, 1180, 1185, 1190, 1195, 1200, 1206, 1213, 1218, 1223, 1228, 1233, 1242, 1247, 1252, 1257, 1264, 1271, 1276, 1281, 1288, 1295, 1302, 1307, 1312, 1317, 1322, 1327, 1332, 1341, 1346, 1351, 1356, 1361, 1366, 1375, 1380, 1385, 1390, 1395, 1400, 1405, 1410, 1415, 1420, 1425, 1430, 1435, 1440, 1445, 1450, 1455, 1460, 1465, 1470, 1475, 1480, 1485, 1490, 1495, 1500, 1505, 1510, 1515, 1520, 1525, 1542, 2276
\@plus 564, 574, 817, 3269, 3274, 3279, 3284, 3289, 3294, 3382, 3384, 3414, 3416, 3472, 3577
\@printcopyrightfalse 1927, 1938
\@printcopyrighttrue 1911, 1923
\@printendtopmatter 2330, 2921
\@printpermissionfalse 1926
\@printpermissiontrue . . . 1913, 1922, 1937
\@printtopmatter 2200, 2403
\@proofindent 3454, 3464, 3474
\@proofnamefont 3453, 3463, 3475
\@received . 1819, 1822, 1823, 1825, 1828, 1829, 1831, 1835, 1836
\@restonecolfalse . . 3573
\@restonecoltrue . . . 3573
\@rightskip . . . 3297, 3298
\@saveabstract 1770, 1771
\@saveteaser . . 2161, 2162
\@savetranslatedabstract 453, 454
\@seccntformat . 489, 560
\@secfont 3271, 3301
\@secpenalty 478
\@sect . . 241, 462, 482, 483
\@sect@kernel . . 241, 462
\@setaddresses 2854
\@setauthorsaddresses . . . 2219, 2368, 2929
\@setengagemetadata 2183, 2931
\@setthanks . . . 2212, 2928
\@shortauthors 3018, 3041, 3049, 3057, 3067, 3085, 3109
\@sidebar 972, 973
\@specialsection . . . 1665, 2295, 2301, 2373
\@ssect . 242, 463, 481, 546
\@ssect@kernel . 242, 463
\@startPage 1759, 2404, 2405, 2407, 3015
\@startsection 239, 459, 564, 3268, 3273, 3278, 3283, 3288, 3293
\@startsection@kernel 239, 461
\@starttoc 561
\@starttoc@cfgpoint@after 568
\@starttoc@cfgpoint@before 566
\@subparfont 3326
\@subsecfont . . 3276, 3301
\@subsubsecfont 3281, 3301
\@subtitle . 1572, 1678, 2533, 2534, 2542, 2543, 2551, 2552, 2900
\@subtitlefont 2499, 2534, 2543, 2552
\@subtitlenotes 1676, 1680, 1683, 2205
\@svsec . 486, 489, 495, 510
\@svsechd . . . 508, 536, 555
\@teaser 2162, 2859
\@teaserfigures 2160, 2162, 2858, 2863
\@tempa 296, 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327, 329, 331, 333, 335, 337, 339, 341, 344, 346, 348, 350, 352, 354, 1615, 1616, 1820, 1821, 2576, 2577, 2695, 3341, 3342, 3343, 3348, 3350, 3351, 3544, 3560, 3561, 3563, 3567

\@tempb 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327, 329, 331, 333, 335, 337, 339, 344, 346, 348, 350, 352, 354, 3562, 3563, 3566, 3567
\@tempboxa . 816, 2413, 2415
\@tempc . 342, 343, 345, 347, 349, 351, 353, 355
\@tempdima 2350, 2353, 2354, 2356, 2409, 2410, 2411, 2417, 2418, 2419
\@tempskipa 470, 472, 473, 478, 491, 492, 523, 524, 526, 538, 539, 547, 548
\@textbottom 817
\@textsuperscript 604, 2198, 2203
\@texttop 818
\@thefnmark . 585, 599, 604, 2198, 2203, 2208
\@title . . . 1669, 2313, 2532, 2541, 2550, 2899
\@titlefont 2474, 2529, 2531, 2538, 2540, 2548
\@titlenotes 1667, 1671, 1674, 2204
\@tochangmeasure 500, 513
\@toclevel 484, 3267, 3272, 3277, 3282, 3287, 3292
\@tocline . . . 576, 577, 578
\@topnum 2327
\@translatedabstracts . 451, 458, 2291, 2292
\@translatedkeywords . 448, 450, 2304, 2305
\@translatedsubtitle 445, 447, 2534, 2543, 2552
\@translatedtitle 442, 444, 2532, 2541, 2550
\@typeset@author@bx 2721, 2775, 2781, 2820, 2825
\@typeset@author@line 2651, 2685, 2709, 2714
\@typesetengagemetadata 2288, 2930
\@undefined 666, 886, 2176
\@undescribed@imagesfalse 895
\@undescribed@imagestrue . . 906, 909, 983, 2864
\@vspace 900, 903, 911, 913, 915, 917, 919, 921, 923, 925, 927, 929, 931, 933, 973, 978, 988, 994, 2192, 2374, 2400, 2887, 2922, 2925, 3581, 3583, 3589
\@vspace@acm 2400, 2925, 3589
\@vspace@orig . . 900, 903, 911, 913, 915, 917, 919, 921, 923, 925, 927, 929, 931, 933, 973, 978, 988, 994, 2192, 2374, 2887, 2922, 3581
\@vspacer 901, 904, 912, 914, 916, 918, 920, 922, 924, 926, 928, 930, 932, 934, 974, 979, 989, 995, 2193, 2375, 2401, 2888, 2923, 2926, 3582, 3586, 3590
\@vspacer@acm 2401, 2926, 3590
\@vspacer@orig . 901, 904, 912, 914, 916, 918, 920, 922, 924, 926, 928, 930, 932, 934, 974, 979, 989, 995, 2193, 2375, 2888, 2923, 3582
\@width 797, 804
\@writetocindents . . 3346
\@xp 570, 571, 3343
\@xsect 240, 464, 521, 522, 557
\@xsect@kernel . 240, 464
\\ 687, 696, 1591, 1870, 2144, 2250, 2257, 2272, 2276, 2279, 2360, 2891, 2899, 2957, 3149, 3234
\{ 304
\} 304
\␣ 1555, 1886, 1896, 2250, 2253, 2895, 2896, 2914, 3015

A

\abstract 1770
abstract (env.) *17*
\abstractname . . 388, 401, 2871, 2875, 2883
\acks 3535
acks (env.) *24*
\acksname 399, 410, 418, 426, 3534, 3537, 3538
\ACM@adddotafter 3249, 3266
\ACM@ArticleType 1838, 3142, 3227
\ACM@ArticleType@nr 1838, 1840, 3140, 3225
\ACM@cc@type . . . 1972, 2141, 2143, 2144, 2147, 2148, 2149, 2150, 2151, 2152, 2153
\ACM@CC@Url 2142, 2143, 2144, 2145
\ACM@cc@version 1971, 2143, 2154
\acm@copyrightinput 1917
\acm@copyrightmode 1917, 1925, 1930, 1933, 1936, 1941, 1944, 1947, 1950, 1953, 1956, 1959, 1962, 1965, 1975, 2014, 2225
\ACM@fontsize 148, 243, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 269, 270
\ACM@format 34, 163
\ACM@format@nr 34, 163, 173, 179, 185, 198, 204, 244, 617, 702, 781, 819, 945, 1014, 2376, 2423, 2449, 2475, 2500, 2592, 2620, 2973, 3037, 3160, 3212, 3306, 3364, 3396, 3455, 3482, 3503
\ACM@lang@check 429, 443, 446, 449, 457
\ACM@languages 155, 390, 392, 430
\ACM@linecount 2951, 2952,

2957, 2958, 2961, 2962
\ACM@linecount@bx . . . 2948, 2968, 2998
\ACM@linecount@bxht 2950, 2956, 2959, 2960
\ACM@linecountL 2964, 3039, 3042, 3047, 3050, 3056, 3058, 3066, 3068, 3084, 3087, 3091, 3097, 3108, 3111, 3115, 3121, 3143, 3162, 3174, 3175, 3186, 3187, 3199, 3202, 3207, 3228
\ACM@linecountR . 2971, 3069, 3071, 3085, 3088, 3095, 3102, 3109, 3112, 3119, 3126, 3200, 3203, 3208
\ACM@mk@linecount 2953, 2966, 2981, 2983, 2985, 2987, 2989, 2991, 2993
\ACM@NR@adjustedSectionformat 3246, 3255
\ACM@NRadjust 3237, 3271, 3276, 3281, 3286, 3291, 3296
\ACM@origbaselinestretch 3591
\ACM@ps@headings 2942, 2946
\ACM@ps@myheadings 2941, 2945
\ACM@ps@plain . 2940, 2944
\ACM@restore@pagestyle 2940
\ACM@sect@format 3256, 3258
\ACM@sect@format@ . . . 3245, 3258, 3260
\ACM@sect@format@null 3259, 3260
\ACM@timestamp 3001, 3134, 3213, 3218
\acmArticle 14, 1705
\acmArticleSeq . 14, 1707
\acmArticleType . 19, 1838
\acmBadge 14, 1758
\acmBadgeL 1745
\acmBadgeR 1732, 1758
\acmBooktitle 9, 1553, 1562
\acmCodeDataLink . . . 1866
\acmCodeLink 19, 1866, 1875
\acmConference . . 9, 1543
\acmConference@date 1546, 3079, 3099, 3102, 3123, 3126, 3196
\acmConference@name . . . 1545, 1553, 1554
\acmConference@shortname 1544, 1548, 1549, 1554, 1555, 2245, 3078, 3098, 3101, 3122, 3125, 3195
\acmConference@venue 1547, 2245, 3079, 3099, 3102, 3123, 3126, 3196
\acmContributions . . 1873
\acmDataLink . . . 19, 1875
\acmdefinition 3413
\acmDOI 14, 1723
\acmISBN 14, 1721
\acmJournal 9, 1535
\acmMonth 14, 1711
\acmNumber 14, 1703
\acmplain 3381
\acmPrice 1717
\acmSubmissionID 14, 1719
\acmVolume 14, 1701
\acmYear 14, 1709
\addcontentsline 292, 502, 515, 2871, 3538
\additionalaffiliation 11, 1637
\addpenalty 478
\addresses 1588, 1590, 1595, 1602, 1633, 1651, 1689, 1696, 1698, 2714, 2781, 2825, 2847
\addto . . 393, 404, 412, 420
\addtocounter . . 610, 1898
\AddToHook 2934, 2936
\addtolength 1040, 1041, 1042, 1046, 1047, 2959
\addvspace 478, 574
\advance 1056, 1061, 1064, 1066, 1068, 1070, 1583, 1585, 1863, 2410, 2418, 2526, 2711, 2731, 2748, 2784, 2795, 2958, 2962
\affiliation 10, 1630, 2694, 2764, 2809
\and 1570, 1603, 1605, 1620, 1626, 2685, 2690, 2692, 2703, 2709, 2722, 2756, 2775, 2781, 2803, 2820, 2825, 2844
\andify 2320, 2321, 2652, 2655, 2913
\anon 23, 2170
anonsuppress (env.) . . . 23
\apptocmd 3583, 3586
\AtBeginDocument 80, 97, 231, 659, 667, 1032, 2947, 3024, 3154, 3261, 3340
\AtBeginEnvironment 899, 902, 911, 913, 915, 917, 919, 921, 923, 925, 927, 929, 931, 933
\AtBeginMaketitle 31, 2179
\AtEndDocument 897, 1765, 1789, 1834, 1904, 2335, 2849, 3529, 3592
\AtEndEnvironment 905, 908
\AtEndPreamble . 632, 887, 3425, 3479, 3545
\author 10, 1580, 2188, 2189, 2893
\author@bx 2717, 2723, 2726
\author@bx@sep 2719, 2726, 2731, 2748, 2784, 2795
\author@bx@wd 2718, 2721, 2730, 2731, 2733, 2739, 2741, 2743, 2745, 2748, 2783, 2784, 2786, 2792, 2795
\authornote 13, 1637, 1687, 2894
\authornotemark . 13, 1693
\authors 1593, 1598, 1605, 2308, 2320, 2322, 2899
\authorsaddresses 13, 1661

B

\balance 3532
\baselineskip . . 2236, 2959, 3269, 3270, 3274, 3275, 3279, 3284, 3289, 3382,

3383, 3384, 3385, 3414, 3415, 3416, 3417
\baselinestretch 3591, 3592, 3594
\begin 20, 2967, 2997
\begingroup 493, 536, 549, 561, 655, 2191, 2590, 3238, 3347, 3536
\bfseries . . 1071, 2232, 2477, 2479, 2481, 2485, 2487, 2489, 2491, 2493, 2495, 2497, 2639, 2642, 2897, 3301, 3302, 3316, 3317, 3319, 3320, 3322, 3323, 3324, 3325, 3329, 3330, 3333, 3334, 3336, 3337, 3374, 3406
\bgroup . 458, 973, 977, 988, 994, 1638, 1663, 2294, 2300, 2341, 2721, 2758, 2761, 2822, 2830, 2859, 2869, 2886, 2898
\bibfont 294
\bibliofont 294
\bibliographystyle . 665
\bibsection 290
\bibstyle 318, 320, 362, 670
\bibstyle@acmauthoryear 368
\bibstyle@acmnumeric 374
\bigskip 1836, 2359, 2360, 2362, 2365, 2368, 2441, 2536, 2546, 2554, 2781, 2825, 2859, 2924
\box 1011, 2425, 2427, 2429, 2431, 2433, 2435, 2437, 2439, 2441, 2443, 2445, 2726, 3144, 3229

C

\c@footnote 2196
\c@secnumdepth 485, 499, 503, 512, 516
\captionsenglish . . . 393
\captionsetup . . 937, 939, 941, 943, 952, 954, 957, 959, 962, 964, 974, 980, 989, 2860
\captionsfrench 404
\captionsgerman 412
\captionsspanish . . . 420
\ccdesc@parse@finish 1909
\ccsdesc *15*, 1880
\ccsdesc@parse 1881, 1882
\ccsdesc@parse@end 1881, 1909
\ccsdesc@parse@finish 1903, 1909
CCSXML (env.) *15*
\centering . . 565, 600, 686, 695, 981, 990, 2538, 2540, 2723, 2780
\changes 148
\cite . . . 648, 649, 660, 664
\citeA 654
\citealt 653
\citeANP 650
\citeauthor 650
\citeN 648
\citename 661
\citeNN 651
\citeNP 653
\citep 649
\citestyle . . . *25*, 360, 380
\citeyear 652
\citeyearNP 652
\citeyearpar . . . 651, 664
\city . . *11*, 1643, 2563, 2840
\ClassError 37, 431, 455, 1533, 1636, 1772, 1782, 1788, 1802, 1853, 2678, 2892, 3593
\ClassInfo 163, 269, 1531, 1779, 1781, 1785, 1787, 1799, 1801, 1804
\ClassWarning . . . 28, 174, 180, 186, 853, 856, 859, 907, 910, 984, 1581, 1648, 1717, 1761, 1805, 2563, 2566, 2831, 2834, 2865, 3583, 3586
\ClassWarningNoLine . 898, 1767, 1791, 1906, 2672, 2675, 2851
\cleaders 2560
\clearpage 2416
\clubpenalty . . . 535, 541
\CodelineIndex 17
\Collect@Body 452, 972, 976, 987, 1770, 2161
\color 2172, 2234, 2957, 2961, 3141, 3226
\color@begingroup 587, 600
\color@endbox 1009
\color@endgroup 590, 603, 814
\colorbox . 1862, 3141, 3226
\colorlet 1842, 1844, 1846, 1848, 1850
\columnsep 3574
\columnseprule 3574
\columnwidth . . . 596, 797, 995, 2783, 2822
\contentsnamefont . . 565
\copy 2560
\copyright 2250
\copyrightpermissionfootnoterule 796
\copyrightyear . *17*, 2158
\country *11*, 1645, 2563, 2843
\csname 362, 498, 500, 504, 511, 513, 517, 560, 570, 571, 585, 599, 1597, 1604, 1655, 1658, 1885, 1886, 1888, 1889, 1890, 1891, 1892, 1895, 1897, 2317, 2319, 3239, 3262, 3343, 3351
\CurrentOption 150, 151, 152, 153, 154, 160, 161

D

\day 3013
\DeclareNewFootnote 800, 802
\DeclareOptionX 40, 150, 151, 152, 153, 154, 156, 160, 161
\DeclareRobustCommand 654, 3258
\DeclareTextFontCommand 888
\def 25, 26, 40, 149, 155, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 322, 323, 324, 325, 326,

327, 328, 329, 330, 331, 333, 335, 337, 339, 340, 344, 346, 348, 350, 352, 354, 442, 445, 448, 451, 454, 467, 483, 508, 522, 546, 555, 560, 561, 576, 577, 578, 579, 581, 592, 604, 610, 611, 612, 613, 614, 634, 665, 796, 803, 805, 817, 973, 977, 988, 994, 997, 1001, 1004, 1022, 1023, 1024, 1025, 1055, 1060, 1063, 1065, 1067, 1069, 1158, 1159, 1160, 1161, 1163, 1164, 1165, 1167, 1168, 1169, 1170, 1172, 1173, 1174, 1175, 1177, 1178, 1179, 1180, 1182, 1183, 1184, 1185, 1187, 1188, 1189, 1190, 1192, 1193, 1194, 1195, 1197, 1198, 1199, 1200, 1202, 1204, 1205, 1206, 1210, 1211, 1212, 1213, 1215, 1216, 1217, 1218, 1220, 1221, 1222, 1223, 1225, 1226, 1227, 1228, 1230, 1231, 1232, 1233, 1235, 1236, 1237, 1239, 1240, 1241, 1242, 1244, 1245, 1246, 1247, 1249, 1250, 1251, 1252, 1254, 1255, 1256, 1257, 1261, 1262, 1263, 1264, 1268, 1269, 1270, 1271, 1273, 1274, 1275, 1276, 1278, 1279, 1280, 1281, 1285, 1286, 1287, 1288, 1292, 1293, 1294, 1295, 1299, 1300, 1301, 1302, 1304, 1305, 1306, 1307, 1309, 1310, 1311, 1312, 1314, 1315, 1316, 1317, 1319, 1320, 1321, 1322, 1324, 1325, 1326, 1327, 1329, 1330, 1331, 1332, 1334, 1335, 1336, 1338, 1339, 1340, 1341, 1343, 1344, 1345, 1346, 1348, 1349, 1350, 1351, 1353, 1354, 1355, 1356, 1358, 1359, 1360, 1361, 1363, 1364, 1365, 1366, 1368, 1369, 1370, 1372, 1373, 1374, 1375, 1377, 1378, 1379, 1380, 1382, 1383, 1384, 1385, 1387, 1388, 1389, 1390, 1392, 1393, 1394, 1395, 1397, 1398, 1399, 1400, 1402, 1403, 1404, 1405, 1407, 1408, 1409, 1410, 1412, 1413, 1414, 1415, 1417, 1418, 1419, 1420, 1422, 1423, 1424, 1425, 1427, 1428, 1429, 1430, 1432, 1433, 1434, 1435, 1437, 1438, 1439, 1440, 1442, 1443, 1444, 1445, 1447, 1448, 1449, 1450, 1452, 1453, 1454, 1455, 1457, 1458, 1459, 1460, 1462, 1463, 1464, 1465, 1467, 1468, 1469, 1470, 1472, 1473, 1474, 1475, 1477, 1478, 1479, 1480, 1482, 1483, 1484, 1485, 1487, 1488, 1489, 1490, 1492, 1493, 1494, 1495, 1497, 1498, 1499, 1500, 1502, 1503, 1504, 1505, 1507, 1508, 1509, 1510, 1512, 1513, 1514, 1515, 1517, 1518, 1519, 1520, 1522, 1523, 1524, 1525, 1527, 1528, 1529, 1535, 1538, 1539, 1540, 1541, 1542, 1562, 1564, 1565, 1566, 1572, 1615, 1637, 1638, 1639, 1640, 1641, 1642, 1653, 1661, 1667, 1668, 1676, 1677, 1686, 1687, 1701, 1703, 1705, 1707, 1709, 1711, 1713, 1717, 1719, 1721, 1723, 1730, 1731, 1759, 1761, 1763, 1771, 1776, 1807, 1819, 1820, 1855, 1861, 1866, 1872, 1873, 1882, 1883, 1909, 1968, 1971, 1972, 1974, 2012, 2013, 2142, 2158, 2160, 2162, 2179, 2180, 2181, 2185, 2198, 2203, 2212, 2219, 2310, 2340, 2373, 2403, 2448, 2474, 2499, 2524, 2537, 2547, 2556, 2563, 2566, 2570, 2571, 2573, 2574, 2576, 2581, 2582, 2586, 2588, 2590, 2618, 2619, 2623, 2624, 2627, 2628, 2630, 2631, 2633, 2634, 2636, 2637, 2639, 2640, 2642, 2643, 2645, 2646, 2648, 2649, 2651, 2653, 2658, 2665, 2670, 2682, 2683, 2684, 2686, 2693, 2694, 2695, 2721, 2722, 2729, 2751, 2757, 2764, 2782, 2798, 2804, 2809, 2826, 2831, 2834, 2837, 2839, 2840, 2841, 2843, 2844, 2845,

2846, 2854, 2855, 2856, 2857, 2859, 2869, 2879, 2886, 2889, 2890, 2891, 2892, 2895, 2899, 2921, 2928, 2929, 2930, 2931, 2943, 2953, 2964, 2971, 3018, 3023, 3029, 3237, 3241, 3243, 3245, 3255, 3259, 3266, 3267, 3272, 3277, 3282, 3287, 3292, 3297, 3301, 3302, 3303, 3304, 3310, 3311, 3313, 3314, 3316, 3317, 3319, 3320, 3322, 3323, 3324, 3325, 3326, 3329, 3330, 3333, 3334, 3336, 3337, 3346, 3354, 3355, 3360, 3361, 3362, 3363, 3372, 3373, 3374, 3375, 3392, 3393, 3394, 3395, 3404, 3405, 3406, 3407, 3453, 3454, 3463, 3464, 3542, 3544, 3560, 3561, 3562, 3566, 3573

\define@boolkey 53, 61, 69, 77, 86, 94, 106, 110, 114, 122, 130, 138, 1635, 1777, 1783, 1797

\define@choicekey 34, 1081, 1838, 1916

\define@cmdkey 1803

\definecolor 674, 675, 676, 677, 678, 679, 680, 681

\department *11*, 1641, 2563, 2842

\Description *22*, 896

\description 1072

\descriptionlabel 1071, 1074

\detokenize 1581

\dimexpr . . 992, 1011, 2350, 3131, 3140, 3225

\divide 2733, 2739, 2741, 2743, 2745, 2786, 2792

\do 296, 634, 3341, 3348

\do@url@hyp 634

\DocInput 21

\documentclass 9, 436, 438

\dp 2410, 2418

E

\edef 150, 151, 152, 153, 154, 484, 2143

\editor *10*, 1566

\egroup 458, 815, 975, 986, 990, 1002, 1008, 1646, 1666, 2296, 2302, 2372, 2725, 2759, 2762, 2825, 2848, 2860, 2878, 2899, 2920

\else . . . 56, 64, 72, 81, 89, 101, 117, 125, 133, 143, 200, 236, 342, 363, 384, 391, 396, 407, 415, 423, 477, 484, 487, 499, 503, 507, 512, 516, 528, 540, 554, 642, 658, 664, 666, 689, 691, 808, 872, 878, 905, 908, 942, 982, 1526, 1554, 1558, 1568, 1584, 1591, 1594, 1600, 1601, 1611, 1614, 1619, 1622, 1625, 1632, 1650, 1673, 1682, 1688, 1694, 1697, 1738, 1751, 1765, 1780, 1786, 1789, 1800, 1811, 1814, 1824, 1827, 1830, 1835, 1869, 1894, 1899, 1900, 1901, 1904, 2167, 2173, 2199, 2210, 2214, 2215, 2216, 2228, 2229, 2237, 2240, 2241, 2244, 2251, 2252, 2258, 2265, 2270, 2273, 2274, 2278, 2279, 2280, 2291, 2294, 2299, 2300, 2304, 2347, 2359, 2362, 2365, 2368, 2406, 2533, 2542, 2551, 2557, 2558, 2577, 2579, 2580, 2581, 2583, 2585, 2654, 2671, 2674, 2677, 2689, 2695, 2702, 2723, 2734, 2744, 2753, 2760, 2769, 2787, 2791, 2800, 2806, 2814, 2828, 2849, 2858, 2863, 2870, 2874, 2882, 2889, 2895, 2900, 2901, 2910, 2912, 2919, 3010, 3021, 3022, 3032, 3043, 3051, 3061, 3072, 3077, 3082, 3089, 3092, 3094, 3096, 3106, 3113, 3116, 3118, 3120, 3148, 3149, 3165, 3169, 3179, 3189, 3194, 3201, 3206, 3214, 3217, 3233, 3234, 3242, 3266, 3544, 3549, 3556, 3565, 3569, 3592

\email *10*, 1647, 2693, 2757, 2804, 2846

\emph 2264, 2266

\empty 3030

\EnableCrossrefs 19

\end 22, 2969, 2999

\end@ACM@color@frame 2335

\end@dblfloat 1000

\end@float 1002

\endcsname 361, 362, 498, 500, 504, 511, 513, 517, 560, 570, 571, 585, 599, 1597, 1604, 1656, 1659, 1885, 1886, 1888, 1889, 1890, 1891, 1892, 1895, 1897, 2317, 2319, 3239, 3262, 3343, 3351

\enddescription 1078

\endgroup 497, 536, 553, 573, 2287, 2616, 3241, 3243, 3353, 3540

\endlist 1076, 1078

\endMakeFramed 1865

\endminipage 805

\endtrivlist 3477

\enspace 3355

environments:
abstract 17
acks 24
anonsuppress 23
CCSXML 15
marginfigure 34
margintable 34
printonly 23
screenonly 23
sidebar 34
teaserfigure 17
translatedabstract 20
\everypar 476, 531, 542, 2873, 2881
\excludecomment . 1877, 3548, 3550, 3554, 3555
\ExecuteOptionsX 52, 60, 68, 76, 85, 93, 105, 109, 113, 121, 129, 137, 147
\expandafter 341, 343, 667, 816, 1595, 1596, 1602, 1603, 1655, 1658, 1885, 1886, 1888, 1889, 1895, 1897, 3239, 3262
\ExplSyntaxOff 2938
\ExplSyntaxOn 2933

F

\familydefault 890
\fancyfoot 3044, 3052, 3062, 3074, 3078, 3083, 3107, 3134, 3145, 3146, 3164, 3166, 3170, 3180, 3191, 3195, 3204, 3209, 3213, 3218, 3230, 3231
\fancyhead . 3039, 3040, 3041, 3042, 3047, 3048, 3049, 3050, 3056, 3058, 3059, 3066, 3068, 3069, 3070, 3084, 3085, 3087, 3088, 3091, 3093, 3097, 3100, 3108, 3109, 3111, 3112, 3115, 3117, 3121, 3124, 3139, 3144, 3162, 3163, 3174, 3175, 3176, 3177, 3184, 3185, 3186, 3187, 3199, 3200, 3202, 3203, 3207, 3208, 3224, 3229
\fancyheadoffset 3131, 3138, 3223
\fancyhf 3026, 3156
\fancypagestyle 3025, 3155
\fi 58, 66, 74, 83, 91, 103, 119, 127, 135, 145, 158, 178, 184, 197, 202, 232, 238, 267, 268, 280, 285, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 345, 347, 349, 351, 353, 355, 356, 365, 367, 381, 386, 389, 398, 402, 409, 417, 425, 428, 441, 456, 468, 474, 479, 484, 490, 501, 505, 514, 518, 520, 543, 544, 556, 572, 591, 631, 635, 644, 662, 664, 668, 671, 698, 699, 700, 778, 794, 812, 838, 850, 883, 884, 885, 891, 898, 907, 910, 968, 969, 985, 999, 1003, 1030, 1530, 1550, 1555, 1556, 1561, 1571, 1587, 1592, 1599, 1606, 1607, 1612, 1613, 1621, 1627, 1628, 1629, 1634, 1652, 1675, 1685, 1692, 1699, 1700, 1716, 1744, 1757, 1769, 1773, 1782, 1788, 1796, 1802, 1816, 1817, 1826, 1832, 1833, 1837, 1851, 1858, 1871, 1893, 1901, 1902, 1908, 1929, 1932, 1935, 1940, 1943, 1946, 1949, 1952, 1955, 1958, 1961, 1964, 1967, 2011, 2157, 2169, 2175, 2178, 2189, 2190, 2199, 2201, 2213, 2220, 2221, 2222, 2223, 2227, 2235, 2238, 2239, 2246, 2247, 2248, 2254, 2255, 2267, 2272, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2288, 2292, 2297, 2298, 2303, 2306, 2307, 2326, 2337, 2357, 2358, 2361, 2364, 2367, 2368, 2399, 2408, 2420, 2446, 2472, 2498, 2523, 2527, 2535, 2544, 2553, 2561, 2578, 2579, 2581, 2583, 2585, 2589, 2615, 2650, 2657, 2673, 2676, 2680, 2691, 2707, 2708, 2712, 2723, 2746, 2747, 2755, 2763, 2774, 2793, 2794, 2802, 2808, 2819, 2828, 2853, 2866, 2868, 2876, 2878, 2884, 2889, 2896, 2900, 2914, 2917, 2918, 2919, 2963, 2970, 2996, 3000, 3012, 3017, 3021, 3022, 3031, 3033, 3034, 3039, 3040, 3045, 3054, 3064, 3080, 3081, 3083, 3092, 3094, 3103, 3104, 3105, 3107, 3116, 3118, 3127, 3128, 3129, 3132, 3135, 3148, 3149, 3150, 3164, 3167, 3173, 3183, 3197, 3198, 3204, 3205, 3209, 3210, 3216, 3219, 3220, 3233, 3234, 3235, 3253, 3264, 3266, 3339, 3358, 3380, 3412, 3450, 3469, 3500, 3501, 3526,

3527, 3533, 3544, 3552, 3558, 3561, 3571, 3572, 3573, 3595
\firstpagestyle 3154
\floatname 971
\flushbottom 824, 826, 828, 830, 832, 835, 837
\footnote 2892
\footnotemark 614, 1669, 1678, 2855, 2856, 2890
\footnoterule 803
\footnotesep . . . 589, 602
\footnotesize . . 595, 3009, 3023, 3044, 3052, 3062, 3074, 3078, 3083, 3091, 3097, 3107, 3146, 3166, 3170, 3180, 3191, 3195, 3204, 3209, 3215, 3231, 3580
\footnotetext . . 1672, 1674, 1681, 1684, 1691
\footnotetextauthorsaddresses 2211, 2218
\footnotetextcopyrightpermission 2226, 2230
\footrulewidth 3028, 3137, 3158, 3222
\foreignlanguage 444, 447
\format 34
\FrameCommand 1861
\FrameRestore 1864
\FrameSep 2351
\frenchspacing 3596
\fulltextwidth 991, 995, 1011

G

\g@addto@macro 159, 444, 447, 450, 458, 1570, 1602, 1605, 1620, 1626, 1633, 1651, 1669, 1671, 1674, 1678, 1680, 1683, 1689, 1690, 1696, 1698, 1739, 1752, 1825, 1831, 1870, 1890, 1897, 2162, 2166, 2168, 2179, 2182, 2690, 2703, 2754, 2761, 2770, 2801, 2807, 2815, 2855, 2856
\gdef . . 158, 1544, 1545, 1546, 1547, 1549, 1562, 1567, 1569, 1590, 1593, 1595, 1598, 1610, 1618, 1624, 1655, 1658, 1734, 1747, 1774, 1806, 1823, 1829, 1868, 1873, 1886, 1888, 1889, 1895, 2405, 2688, 2692, 2697, 2727, 2728, 2749, 2750, 2752, 2756, 2758, 2765, 2796, 2797, 2799, 2803, 2805, 2810, 2838, 2839, 2844, 3343
\geometry . . . 704, 707, 714, 721, 728, 735, 742, 749, 756, 765, 772
\getrefnumber . . 1766, 1790, 1905, 2347, 2889
\global 530, 533, 573, 593, 896, 906, 909, 983, 1010, 1536, 1537, 1551, 1583, 1585, 1586, 1631, 2322, 2323, 2327, 2329, 2343, 2356, 2571, 2573, 2578, 2582, 2586, 2588, 2666, 2667, 2668, 2685, 2709, 2713, 2723, 2775, 2778, 2820, 2861, 2864, 2958, 2962, 3481, 3505, 3507, 3509, 3521, 3525
\grantnum *24*, 3543
\grantsponsor . . *24*, 3542

H

\hbox . 604, 2198, 2203, 2559
\headrulewidth 3027, 3157
\height 1736, 1742, 1749, 1755
\hfill 2549, 2961
\href . 1657, 1660, 1737, 1743, 1750, 1756, 2144, 2145, 3564, 3568
\hrule 797, 804, 2549
\hsize . 596, 1863, 2197, 2342, 2345, 2524, 2526, 2528, 2537, 2539, 2547, 2591, 2711, 2721, 2777, 2822
\hskip . . 495, 509, 539, 551, 555, 2560, 3474
\hspace 1740, 1753, 1861, 2024, 2035, 2044, 2051, 2058, 2072, 2084, 2092, 2106, 2114, 2121, 2128, 2726, 2780
\ht 2409, 2417
\Huge . 2483, 2485, 2487, 2489, 2491, 2493, 2495
\hypersetup 637, 643, 645, 2311
\hyphenpenalty 3579

I

\if 342
\if@ACM@acmcp 171, 282, 1856, 2214, 2229, 2299, 2333, 2525, 2710, 3136, 3221, 3356
\if@ACM@acmthm . 69, 3426
\if@ACM@affiliation@obeypunctuation 1635, 2558, 2579, 2581, 2583, 2584
\if@ACM@anonymous . . 122, 1589, 1601, 1608, 1632, 1650, 1670, 1679, 1688, 1694, 2165, 2171, 2187, 2216, 3019, 3553
\if@ACM@authordraft 138, 682, 2231
\if@ACM@authorversion 86, 2237, 2259
\if@ACM@badge 1725
\if@ACM@balance 106, 3502, 3530
\if@ACM@citypresent 2661, 2674
\if@ACM@countrypresent 2663, 2677
\if@ACM@engage 169, 387, 400, 2242, 2288, 3090, 3114
\if@ACM@instpresent 2659, 2671
\if@ACM@journal 165, 233, 382, 394, 405, 413, 421, 938, 1558, 1812, 2569, 2849, 2872, 2880

\if@ACM@journal@bibstrip . 166, 2241, 2263, 2275, 2906, 3073, 3190
\if@ACM@journal@bibstrip@or@tog 167, 2217, 3036, 3159
\if@ACM@maketitle@typeset 454, 1079, 1771
\if@ACM@manuscript 164, 277, 1809, 2240, 2256
\if@ACM@natbib 114, 288, 379, 647
\if@ACM@natbib@override 114
\if@ACM@newfonts 851, 862
\if@ACM@nonacm .. 94, 691, 1765, 1789, 1904, 2224, 2274, 2849, 2901, 3043, 3051, 3061, 3072, 3086, 3110, 3165, 3169, 3179, 3189, 3214
\if@ACM@pbalance 110, 3480
\if@ACM@printacmref 1783, 2324
\if@ACM@printccs 1777, 2293
\if@ACM@printfolios 1797, 3031, 3033, 3039, 3040, 3083, 3107, 3164, 3204, 3209
\if@ACM@review 77, 2948, 2965, 2972
\if@ACM@screen 53, 636, 3546
\if@ACM@sigchiamode ... 168, 580, 690, 889, 993, 1000, 2199, 2201, 2723, 3130
\if@ACM@timestamp .. 130, 3001, 3133, 3211
\if@ACM@urlbreakonhyphens 61, 633
\if@acmowned 1914
\if@Description@present 892, 905, 908, 982, 2863
\if@filesw 569, 669
\if@insideauthorgroup 1578, 1584
\if@nobreak 475
\if@noskipsec .. 468, 532
\if@printcopyright 1910, 2249
\if@printpermission 1912, 2238
\if@twocolumn . 3531, 3573
\if@undescribed@images 894, 897
\IfBeginWith 1654
\ifcase 204, 244, 617, 702, 781, 819, 945, 1014, 1156, 1713, 1840, 1975, 2014, 2376, 2423, 2449, 2475, 2500, 2592, 2620, 2735, 2788, 2973, 3037, 3160, 3306, 3364, 3396, 3455, 3482, 3503
\ifcsname 361
\ifdim 472, 492, 524, 548, 2353, 2411, 2419, 2960
\IfEq 2141, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154
\IfFileExists 853, 856, 859
\IfInteger 1804
\ifluatex 873
\ifNAT@numbers 664
\ifnum 173, 179, 185, 198, 484, 485, 499, 503, 512, 516, 1766, 1790, 1899, 1900, 1901, 1905, 1925, 1930, 1933, 1936, 1941, 1944, 1947, 1950, 1953, 1956, 1959, 1962, 1965, 2189, 2225, 2347, 2732, 2785, 2827, 2889, 3212
\ifPDFTeX 839
\IfSubStr 1581, 1648
\ifvmode 2557
\ifvoid 808
\ifx 157, 243, 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327, 329, 331, 333, 335, 337, 339, 344, 346, 348, 350, 352, 354, 390, 430, 666, 1548, 1552, 1554, 1566, 1588, 1591, 1609, 1611, 1616, 1617, 1623, 1695, 1733, 1746, 1765, 1821, 1822, 1828, 1835, 1867, 1885, 1894, 1904, 2176, 2210, 2215, 2252, 2268, 2279, 2280, 2291, 2294, 2300, 2304, 2359, 2362, 2365, 2368, 2404, 2533, 2542, 2551, 2577, 2654, 2687, 2695, 2696, 2751, 2757, 2764, 2798, 2804, 2809, 2850, 2858, 2870, 2895, 2900, 2912, 2919, 3010, 3021, 3030, 3092, 3094, 3116, 3118, 3148, 3149, 3233, 3234, 3239, 3262, 3266, 3544, 3561, 3563, 3567, 3592
\ifxetex 867
\ignorespaces 545, 589, 602, 896, 1639, 1640, 1642, 1653, 2565, 2568, 2570, 2572, 2573, 2574, 2575, 2579, 2833, 2836, 2837, 2877, 2885, 2891, 2899, 3475
\immediate . 571, 670, 3349
\includecomment 3547, 3551, 3557
\includegraphics 1737, 1743, 1750, 1756, 2144, 2345
\indent 3454
\input 840
\InputIfFileExists .. 27
\institution *11*, 1640, 2563, 2839
\interfootnotelinepenalty 583
\interlinepenalty 496, 552, 583
\item 3474, 3576
\itshape 2243, 2245, 3303, 3304, 3325, 3326, 3360, 3372, 3394, 3463

J

\jobname 567, 571

K

\kern 796, 797, 803, 804, 2549
\keywords *15*, 1763
\keywordsname 383, 385, 395, 397, 406, 408, 414, 416, 422, 424, 1665, 2301

L

\l@section 576
\l@subsection . . 576, 577
\l@subsubsection . . . 578
\labelenumi 1022
\labelenumii 1023
\labelenumiii 1024
\labelenumiv 1025
\labelsep 1033, 1041, 1046, 1056, 1061, 1064, 1066, 1068, 1070, 3474
\labelwidth 1056, 1061, 1064, 1066, 1068, 1070, 1073
\LARGE 2477, 2479, 2481, 2497, 2508, 2510, 2512, 2514, 2516, 2520, 2627, 2630, 2645
\Large 2618, 2636, 3316, 3317, 3319, 3320, 3322, 3336, 3337
\large 2232, 2623, 2628, 2631, 2646, 2648, 3310, 3311, 3313, 3314
\lastbox . . 534, 2873, 2881
\leaders 2549
\leavevmode 468, 2549, 2779
\leftmargin 1055, 1060, 1063, 1065, 1067, 1069
\leftmargini 1039, 1040, 1041, 1042, 1055, 1056
\leftmarginii 1045, 1046, 1047, 1048, 1060, 1061
\leftmarginiii 1048, 1049, 1063, 1064
\leftmarginiv 1049, 1050, 1065, 1066
\leftmarginv 1050, 1051, 1067, 1068
\leftmarginvi 1051, 1069, 1070
\leftskip . 2548, 2823, 3299
\let 239, 240, 241, 242, 318, 320, 332, 334, 336, 362, 461, 462, 463, 464, 486, 605, 606, 648, 649, 650, 651, 652, 653, 656, 660, 818, 886, 900, 901, 903, 904, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 973, 974, 978, 979, 988, 989, 994, 995, 996, 1059, 1074, 1078, 1643, 1644, 1645, 1758, 1764, 1875, 1878, 2177, 2192, 2193, 2194, 2195, 2207, 2208, 2209, 2212, 2219, 2308, 2322, 2323, 2374, 2375, 2400, 2401, 2587, 2685, 2709, 2775, 2781, 2820, 2825, 2887, 2888, 2922, 2923, 2925, 2926, 2940, 2941, 2942, 2944, 2945, 2946, 3244, 3246, 3248, 3249, 3251, 3257, 3260, 3263, 3576, 3581, 3582, 3589, 3590, 3591
\libertineLF 888
\lineskip 2780, 2824
\linespacing . . . 564, 565
\liningnums 886
\list 1072
\listisep . 1053, 1054, 1058
\listparindent 1057
\LoadClass 270
\long 454, 581, 592, 973, 977, 988, 1771, 1774, 1776, 2162, 2928
\loop 2412, 2957
\LTX@adddotafter 3263, 3266

M

\makeatletter 561
\makebox 2232, 3139, 3144, 3224, 3229
\MakeFramed 1863
\makelabel 1074
\maketitle *18*, 2185
\MakeUppercase 2688, 2690, 3250
\marginfigure 976
marginfigure (env.) . . . *34*
\marginpar 581, 975, 981, 990
\marginparsep . . 992, 3131
\marginparwidth . 992, 3131
\margintable 987
margintable (env.) *34*
\mathchardef . . 2759, 2762
\mbox 340
\mdseries . . 2502, 2504, 2506, 2510, 2512, 2514, 2516, 2518, 2520, 2522, 2640, 2643
\medskip . . 2378, 2380, 2382, 2384, 2713, 2715, 2779, 2867, 2897
\MessageBreak . . 175, 181, 187, 188, 189, 190, 191, 192, 193, 194, 195, 432, 433, 434, 435, 437, 439, 1792, 1793, 1794, 1853
\metadata@authors . . . 2308, 2309, 2312
\mktitle@bx 2184, 2409, 2410, 2413, 2417, 2418, 2425, 2427, 2429, 2431, 2433, 2435, 2437, 2439, 2441, 2443, 2445, 2529, 2538, 2548, 2713, 2778, 2779, 2861
\month 1712, 3013
\moveleft 1010

N

\NAT@@setcites 358
\NAT@aysep 349
\NAT@citetp 656
\NAT@close 298, 300, 302, 304, 347
\NAT@cmprs . . 326, 328, 330
\NAT@cmt 353
\NAT@ctype 656
\NAT@find@eq 341
\NAT@fullfalse 656
\NAT@longnamestrue . 338

\NAT@merge . . 332, 334, 336
\NAT@nmfmt 340
\NAT@numbersfalse . . 312
\NAT@numberstrue 314, 316
\NAT@open 298, 300, 302, 304, 345, 656
\NAT@partrue 656
\NAT@rem@eq 343
\NAT@sep 306, 308, 310, 355
\NAT@sort . . . 322, 324, 330
\NAT@superfalse 314
\NAT@supertrue 316
\NAT@swafalse 655
\NAT@up 340
\NAT@yrsep 351
\NeedsTeXFormat 1
\newblock 657
\newbox 2184, 2339, 2555, 2717
\newcommand . 368, 374, 429, 443, 446, 449, 663, 896, 1543, 1630, 1663, 1693, 1732, 1745, 1820, 1880, 1970, 2170, 2575, 2584, 3008, 3287, 3534, 3543, 3559
\newcount . 1574, 1576, 2951
\newcounter 1879, 3004, 3006
\newdimen 286, 991, 1031, 2718
\newenvironment . 452, 976, 987, 1860, 2161
\newfloat 970
\newif 164, 165, 166, 167, 168, 169, 171, 851, 892, 894, 1079, 1578, 1910, 1912, 1914, 2659, 2661, 2663
\newlabel 3350
\newlength 1725, 1727, 1728, 2950
\newsavebox 2949
\newskip 1053, 2719
\newtheorem 3429, 3432, 3435, 3438, 3441, 3445, 3448
\newtheoremstyle 3381, 3413
\newwrite 570
\next 3241, 3243, 3253
\nobreak 525, 2897
\noindent . . 579, 1666, 1836, 2209, 2296, 2302, 2378, 2380, 2382, 2384, 2415, 2422, 2529, 2531, 2534, 2543, 2549, 2550, 2552, 2652, 2713, 2714, 2778, 2824, 2861, 2862, 2897, 2898, 2931, 3464
\noindentparagraph 2390, 3287
\nolinkurl 2759, 2762, 2805, 2807, 2846
\normalbaselines . . . 2722
\normalcolor 810
\normalfont 604, 1836, 2203, 2619, 2624, 2633, 2634, 2636, 2637, 2649, 2954, 3375, 3392, 3404, 3407, 3472, 3596
\normalparindent . . . 795
\normalsize 2499, 2619, 2633, 2634, 2637, 2955, 3596
\num@authorgroups . . 1574, 1585, 2189, 2735, 2739, 2741, 2788
\num@authors 1576, 1583, 1597, 1604, 1656, 1659, 2827
\number 484
\numberline 504, 517
\numexpr . 3003, 3005, 3007
\nxandlist 2309

O

\onehalfspacing 279
\openout 571
\or . . 207, 209, 211, 214, 216, 218, 220, 222, 225, 228, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 619, 620, 621, 622, 623, 624, 626, 627, 629, 630, 706, 713, 720, 727, 734, 741, 748, 755, 764, 771, 783, 784, 785, 787, 788, 789, 790, 791, 792, 793, 821, 822, 823, 825, 827, 829, 831, 833, 834, 836, 947, 948, 949, 950, 951, 953, 956, 961, 966, 967, 1016, 1017, 1018, 1019, 1020, 1021, 1026, 1027, 1028, 1029, 1162, 1166, 1171, 1176, 1181, 1186, 1191, 1196, 1201, 1209, 1214, 1219, 1224, 1229, 1234, 1238, 1243, 1248, 1253, 1260, 1267, 1272, 1277, 1284, 1291, 1298, 1303, 1308, 1313, 1318, 1323, 1328, 1333, 1337, 1342, 1347, 1352, 1357, 1362, 1367, 1371, 1376, 1381, 1386, 1391, 1396, 1401, 1406, 1411, 1416, 1421, 1426, 1431, 1436, 1441, 1446, 1451, 1456, 1461, 1466, 1471, 1476, 1481, 1486, 1491, 1496, 1501, 1506, 1511, 1516, 1521, 1713, 1714, 1715, 1843, 1845, 1847, 1849, 1976, 1978, 1981, 1983, 1984, 1986, 1988, 1990, 1993, 1995, 1998, 2000, 2003, 2006, 2009, 2015, 2026, 2037, 2045, 2052, 2059, 2073, 2085, 2093, 2107, 2115, 2122, 2129, 2134, 2140, 2379, 2381, 2383, 2385, 2387, 2389, 2391, 2393, 2395, 2397, 2426, 2428, 2430, 2432, 2434, 2436, 2438, 2440, 2442, 2444, 2452, 2454, 2456, 2458, 2460, 2462, 2464, 2466, 2468, 2470, 2478, 2480, 2482, 2484, 2486, 2488, 2490, 2492, 2494,

2496, 2503, 2505, 2507, 2509, 2511, 2513, 2515, 2517, 2519, 2521, 2595, 2597, 2599, 2601, 2603, 2605, 2607, 2609, 2611, 2613, 2622, 2625, 2626, 2629, 2632, 2635, 2638, 2641, 2644, 2647, 2737, 2738, 2740, 2742, 2790, 2976, 2978, 2980, 2982, 2984, 2986, 2988, 2990, 2992, 2994, 3046, 3055, 3065, 3168, 3178, 3188, 3308, 3309, 3312, 3315, 3318, 3321, 3327, 3331, 3335, 3338, 3366, 3367, 3368, 3369, 3370, 3371, 3376, 3377, 3378, 3379, 3398, 3399, 3400, 3401, 3402, 3403, 3408, 3409, 3410, 3411, 3457, 3458, 3459, 3460, 3461, 3462, 3465, 3466, 3467, 3468, 3484, 3485, 3486, 3488, 3490, 3492, 3494, 3496, 3497, 3499, 3506, 3508, 3510, 3512, 3514, 3516, 3518, 3520, 3522, 3524

\orcid *10*, 1653

\outer@nobreak 1007

P

\p@ 574, 779, 786, 796, 797, 803, 804, 3137, 3222, 3269, 3274, 3279, 3280, 3284, 3285, 3289, 3290, 3294, 3295, 3472, 3574, 3577

\PackageError 58, 66, 74, 83, 91, 103, 107, 111, 119, 127, 135, 145

\PackageInfo 55, 57, 63, 65, 71, 73, 79, 82, 88, 90, 96, 102, 116, 118, 124, 126, 132, 134, 140, 144, 1208, 1259, 1266, 1283, 1290, 1297

\PageIndex 16

\pageref 3015

\pagestyle 3152

\par 444, 447, 469, 525, 563, 806, 1005, 1666, 1836, 2212, 2219, 2238, 2243, 2245, 2296, 2302, 2345, 2360, 2363, 2366, 2370, 2378, 2380, 2382, 2384, 2425, 2427, 2429, 2441, 2445, 2534, 2536, 2543, 2546, 2549, 2552, 2554, 2581, 2583, 2585, 2652, 2656, 2713, 2715, 2722, 2724, 2752, 2754, 2761, 2770, 2779, 2781, 2799, 2801, 2807, 2815, 2823, 2825, 2859, 2860, 2861, 2863, 2877, 2897, 2920, 2924, 2928, 2931, 3470

\paragraph 3282

\parbox 686, 695, 2530, 2540, 2954

\parindent . . 779, 795, 1040, 2212, 2219, 2236, 2344, 3283, 3300, 3361, 3393, 3577

\parskip . . 779, 2236, 3577

\part 3292

\PassOptionsToClass 160, 161

\pdfgentounicode . . . 848

\pdfglyphtounicode 841, 842, 843, 844, 845, 846, 847

\pdfstringdefDisableCommands 609

\phantomsection 292, 2871, 3538

\popQED 3477

\position *11*, 1639, 1643, 1644, 1645, 2563, 2837

\postcode 2563, 2834

printonly (env.) *23*

\ProcessOptionsX . . . 162

\proof 3470

\proofname 3470

\protect 504, 517

\protected@edef 489, 584, 598

\protected@write . . . 2355

\providecommand 657, 661, 3359

\ProvidesClass 5, 6

\ProvidesFile 3

\ps@headings . . 2942, 2946

\ps@myheadings 2941, 2945

\ps@plain 2940, 2944

\pushQED 3471

\put 2968, 2998

Q

\qed 3471

\quad 560, 3057, 3060, 3067, 3071, 3213

R

\raggedright 2530, 2548, 2823, 3578

\raisebox 1736, 1742, 1749, 1755, 2232, 3140, 3225

\real@adddotafter 3248, 3251

\realSectionformat . . . 3244, 3256, 3257

\received *18*, 1820

\RecordChanges 18

\ref 2909, 2916

\refname 291, 292

\refstepcounter 488

\relax 173, 179, 185, 198, 205, 245, 287, 341, 342, 430, 470, 489, 491, 495, 509, 523, 538, 547, 555, 571, 618, 703, 782, 818, 820, 946, 1015, 1157, 1552, 1575, 1577, 1583, 1585, 1693, 1695, 1766, 1790, 1841, 1864, 1885, 1894, 1904, 1905, 1925, 1930, 1933, 1936, 1941, 1944, 1947, 1950, 1953, 1956, 1959, 1962, 1965, 1975,

2014, 2207, 2208, 2225, 2352, 2353, 2356, 2377, 2424, 2450, 2476, 2501, 2593, 2621, 2720, 2730, 2731, 2732, 2733, 2736, 2739, 2741, 2743, 2745, 2748, 2780, 2783, 2784, 2785, 2786, 2789, 2792, 2795, 2827, 2855, 2889, 2952, 2974, 2975, 2977, 2979, 2995, 3005, 3007, 3010, 3038, 3161, 3212, 3239, 3262, 3266, 3307, 3365, 3397, 3456, 3472, 3483, 3504, 3563, 3567, 3577
\removelastskip 563
\renewcommand 290, 294, 295, 298, 300, 302, 304, 306, 308, 310, 360, 383, 385, 388, 395, 397, 399, 401, 406, 408, 410, 414, 416, 418, 422, 424, 426, 890, 1071, 1580, 1647, 2163, 2196, 2842, 3027, 3028, 3137, 3157, 3158, 3222, 3267, 3272, 3277, 3282, 3292
\renewenvironment .. 972, 1072, 1770, 3470
\repeat 2419, 2960
\RequirePackage .. 31, 32, 33, 271, 272, 273, 274, 275, 276, 278, 281, 283, 284, 289, 392, 607, 608, 672, 673, 683, 692, 701, 798, 849, 868, 870, 874, 876, 879, 880, 881, 882, 936, 1876, 2939, 3487, 3489, 3491, 3493, 3495, 3498, 3511, 3513, 3515, 3517, 3519, 3523
\reset@font 582, 595
\reversemarginpar .. 763
\rightarrow 1882
\rightskip 3298
\rotatebox 3141, 3226
\rule 589, 602

S

\savebox 2954
screenonly (env.) *23*
\scriptsize 2346, 2957, 2961
\scshape 3362, 3453
\section 291, 2386, 2388, 2392, 2394, 2396, 2398, 2875, 2883, 3267, 3537
\section@raggedright 3297, 3301, 3302, 3310, 3311, 3313, 3314, 3316, 3317, 3319, 3320, 3322, 3323, 3324, 3329, 3330, 3333, 3334, 3336, 3337
\Sectionformat 3240, 3244, 3246, 3257
\SelectFootnoteRule 799, 801
\selectlanguage 1664, 2879
\set@ACM@acmcpbox 2334, 2339
\setbox 534, 593, 1010, 2343, 2413, 2529, 2538, 2548, 2559, 2713, 2723, 2778, 2861, 2873, 2881
\setcctype *16*, 1970
\setcitestyle *25*, 295, 369, 375
\setcopyright .. *16*, 1968
\setcounter 2202, 2289, 2407, 3005, 3007, 3305, 3328, 3332, 3357
\setengagemetadata *18*, 2181
\setkeys . 40, 177, 183, 1535, 1807, 1855, 1968, 2698, 2699, 2704, 2705, 2766, 2767, 2771, 2772, 2811, 2812, 2816, 2817
\setlength 779, 780, 786, 795, 1033, 1034, 1039, 1045, 1048, 1049, 1050, 1051, 1726, 1729, 2344, 2956
\setmathfont ... 869, 875
\setmonofont ... 871, 877
\settopmatter *17*, 100, 1795, 1807, 1808, 1810, 1813, 1815, 1818, 2905
\setTrue 562
\SetWatermarkColor 685, 694
\SetWatermarkFontSize 684, 693
\SetWatermarkText 686, 695
\sfdefault 890
\sffamily .. 2477, 2479, 2481, 2483, 2485, 2487, 2491, 2495, 2497, 2618, 2623, 2627, 2648, 3023, 3301, 3302, 3303, 3310, 3311, 3313, 3314, 3319, 3320, 3329, 3330, 3333, 3334
\shortauthors *18*, 1609, 1610, 1617, 1618, 1620, 1623, 1624, 1626, 2321, 2323, 3022
\shortcite 660, 663
\shorttitle 3042, 3050, 3060, 3071, 3084, 3108
\showeprint 3559
\sidebar 970
sidebar (env.) *34*
\skip 809
\small 582, 975, 982, 990, 1836, 2378, 2380, 2382, 2384, 2624, 2649, 2873, 2881, 2897, 3164
\smallskipamount ... 1054
\smash 1735, 1741, 1748, 1754
\space 513, 1582, 1649, 1795, 2317, 3148, 3233, 3544, 3583, 3586, 3594
\specialcomment 3535
\standardpagestyle . 3024
\startPage *15*, 1759
\state . *11*, 1644, 2563, 2841
\stepcounter 1672, 1674, 1681, 1684, 1691, 1884
\StrDel 2576
\streetaddress 2563, 2831
\string 432, 433, 436, 438, 670, 1582, 1649,

1717, 1761, 1795, 2356, 2893, 2894, 3350, 3583, 3586, 3594
\strut 3142, 3227
\strutbox 589, 602
\subsection 3272
\subsubsection 3277
\subtitle *10*, 1572
\subtitlenote . . *13*, 1677

T

\tag 2935, 2937
\tagmcbegin 2935
\tagmcend 2937
\tagstructbegin 2935
\tagstructend 2937
\teaserfigure 2161
teaserfigure (env.) . . . *17*
\terms *15*, 1761
\textbf . . 1887, 1899, 2931
\textbullet 612, 1886, 3057, 3060, 3067, 3071
\textheight 2411, 2413, 2419, 2960, 3140, 3225
\textit 1900, 2907, 2911, 2912, 2913
\textrightarrow 613, 1882, 1896
\textwidth 992, 1011, 1012, 2197, 2524, 2537, 2547, 2591, 2730, 2777
\thanks *13*, 2163, 2928
\thankses 2166, 2168, 2210, 2928
\the . . 1597, 1604, 1656, 1659, 1710, 1712, 2356, 2957, 2961, 3013
\theACM@time@hours 3007, 3014
\theACM@time@minutes 3014
\theenumi 1022
\theenumii 1023
\theenumiii 1024
\theenumiv 1025
\thefootnote 2196
\theindex 3573
\theoremstyle 3424, 3427, 3443, 3451
\thepage 3015, 3031, 3033, 3039, 3040, 3083, 3107, 3164, 3204, 3209
\thispagestyle 2414, 2421
\thmname 3391, 3423
\thmnote 3391, 3423
\thmnumber 3391, 3423
\thr@@ 336
\time 3002, 3005, 3007
\title *10*, 2893
\titlenote . . *13*, 1668, 2894
\topsep . . 1058, 1062, 3472
\translatedabstract 452
translatedabstract (env.) *20*
\translatedkeywords *20*, 449
\translatedsubtitle *20*, 446
\translatedtitle . *20*, 443
\trivlist 3473
\tw@ 334
\two@digits . . . 3013, 3014
\twocolumn . 2431, 2433, 2435, 2437, 2439, 2443

U

\unskip . 537, 611, 807, 1646, 1653, 2560, 2565, 2568, 2570, 2572, 2573, 2574, 2575, 2656, 2833, 2836, 2837, 2839, 2840, 2841, 2842, 2843, 2844, 2846, 2891, 2899, 2916, 2929
\unvbox . 594, 811, 816, 2415, 2713, 2779, 2861
\upshape 1071
\url . 1868, 1870, 2012, 3544
\UrlBreakPenalty 2759, 2762
\urlstyle . . . 616, 625, 628
\usebox 2968, 2998
\usepackage 10, 11, 12, 13, 14, 15

V

\value 1901
\vbox 593, 1010, 2343, 2529, 2538, 2548, 2713, 2778, 2861
\vskip 526, 563, 809, 817, 1005
\vspace 2354, 3581
\vsplit 2413
\vtop 2723

W

\wd 1012, 2560
\write 670, 3349

X

\xdef 345, 347, 349, 351, 353, 355

Y

\year 1710, 3013

Z

\z@ 324, 328, 472, 492, 524, 534, 548, 564, 589, 602, 780, 817, 940, 944, 955, 1039, 1045, 1057, 2212, 2219, 2232, 2236, 2327, 2329, 2344, 2823, 2873, 2881, 3027, 3028, 3139, 3144, 3157, 3158, 3224, 3229, 3268, 3273, 3278, 3288, 3293, 3300, 3373, 3405, 3574, 3577
\z@skip 563, 1005, 1062, 3299
\zposy 2350, 2351
\zrefused 2348, 2349
\zsaveposy 1864, 2369