LaTeX Class for *Association for Computing Machinery*[*]

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Abstract

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

Contents

1 Introduction **3**

2 User's guide **3**
2.1 Installation . . . 3
2.2 Invocation and options . . . 5
2.3 Topmatter commands . . . 7
2.4 Algorithms . . . 19
2.5 Figures and tables . . . 19
2.6 Theorems . . . 21
2.7 Online-only and offline-only material . . . 21
2.8 Note about anonymous mode . . . 22
2.9 Acknowledgments . . . 22
2.10 Bibliography . . . 23
2.11 Colors . . . 25
2.12 Other notable packages and typographic remarks . . . 26
2.13 A note for wizards: `acmart-preload-hook.tex` . . . 26

3 Implementation **28**
3.1 Identification . . . 28
3.2 Preload . . . 28
3.3 Options . . . 28
3.4 Setting switches . . . 31

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3.5 Loading base class and package . . . 32
3.6 Paper size and paragraphing . . . 39
3.7 Fonts . . . 42
3.8 Floats . . . 43
3.9 Lists . . . 45
3.10 Top matter data . . . 47
3.11 Concepts system . . . 59
3.12 Copyright system . . . 60
3.13 Typesetting top matter . . . 65
3.14 Headers and Footers . . . 79
3.15 Sectioning . . . 84
3.16 TOC Lists . . . 86
3.17 Theorems . . . 86
3.18 Acknowledgments . . . 89
3.19 Conditional typesetting . . . 89
3.20 Additional bibliography commands . . . 90
3.21 End of Class . . . 90

1 Introduction

Association for Computing Machinery is the world's largest educational and scientific computing society, which delivers resources that advance computing as a science and a profession[1]. It was one of the early adopters of TEX for its typesetting.

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

This package provides the uniform interface for all ACM publications. It is intended to replace all different classes and packages and provide an up to date LATEX package.

The 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 the package.

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

2 User's guide

The 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 the package uses a number of relatively recent packages, especially the ones related to the fonts.

The latest released version of the 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 making a pull request.

Most users should not attempt to install this package themselves, and rather rely on their TEX distributions to provide it. If you decide to install the package yourself, follow the standard rules:

[1] http://www.acm.org/

1. Run latex on `acmart.ins`. This will produce the file `acmart.cls`
2. Put the file `acmart.cls` and the bibliography files `*.bst` to the 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 the file you are probably 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.

The 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
- *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
- *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
- *ifluatex*, http://www.ctan.org/pkg/ifluatex
- *ifxetex*, http://www.ctan.org/pkg/ifxetex

- *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 the 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}
```

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 CIE, CSUR, JACM, JDIQ, JEA, JERIC, JETC, PACMHCI, PACMPL, TAAS, TACCESS, TACO, TALG, TALLIP (formerly TALIP), TCPS, TEAC, TECS, THRI, TIIS, TISSEC, TIST, TKDD, TMIS, TOCE, TOCHI, TOCL, TOCS, TOCT, TODAES, TODS, TOIS, TOIT, TOMACS, TOMM (formerly TOMCCAP), TOMPECS, TOMS, TOPC, TOPLAS, TOPS, TOS, TOSEM, TOSN, TRETS, TSAS, TSC, TSLP, TWEB, including special issues.
`acmlarge`	Large single column format, used for IMWUT, JOCCH, POMACS, TAP, including special issues.
`acmtog`	Large double column format, used for TOG, including special issues.
`sigconf`	Proceedings format for most of ACM conferences (with the exceptions listed below) and all ICPS volumes.
`siggraph`	As of March 2017, this format is no longer used. Please use sigconf for SIGGRAPH conferences.
`sigplan`	Proceedings format for SIGPLAN conferences.
`sigchi`	Proceedings format for SIGCHI conferences.
`sigchi-a`	Format for SIGCHI extended abstract.

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 and transactions, while formats starting with `sig` are intended for proceedings published as books.

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

There are several Boolean options which can take `true` or `false` values. They are listed in Table 2. The words `=true` can be omitted when setting the 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 copyeditors.

Table 2: Boolean options

Option	Default	Meaning
`review`	`false`	A review version: lines are numbered, hyperlinks are colored
`screen`	see text	A screen version: hyperlinks are colored
`natbib`	`true`	Whether to use `natbib` package (see Section 2.10)
`anonymous`	`false`	Whether to make author(s) anonymous
`authorversion`	`false`	Whether to generate a special version for authors' personal use or posting (see Section 2.3)
`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 2.6

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 3 set this option to `true`. This option may in the future involve additional features suitable for on-screen versions of the 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 2.10.

The option `anonymous` is used for anonymous review process: all author information becomes 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 include the page range of the document. This helps detect missing pages in hard copies.

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

2.3 Topmatter commands

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

The class internally loads `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 3. Note that conference proceedings published in *book* form do not set this macro.

It is expected that this command is inserted by the author of the manuscript when she decides to which journal to submit the manuscript.

`\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 the 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` may 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)}
```

`\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 amsart class, has two arguments: one optional, and one mandatory:

Table 3: ACM publications and arguments of the `\acmJournal` command

Abbreviation	Publication
CIE	ACM Computers in Entertainment
CSUR	ACM Computing Surveys
IMWUT	PACM on Interactive, Mobile, Wearable and Ubiquitous Technologies
JACM	Journal of the ACM
JDIQ	ACM Journal of Data and Information Quality
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
PACMHCI	PACM on Human-Computer Interaction
PACMPL	PACM on Programming Languages
POMACS	PACM on Measurement and Analysis of Computing Systems
TAAS	ACM Transactions on Autonomous and Adaptive Systems
TACCESS	ACM Transactions on Accessible Computing
TACO	ACM Transactions on Architecture and Code Optimization
TALG	ACM Transactions on Algorithms
TALLIP	ACM Transactions on Asian and Low-Resource Language Information Processing
TAP	ACM Transactions on Applied Perception
TCPS	ACM Transactions on Cyber-Physical Systems
TEAC	ACM Transactions on Economics and Computation
TECS	ACM Transactions on Embedded Computing Systems
THRI	ACM Transactions on Human-Robot Interaction
TIIS	ACM Transactions on Interactive Intelligent Systems
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
TOPS	ACM Transactions on Privacy and Security
TOS	ACM Transactions on Storage
TOSEM	ACM Transactions on Software Engineering and Methodology
TOSN	ACM Transactions on Sensor Networks
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

`\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 subtitle, set with the `\subtitle{`⟨*subtitle*⟩`}` macro.

The commands for specification of 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 LaTeX `\and` macro! Each author deserves his or her own `\author` command.

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

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

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

Similarly you can repeat `\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, and author A_3 is affiliated with I_1 and I_3, …). 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 may try to save the space using the format

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

However, this format is not generally recommended.

\additionalaffiliation

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

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

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

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

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

An example of the author block:

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

Note that old ACM conference formats did not allow for more than six authors and required some efforts from the 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 within JD Inst!
\department{John Doe Institute}
\institution{University of San Serriffe}
\country{San Serriffe}}
```

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

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

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

```
Fluginstitut
Sonenallee 17
123456, Helm, Germany
```

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

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

will be typeset as

```
Fluginstitut
Sonenallee 17
123456 Helm, Germany
```

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

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

\thanks Like amsart (and unlike standard LaTeX), we allow \thanks only *outside* of commands

\title and \author. This command is obsolete, and should *not* be used in most cases. Do not list your acknowledgements and grant sponsors here: put this information in the acks environment (see Section 2.9).

\authorsaddresses In some formats the 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{}.

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

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

Please never use \footnotes inside \author or \title commands, since this confuses metadata extraction software (actually these commands now produce errors).

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

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

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

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

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

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

`\acmArticleSeq` The articles in the same issue of a journal have a *sequential number*. It is used to vertically position the black blob in some formats. By default it is the same as article number, but the command `\acmArticleSeq{`⟨*n*⟩`}` can be used to change it:

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

Setting this number to zero suppresses the blob.

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

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

`\acmPrice` The macro `\acmPrice{`⟨*price*⟩`}` sets the price for the article

```
\acmPrice{25.00}
```

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

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

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

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

`\acmDOI` The macro `\acmDOI{`⟨*DOI*⟩`}` sets the DOI number of the article, for example,

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

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

`\acmBadgeR` `\acmBadgeL` Some conference articles get special distinction, 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. The class provides commands to

add these badges: \acmBadgeR[⟨*url*⟩]{⟨*graphics*⟩} and \acmBadgeL[⟨*url*⟩]{⟨*graphics*⟩}. The first command puts the badge to the right of the title, and the second one—to the left. The exception is the `sigchi-a` mode for SIGCHI Extended abstract, which puts the badges on the left margin. The argument have the following meaning: [⟨*url*⟩], if provided, sets the link to the badge authority in the screen version, while {⟨*graphics*⟩} sets the graphics file with the badge image. The file must be a cropped square, which is scaled to a standard size in the output. For example, if the badge image is `ae-logo.pdf`, the command is

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

\startPage The macro \startPage{⟨*page*⟩} sets the first page of the article in the 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 \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 the 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 the result 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>
```

Table 4: Parameters for \setcopyright command

Parameter	Meaning
none	The copyright and permission information is not typeset (this is the option for some ACM conferences).
acmcopyright	The authors transfer the copyright to ACM (the "traditional" choice).
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 US or Canada.
licensedothergov	Authors are employees of a Government other than US or Canada, and the publication rights are licensed to ACM.

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

\setcopyright

There are several possibilities for the copyright of the papers published by ACM: the authors may transfer the rights to ACM, license them to ACM, some or all authors might be employees of the US or Canada Government, 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 4.

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 decision 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 the 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 The environment abstract must *precede* \maketitle command. Again, this is different from the standard LATEX.

teaserfigure 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 may override these defaults using the command \settopmatter{⟨*settings*⟩}. The settings and their meanings are listed in Table 5. 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 the boxes per row is determined automatically. If you want to override this decision, you may do it using this parameter, for example,

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

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

\received The command \received[⟨*stage*⟩]{⟨*date*⟩} sets the history of the publication. The

Table 5: Settings for `\settopmatter` command

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

`[`⟨*stage*⟩`]` argument is optional; the default is `Received` for the first date and `revised` for the subsequent ones. For example

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

`\maketitle` The macro `\maketitle` must be the last command in the top matter group: i.e., 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 may redefine it if the list of author's name is too long, e.g.,

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

2.4 Algorithms

There are now several good packages for typesetting algorithms [3, 4, 5], and the authors are now free to choose their favorite one.

2.5 Figures and tables

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 the tables *before* the table bodies.

2. ACM uses the standard types for figures and types and adds several new ones. In total there are the following types:

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

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

teaserfigure: a special figure before `\maketitle`.

sidebar, marginfigure, margintable: in the `sigchi-a` format, special sidebars, tables and figures on the margin.

3. Accordingly, when scaling the images, one should use the following sizes:
   (a) For `figure` in one-column mode, `figure*` in two-column mode or `teaserfigure`—`\textwidth` (in the one-column you can also use `\columnwidth`, which coincides with `\textwidth` in this case).
   (b) For `figure` in two-column mode—`\columnwidth`.
   (c) For `marginfigure`–`\marginparwidth`.
   (d) For `figure*` in SIGCHI Extended abstracts—`\fulltextwidth`.

It is strongly recommended to use the package booktabs [6] 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 TeX FAQ [1]. The simplest one is to use `\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}
```

sidebar
marginfigure
margintable

SIGCHI extended abstract extensively uses margin space. The package provides three environments for this with option captions:

sidebar: textual information on the margin

marginfigure: a figure on the margin

margintable: a table on the margin

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

2.6 Theorems

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.

2.7 Online-only and offline-only material

printonly
screenonly

Some supplementary material in ACM publication 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 typset only when this option is set to `false`. For example

```
\section{Supplementary materials}

\begin{printonly}
  This section is included in the online version of the paper.
\end{printonly}

\begin{screenonly}
  (The actual section).
\end{screenonly}
```

We use *comment* package for typesetting this code, so `\begin` and `\end` should start at the first positions of the lines of their own (no initial spaces etc.).

2.8 Note about anonymous mode

anonsuppress

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

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

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

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

acks

The environment `acks` starts an unnumbered section "Acknowledgments" unless the anonymous mode is chosen. Put all thanks inside this environment.

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

\grantsponsor
\grantnum

All the financial support *must* be listed using the commands `\grantsponsor` and `\grantnum`. These commands tell the postprocessing software about the granting organization and the grant. The format of the command 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 `\sponsorID` of a `\grantsponsor` command. Some awards have their own web pages, which you can include using the optional argument of `\grantnum` command.

At present `{`⟨*sponsorID*⟩`}` is chosen by the authors and can be an arbitrary key, in the same way the label of `\cite` is arbitrarily chosen. There might be a change to this policy if 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. The work is
  supported by the \grantsponsor{GS501100001809}{National Natural
  Science Foundation of
  China}{https://doi.org/10.13039/501100001809} under Grant
  No.:~\grantnum{GS501100001809}{61273304}
  and~\grantnum[http://www.nnsf.cn/youngscientsts]{GS501100001809}{Young
  Scientsts' Support Program}.
\end{acks}
```

2.10 Bibliography

ACM uses the *natbib* package for formatting references and the style `ACM-Reference-Format.bst` for BibTEX processing. You may disable loading of *natbib* by 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 sitation styles: the author-year format `acmauthoryear` or the numeric format `acmnumeric` using the command `\citestyle`, for example,

```
\citestyle{acmauthoryear}
```

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

`\setcitestyle` You may further customize *natbib* using `\setcitestyle` command, for example,

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

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 the author-date mode.

There are several customized BIBTEX entries and fields in ACM style `ACM-Reference-Format.bst` you may want to be aware of.

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

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

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

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

See the examples at http://arxiv.org/hypertex/bibstyles/.

There are special entries online and game 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",
}
```

For these entries you can use the lastaccessed field to add the access date to the URL.

There are two ways to enter video and audio sources in the bibliograpy corresponding to two different possibilies. For standalone sources available on WWW you can use an online entry, setting there 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 the sources available as attachments to conference proceedings and similar documents, you can use the usual inproceedings entry, again setting the 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 entry periodical 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") entry.

If you do not know the author (this is often the case for online entries), use `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",
}
```

2.11 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 [7]: `ACMBlue`, `ACMYellow`, `ACMOrange`, `ACMRed`, `ACMLightBlue`, `ACMGreen`, `ACMPurple`, `ACMDarkBlue`. You can use them in the color assignments.

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 only differ 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 & 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, ACM recommends that you choose sets of colors to help ensure suitable variations in Black & White 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.

2.12 Other notable packages and typographic remarks

Several other packages are recommended for specialized tasks.

The package *subcaption* [8] is recommended for complex figures with several subplots or subfigures that require separate subcaptioning. The packages *nomencl* [9] and *glossaries* [10] 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 and the end of the page) and hyphenation at the end of the page. This is done by 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 *textcase* package [11], so command `\NoCaseChange` inside title may help to prevent extraneous uppercasing.

2.13 A note for wizards: `acmart-preload-hook.tex`

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 `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 package. Suppose you want to use `dvipsnames` option of `xcolor` package. Normally you cannot do this because `acmart` loads this package itself without options.

The file `acmart-preload-hook.tex` may 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 which is not acceptable by ACM. Even easier it is to create a file which 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 decided to use this hook, you are on your own.

3 Implementation

3.1 Identification

We start with the declaration who we are. Most `.dtx` files put driver code in a separate driver file `.drv`. 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⟩\ProvidesClass{acmart}
[2017/08/31 v1.47 Typesetting articles for Association of
Computing Machinery]
```

And the driver code:

```
⟨*gobble⟩
\documentclass{ltxdoc}
\usepackage{array,booktabs,amsmath,graphicx,fancyvrb,tabularx}
\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⟩
\def\@classname{acmart}
```

3.2 Preload

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 integer

```
\RequirePackage{xstring}
```

`format` The possible formats

```
\define@choicekey*+{acmart.cls}{format}[\ACM@format\ACM@format@nr]{%
  manuscript, acmsmall, acmlarge, acmtog, sigconf, siggraph,
  sigplan, sigchi, sigchi-a}[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{acmart.cls}{format=#1}}}
\@DeclareACMFormat{manuscript}
\@DeclareACMFormat{acmsmall}
\@DeclareACMFormat{acmlarge}
\@DeclareACMFormat{acmtog}
\@DeclareACMFormat{sigconf}
\@DeclareACMFormat{siggraph}
\@DeclareACMFormat{sigplan}
\@DeclareACMFormat{sigchi}
\@DeclareACMFormat{sigchi-a}
\ExecuteOptionsX{format}
```

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

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

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

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

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

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

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

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

\if@ACM@natbib@override

\if@ACM@natbib Whether we use natbib mode

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

\if@ACM@anonymous Whether we use anonymous mode

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

\if@ACM@timestamp Whether we use timestamp mode

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

\if@ACM@authordraft Whether we use authordraft mode

```
\define@boolkey+{acmart.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}{Option authordraft can be either true or
    false}}
\ExecuteOptionsX{authordraft=false}
```

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

```
\def\ACM@fontsize{}
\DeclareOptionX{9pt}{\edef\ACM@fontsize{\CurrentOption}}
\DeclareOptionX{10pt}{\edef\ACM@fontsize{\CurrentOption}}
\DeclareOptionX{11pt}{\edef\ACM@fontsize{\CurrentOption}}
\DeclareOptionX{12pt}{\edef\ACM@fontsize{\CurrentOption}}

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

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

Setting up switches

```
\ifnum\ACM@format@nr=5\relax % siggraph
  \ClassWarning{\@classname}{The format 'siggraph' is now obsolete.
    I am switching to sigconf.}
  \setkeys{acmart.cls}{format=sigconf}
\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
\or % sigconf
  \@ACM@journalfalse
\or % siggraph
  \@ACM@journalfalse
 \or % sigplan
  \@ACM@journalfalse
 \or % sigchi
  \@ACM@journalfalse
\or % sigchi-a
  \@ACM@journalfalse
  \@ACM@sigchiamodetrue
\fi
```

3.5 Loading base class and package

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{10pt}%
  \or % sigchi-a
    \def\ACM@fontsize{10pt}%
  \fi
\fi
\ClassInfo{\@classname}{Using fontsize \ACM@fontsize}
\LoadClass[\ACM@fontsize, reqno]{amsart}
\RequirePackage{microtype}
```

We need `etoolbox` for delayed code

```
\RequirePackage{etoolbox}
```

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

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

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

```
\RequirePackage{environ}
```

We use setspace for doublespacing

```
\if@ACM@manuscript
\RequirePackage{setspace}
\onehalfspacing
\fi
```

We need *textcase* for better upcasing

```
\RequirePackage{textcase}
```

Citations. We patch \setcitestyle to allow, e.g., \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
```

`\@startsection` Before we call `hyperref`, we redefine `\startsection` commands to their LaTeX defaults, since `amsart` ones are too AMS-specific. We need to do this early since we want `hyperref` to have a chance to redefine them again:

```
\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\@seccntformat#1{\csname the#1\endcsname\quad}
\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}}
```

`\@startsection` Amsart redefines `\startsection`. Here we redefine it again to make TOC working

```
\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}%
  \@input{\jobname.#1}%
  \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` Amsart has too large spacing

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

`\l@subsubsection` Amsart has too large spacing

```
\def\l@subsubsection{\@tocline{2}{0pt}{1pc}{5pc}{}}
```

And `hyperref`

```
\let\@footnotemark@nolink\@footnotemark
\let\@footnotetext@nolink\@footnotetext
\RequirePackage[bookmarksnumbered,unicode]{hyperref}
\pdfstringdefDisableCommands{%
  \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}
\fi
\AtEndPreamble{%
  \if@ACM@screen
    \hypersetup{colorlinks,
      linkcolor=ACMRed,
      citecolor=ACMPurple,
      urlcolor=ACMDarkBlue,
      filecolor=ACMDarkBlue}
    \else
    \hypersetup{hidelinks}
  \fi}
```

Bibliography mangling.

```
\if@ACM@natbib
  \let\citeN\cite
  \let\cite\citep
  \let\citeANP\citeauthor
  \let\citeNN\citeyearpar
  \let\citeyearNP\citeyear
  \let\citeyear\citeyearpar
  \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\citeyear[#1]{#2}\fi}
```

`\bibliographystyle` Amsart redefines `\bibliographystyle` since it prefers AMS bibliography. We turn it back to LaTeX definition:

```
\def\bibliographystyle#1{%
  \ifx\@begindocumenthook\@undefined\else
    \expandafter\AtBeginDocument
```

```
  \fi
    {\if@filesw
       \immediate\write\@auxout{\string\bibstyle{#1}}%
     \fi}}
```

Graphics and color

```
\RequirePackage{graphicx, xcolor}
```

We define ACM colors according to [7]:

```
\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

```
\if@ACM@authordraft
  \RequirePackage{draftwatermark}
  \SetWatermarkFontSize{0.5in}
  \SetWatermarkColor[gray]{.9}
  \SetWatermarkText{\parbox{12em}{\centering
      Unpublished working draft\\
      Not for distribution}}
\fi
```

3.6 Paper size and paragraphing

We use `geometry` for dimensions. Note the presently margins do not depend on the font size option - maybe we will 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
\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
\fi
```

\normalparindent amsart 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 bibstrip. In the old ACM classes 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 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   %% added 24 May 89
  \color@endgroup
  \egroup
  \expandafter\@iiiparbox\@mpargs{\unvbox\@tempboxa}}
```

`\@makefntext` We do note use indentation for footnotes

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

`\@footnotetext` In sigchi-a mode our footnotes are on the margins!

```
\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}}}
```

`\@textbottom` Added 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
```

3.7 Fonts

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

The code below is by Ross Moore.

```
\RequirePackage{iftex}
\ifPDFTeX
\input{glyphtounicode}
\pdfglyphtounicode{f_f}{FB00}
\pdfglyphtounicode{f_f_i}{FB03}
\pdfglyphtounicode{f_f_l}{FB04}
\pdfglyphtounicode{f_i}{FB01}
\pdfglyphtounicode{t_t}{00740074}
\pdfglyphtounicode{f_t}{00660074}
\pdfglyphtounicode{T_h}{00540068}
\pdfgentounicode=1
\fi
\RequirePackage{cmap}
```

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

```
\newif\if@ACM@newfonts
\@ACM@newfontstrue
\IfFileExists{libertine.sty}{}{\ClassWarning{\@classname}{You do not
    have libertine package installed.  Please upgrade your
    TeX}\@ACM@newfontsfalse}
\IfFileExists{zi4.sty}{}{\ClassWarning{\@classname}{You do not
   have zi4 package installed.  Please upgrade your TeX}\@ACM@newfontsfalse}
\IfFileExists{newtxmath.sty}{}{\ClassWarning{\@classname}{You do not
    have newtxmath package installed.  Please upgrade your
    TeX}\@ACM@newfontsfalse}
```

We use Libertine throughout.

```
\if@ACM@newfonts
\RequirePackage[tt=false, type1=true]{libertine}
\RequirePackage[varqu]{zi4}
\RequirePackage[libertine]{newtxmath}
\RequirePackage[T1]{fontenc}
\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
```

3.8 Floats

We use `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}}
  \or % sigchi-a
    \captionsetup[figure]{labelfont={bf, small},
      textfont={bf, small}}
  \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\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\captionsetup{type=figure}%
  \marginpar{\centering\small#1}\egroup}
```

`margintable` The margintable environment:

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

\@margintable The processing of the saved text

```
\long\def\@margintable#1{\bgroup\captionsetup{type=table}%
  \marginpar{\centering\small#1}\egroup}
```

SIGCHI extended abstract provides 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\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
}
```

3.9 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
\fi
```

AMS uses generous margins for the lists. Note that `amsart` defines `\leftmargin` values for list levels at begin document, so we must redefine them in the same manner. Also, note that `amsart` redefines `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\leftmarginiv{\leftmarginiii}
  \setlength\leftmarginv{\leftmarginiv}
  \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 default colon as \amsart does:

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

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

```
\renewenvironment{description}{\list{}{%
    \labelwidth\@ACM@labelwidth
    \let\makelabel\descriptionlabel}%
}{
  \endlist
}
\let\enddescription=\endlist % for efficiency
```

3.10 Top matter data

We use keyval interface to define journal title and relevant information

```
\define@choicekey*+{ACM}{acmJournal}[\@journalCode\@journalCode@nr]{%
  CIE,%
  CSUR,%
  IMWUT,%
  JACM,%
  JDIQ,%
  JEA,%
  JERIC,%
  JETC,%
  JOCCH,%
  PACMHCI,%
  PACMPL,%
  POMACS,%
  TAAS,%
  TACCESS,%
  TACO,%
  TALG,%
  TALLIP,%
  TAP,%
  TCPS,%
  TEAC,%
  TECS,%
  THRI,%
  TIIS,%
  TISSEC,%
  TIST,%
  TKDD,%
  TMIS,%
  TOCE,%
  TOCHI,%
```

```
  TOCL,%
  TOCS,%
  TOCT,%
  TODAES,%
  TODS,%
  TOG,%
  TOIS,%
  TOIT,%
  TOMACS,%
  TOMM,%
  TOMPECS,%
  TOMS,%
  TOPC,%
  TOPS,%
  TOPLAS,%
  TOS,%
  TOSEM,%
  TOSN,%
  TRETS,%
  TSAS,%
  TSC,%
  TSLP,%
  TWEB%
}{%
\ifcase\@journalCode@nr
\relax % 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}%
\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}%
  \@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}%
\or % JDIQ
  \def\@journalName{ACM Journal of Data and Information Quality}%
  \def\@journalNameShort{ACM J. Data Inform. Quality}%
  \def\@permissionCodeOne{1936-1955}%
\or % JEA
  \def\@journalName{ACM Journal of Experimental Algorithmics}%
```

```
  \def\@journalNameShort{ACM J. Exp. Algor.}%
  \def\@permissionCodeOne{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}%
\or % JOCCH
  \def\@journalName{ACM Journal on Computing and Cultural Heritage}%
  \def\@journalName{ACM J. Comput. Cult. Herit.}%
\or % PACMHCI
  \def\@journalName{Proceedings of the ACM on Human-Computer Interaction}%
  \def\@journalName{Proc. ACM Hum.-Comput. Interact.}%
  \def\@permissionCodeOne{2573-0142}%
  \@ACM@screentrue
  \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
\or % PACMPL
  \def\@journalName{Proceedings of the ACM on Programming Languages}%
  \def\@journalName{Proc. ACM Program. Lang.}%
  \def\@permissionCodeOne{2475-1421}%
  \@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\@journalName{Proc. ACM Meas. Anal. Comput. Syst.}%
  \def\@permissionCodeOne{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}%
\or % TACCESS
  \def\@journalName{ACM Transactions on Accessible Computing}%
  \def\@journalNameShort{ACM Trans. Access. Comput.}%
  \def\@permissionCodeOne{1936-7228}%
\or % TACO
  \def\@journalName{ACM Transactions on Architecture and Code Optimization}%
\or % TALG
  \def\@journalName{ACM Transactions on Algorithms}%
  \def\@journalNameShort{ACM Trans. Algor.}%
  \def\@permissionCodeOne{1549-6325}%
\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}%
\or % TAP
```

```
  \def\@journalName{ACM Transactions on Applied Perception}%
\or % TCPS
  \def\@journalName{ACM Transactions on Cyber-Physical Systems}%
\or % TEAC
  \def\@journalName{ACM Transactions on Economics and Computation}%
\or % TECS
  \def\@journalName{ACM Transactions on Embedded Computing Systems}%
  \def\@journalNameShort{ACM Trans. Embedd. Comput. Syst.}%
  \def\@permissionCodeOne{1539-9087}%
\or % THRI
  \def\@journalName{ACM Transactions on Human-Robot Interaction}%
  \def\@journalNameShort{ACM Trans. Hum.-Robot Interact.}%
  \def\@permissionCodeOne{2573-9522}%
\or % TIIS
  \def\@journalName{ACM Transactions on Interactive Intelligent Systems}%
  \def\@journalNameShort{ACM Trans. Interact. Intell. Syst.}%
  \def\@permissionCodeOne{2160-6455}%
\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}%
\or % TKDD
  \def\@journalName{ACM Transactions on Knowledge Discovery from Data}%
  \def\@journalNameShort{ACM Trans. Knowl. Discov. Data.}%
  \def\@permissionCodeOne{1556-4681}%
\or % TMIS
  \def\@journalName{ACM Transactions on Management Information Systems}%
  \def\@journalNameShort{ACM Trans. Manag. Inform. Syst.}%
  \def\@permissionCodeOne{2158-656X}%
\or % TOCE
  \def\@journalName{ACM Transactions on Computing Education}%
  \def\@journalNameShort{ACM Trans. Comput. Educ.}%
  \def\@permissionCodeOne{1946-6226}%
\or % TOCHI
  \def\@journalName{ACM Transactions on Computer-Human Interaction}%
  \def\@journalNameShort{ACM Trans. Comput.-Hum. Interact.}%
  \def\@permissionCodeOne{1073-0516}%
\or % TOCL
  \def\@journalName{ACM Transactions on Computational Logic}%
  \def\@journalNameShort{ACM Trans. Comput. Logic}%
  \def\@permissionCodeOne{1529-3785}%
\or % TOCS
  \def\@journalName{ACM Transactions on Computer Systems}%
  \def\@journalNameShort{ACM Trans. Comput. Syst.}%
  \def\@permissionCodeOne{0734-2071}%
\or % TOCT
```

```
  \def\@journalName{ACM Transactions on Computation Theory}%
  \def\@journalNameShort{ACM Trans. Comput. Theory}%
  \def\@permissionCodeOne{1942-3454}%
\or % TODAES
  \def\@journalName{ACM Transactions on Design Automation of Electronic Systems}%
  \def\@journalNameShort{ACM Trans. Des. Autom. Electron. Syst.}%
  \def\@permissionCodeOne{1084-4309}%
\or % TODS
  \def\@journalName{ACM Transactions on Database Systems}%
  \def\@journalNameShort{ACM Trans. Datab. Syst.}%
  \def\@permissionCodeOne{0362-5915}%
\or % TOG
  \def\@journalName{ACM Transactions on Graphics}%
  \def\@journalNameShort{ACM Trans. Graph.}%
  \def\@permissionCodeOne{0730-0301}
\or % TOIS
  \def\@journalName{ACM Transactions on Information Systems}%
  \def\@journalName{ACM Transactions on Information Systems}%
  \def\@permissionCodeOne{1046-8188}%
\or % TOIT
  \def\@journalName{ACM Transactions on Internet Technology}%
  \def\@journalNameShort{ACM Trans. Internet Technol.}%
  \def\@permissionCodeOne{1533-5399}%
\or % TOMACS
  \def\@journalName{ACM Transactions on Modeling and Computer Simulation}%
  \def\@journalName{ACM Transactions on Modeling and Computer Simulation}%
  \def\@journalNameShort{ACM Trans. Model. Comput. Simul.}%
\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{0100}%
\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}%
\or % TOMS
  \def\@journalName{ACM Transactions on Mathematical Software}%
  \def\@journalNameShort{ACM Trans. Math. Softw.}%
  \def\@permissionCodeOne{0098-3500}%
\or % TOPC
  \def\@journalName{ACM Transactions on Parallel Computing}%
  \def\@journalNameShort{ACM Trans. Parallel Comput.}%
  \def\@permissionCodeOne{1539-9087}%
\or % TOPS
  \def\@journalName{ACM Transactions on Privacy and Security}%
  \def\@journalNameShort{ACM Trans. Priv. Sec.}%
  \def\@permissionCodeOne{2471-2566}%
\or % TOPLAS
  \def\@journalName{ACM Transactions on Programming Languages and Systems}%
```

```
  \def\@journalNameShort{ACM Trans. Program. Lang. Syst.}%
  \def\@permissionCodeOne{0164-0925}%
\or % TOS
  \def\@journalName{ACM Transactions on Storage}%
  \def\@journalNameShort{ACM Trans. Storage}%
  \def\@permissionCodeOne{1553-3077}%
\or % TOSEM
  \def\@journalName{ACM Transactions on Software Engineering and Methodology}%
  \def\@journalNameShort{ACM Trans. Softw. Eng. Methodol.}%
  \def\@permissionCodeOne{1049-331X}%
\or % TOSN
  \def\@journalName{ACM Transactions on Sensor Networks}%
  \def\@journalNameShort{ACM Trans. Sensor Netw.}%
  \def\@permissionCodeOne{1550-4859}%
\or % TRETS
  \def\@journalName{ACM Transactions on Reconfigurable Technology and Systems}%
  \def\@journalNameShort{ACM Trans. Reconfig. Technol. Syst.}%
  \def\@permissionCodeOne{1936-7406}%
\or % TSAS
  \def\@journalName{ACM Transactions on Spatial Algorithms and Systems}%
  \def\@journalNameShort{ACM Trans. Spatial Algorithms Syst.}%
  \def\@permissionCodeOne{2374-0353}%
\or % TSC
  \def\@journalName{ACM Transactions on Social Computing}%
  \def\@journalNameShort{ACM Trans. Soc. Comput.}%
  \def\@permissionCodeOne{2469-7818}%
\or % TSLP
  \def\@journalName{ACM Transactions on Speech and Language Processing}%
  \def\@journalNameShort{ACM Trans. Speech Lang. Process.}%
  \def\@permissionCodeOne{1550-4875}%
\or % TWEB
  \def\@journalName{ACM Transactions on the Web}%
  \def\@journalNameShort{ACM Trans. Web}%
  \def\@permissionCodeOne{1559-1131}%
\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}}
```

The defaults:

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

\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}
\acmConference[Conference'17]{ACM Conference}{July 2017}{Washington,
  DC, USA}
```

\acmBooktitle The book title of the conference:

\@acmBooktitle

```
\def\acmBooktitle#1{\gdef\@acmBooktitle{#1}}
\acmBooktitle{Proceedings of \acmConference@name
       \ifx\acmConference@name\acmConference@shortname\else
         \ (\acmConference@shortname)\fi}
```

\@editorsAbbrev How to abbreviate editors

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

\@acmEditors The list of editors

\editor Add 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 @insideauthorgroup insideauthorgroup-false

\author Adding an author to the list of authors and addresses

```
\renewcommand\author[2][]{%
  \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)}}%
      \gdef\authors{Anonymous Author(s)}%
    \else
      \gdef\addresses{\@author{#2}}%
      \gdef\authors{#2}%
    \fi
  \else
    \if@ACM@anonymous\else
      \g@addto@macro\addresses{\and\@author{#2}}%
      \g@addto@macro\authors{\and#2}%
    \fi
  \fi
  \if@ACM@anonymous
    \ifx\shortauthors\@empty
      \gdef\shortauthors{Anon.}%
    \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 author's punctuation (by default false = add American punctuation)

```
\define@boolkey+{@ACM@affiliation@}[@ACM@affiliation@]{obeypunctuation}%
[true]{}{\ClassError{\@classname}{obeypunctuation must be 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{\unskip, ##2\ignorespaces}%
  \let\streetaddress\position
  \let\city\position
  \let\state\position
  \let\postcode\position
  \let\country\position
  Also with #1\unskip.\egroup}
```

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

```
\renewcommand{\email}[2][]{%
  \if@ACM@anonymous\else
    \g@addto@macro\addresses{\email{#1}{#2}}%
  \fi}
```

\orcid Right now we do not typeset orcids

\authorsaddresses Setting up authors' addresses

\@titlenotes The titlenotes

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

\titlenote Adding 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 subtitlenotes

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

\subtitlenote Adding 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 authornotes

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

`\authornote` Adding 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 footnotemark to authors

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

```
\def\acmPrice#1{\def\@acmPrice{#1}}
\acmPrice{15.00}
```

`\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/YY/MM}
```

`\acmDOI` The paper doi

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

`\if@ACM@badge` Whether to print badge. Note that either left or right badge triggers it:

```
\newif\if@ACM@badge
\@ACM@badgefalse
```

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

```
\newlength\@ACM@badge@width
\setlength\@ACM@badge@width{5pc}
```

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

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

`\@ACM@badge@skip` The space between the badge and the title

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

`\acmBadgeR` Setting the right badge

```
\newcommand\acmBadgeR[2][]{\@ACM@badgetrue
  \def\@acmBadgeR@url{#1}%
  \def\@acmBadgeR@image{#2}}
\def\@acmBadgeR@url{}
\def\@acmBadgeR@image{}
```

`\acmBadgeL` Setting the left badge

```
\newcommand\acmBadgeL[2][]{\@ACM@badgetrue
  \def\@acmBadgeL@url{#1}%
  \def\@acmBadgeL@image{#2}}
\def\@acmBadgeL@url{}
\def\@acmBadgeL@image{}
```

\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}}
\keywords{}
```

abstract Amsart puts abstract in the 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{\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}{printccs must be true or false}}
```

\if@ACM@printacmref Whether to print ACM bib

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

\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}{printfolios must be true or false}}
```

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

```
\define@cmdkey{@ACM@topmatter@}[@ACM@]{authorsperrow}[0]{%
  \IfInteger{#1}{\ClassInfo{\@classname}{Setting authorsperrow to
      #1}}{\ClassWarning{\@classname}{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}
```

3.11 Concepts system

We exclude CCSXML stuff generated by the ACM system:

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

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

```
\let\@concepts\@empty
```

`\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!

```
\RequirePackage{textcomp}
\def\ccsdesc@parse#1~#2~#3~{%
  \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}{%
     \ifnum#1>499\textbf{#3}; \else
     \ifnum#1>299\textit{#3}; \else
     #3; \fi\fi}%
  \fi
\ccsdesc@parse@finish}
```

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

```
\def\ccsdesc@parse@finish#1\ccsdesc@parse@end{}
```

3.12 Copyright system

This is from `acmcopyright.sty`

`\if@printcopyright` A flag whether to print copyright symbol

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

`\if@printpermission` Whether to print permission block

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

\if@acmowned Whether 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}{%
  \@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
   \acmPrice{}%
  \fi
  \ifnum\acm@copyrightmode=4\relax % usgov
   \@printpermissiontrue
   \@printcopyrightfalse
   \@acmownedfalse
   \acmPrice{}%
  \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}
```

\setcopyright This is the syntactic sugar around setting keys.

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

\@copyrightowner Here is the owner of the copyright

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

\@formatdoi Print a clickable doi

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

\@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
```

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```

```
\or % cagovmixed
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```

```
  retains a nonexclusive, royalty-free right to publish or reproduce
  this article, or to allow others to do so, for Government purposes
  only.
 \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}}
```

3.13 Typesetting top matter

\mktitle@bx Some of our formats use two column design, some use one column one. In all cases we use wide title. Thus we typeset the top matter in a special box to be use 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 thankses. The latter 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{%
 \if@ACM@anonymous
  % Anonymize omission of \author-s
  \ifnum\num@authorgroups=0\author{}\fi
 \fi
 \begingroup
 \let\@footnotemark\@footnotemark@nolink
 \let\@footnotetext\@footnotetext@nolink
 \renewcommand\thefootnote{\@fnsymbol\c@footnote}%
 \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 bottom either
\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
\ifx\@empty\@authorsaddresses\else
   \if@ACM@anonymous\else
     \if@ACM@journal
       \footnotetextauthorsaddresses{%
         \def\par{\let\par\@par}\parindent\z@\@setauthorsaddresses}%
     \fi
   \fi
\fi
\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\else % Print the conference information
     {\itshape \acmConference@shortname, \acmConference@date, \acmConference@venue}\par
     \fi
  \fi
  \if@printcopyright
    \copyright\ \@copyrightyear\ \@copyrightowner\\
  \else
   \@copyrightyear.\
  \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
          \emph{\@journalName}%
        \else
          \emph{\@acmBooktitle}%
        \fi
        \ifx\@acmDOI\@empty
        .
        \else
          , \@formatdoi{\@acmDOI}.
        \fi\\
      \else
        \if@ACM@journal
          \@permissionCodeOne/\@acmYear/\@acmMonth-ART\@acmArticle
          \ifx\@acmPrice\@empty\else\ \$\@acmPrice\fi\\
          \@formatdoi{\@acmDOI}%
        \else % Conference
          \ifx\@acmISBN\@empty\else ACM~ISBN~\@acmISBN
          \ifx\@acmPrice\@empty.\else\dots\$\@acmPrice\fi\\\fi
          \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi%
        \fi
      \fi
    \fi}
\endgroup
\setcounter{footnote}{0}%
\@mkabstract
\if@ACM@printccs
  \ifx\@concepts\@empty\else\bgroup
    {\@specialsection{CCS Concepts}%
       \@concepts\par}\egroup
   \fi
 \fi
 \ifx\@keywords\@empty\else\bgroup
    {\if@ACM@journal
       \@specialsection{Additional Key Words and Phrases}%
     \else
       \@specialsection{Keywords}%
     \fi
       \@keywords}\par\egroup
 \fi
\andify\authors
\andify\shortauthors
\global\let\authors=\authors
\global\let\shortauthors=\shortauthors
\if@ACM@printacmref
   \@mkbibcitation
\fi
```

```
  \hypersetup{pdfauthor={\authors},
    pdftitle={\@title},
    pdfsubject={\@concepts},
    pdfkeywords={\@keywords}}%
  \@printendtopmatter
  \@afterindentfalse
  \@afterheading
}
```

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

```
\def\@specialsection#1{%
  \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
    \paragraph*{#1}%
  \or % sigchi
    \section*{#1}%
  \or % sigchi-a
    \section*{#1}%
  \fi}
```

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

```
\def\@printtopmatter{%
  \ifx\@startPage\@empty
     \gdef\@startPage{1}%
  \else
     \setcounter{page}{\@startPage}%
  \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
    \if@ACM@badge
       \marginpar{\noindent
         \ifx\@acmBadgeL@image\@empty\else
           \href{\@acmBadgeL@url}{%
             \includegraphics[width=\@ACM@badge@width]{\@acmBadgeL@image}}%
            \hskip\@ACM@badge@skip
          \fi
         \ifx\@acmBadgeR@image\@empty\else
           \href{\@acmBadgeR@url}{%
             \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}%
          \fi}%
    \fi
  \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
  \fi
```

```
}
```

`\@titlefont` The font to typeset 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
  \fi}
```

`\@subtitlefont` The font to typeset title

```
\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
  \fi}
```

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

```
\def\@mktitle@i{\hsize=\textwidth
  \@ACM@title@width=\hsize
  \ifx\@acmBadgeL@image\@empty\else
    \advance\@ACM@title@width by -\@ACM@badge@width
    \advance\@ACM@title@width by -\@ACM@badge@skip
  \fi
  \ifx\@acmBadgeR@image\@empty\else
    \advance\@ACM@title@width by -\@ACM@badge@width
    \advance\@ACM@title@width by -\@ACM@badge@skip
  \fi
  \setbox\mktitle@bx=\vbox{\noindent\@titlefont
    \ifx\@acmBadgeL@image\@empty\else
      \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeL@url}{%
          \includegraphics[width=\@ACM@badge@width]{\@acmBadgeL@image}}}%
      \hskip\@ACM@badge@skip
    \fi
    \parbox[t]{\@ACM@title@width}{\raggedright
      \@titlefont\noindent
      \@title
  \ifx\@subtitle\@empty\else
    \par\noindent{\@subtitlefont\@subtitle}
  \fi}%
  \ifx\@acmBadgeR@image\@empty\else
    \hskip\@ACM@badge@skip
    \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeR@url}{%
        \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}}%
  \fi
  \par\bigskip}}%
```

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

`\@mktitle@iii` The version of `\@mktitle` for sigproc. Note that since the title is centered, we leave the space for the left badge even if only the right badge is defined.

```
\def\@mktitle@iii{\hsize=\textwidth
    \setbox\mktitle@bx=\vbox{\@titlefont\centering
      \@ACM@title@width=\hsize
      \if@ACM@badge
        \advance\@ACM@title@width by -2\@ACM@badge@width
        \advance\@ACM@title@width by -2\@ACM@badge@skip
        \parbox[b]{\@ACM@badge@width}{\strut
          \ifx\@acmBadgeL@image\@empty\else
            \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeL@url}{%
             \includegraphics[width=\@ACM@badge@width]{\@acmBadgeL@image}}}%
          \fi}%
        \hskip\@ACM@badge@skip
      \fi
      \parbox[t]{\@ACM@title@width}{\centering\@titlefont
        \@title
        \ifx\@subtitle\@empty\else
          \par\noindent{\@subtitlefont\@subtitle}
```

```
      \fi
    }%
    \if@ACM@badge
      \hskip\@ACM@badge@skip
      \parbox[b]{\@ACM@badge@width}{\strut
        \ifx\@acmBadgeR@image\@empty\else
          \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeR@url}{%
           \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}}%
        \fi}%
    \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
    \ifx\@subtitle\@empty\else
      \par\noindent\@subtitlefont\@subtitle
    \fi
    \par\bigskip}}%
```

`\@ACM@addtoaddress` The macro adds an item to 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 on the end of the 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` heoretically 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{\unskip\ignorespaces}
\def\postcode#1{\unskip\ignorespaces}
\if@ACM@journal
  \def\position#1{\unskip\ignorespaces}
  \def\institution#1{\unskip~#1\ignorespaces}
  \def\city#1{\unskip\ignorespaces}
  \def\state#1{\unskip\ignorespaces}
```

```
  \newcommand\department[2][0]{\unskip\ignorespaces}
  \def\country#1{\if@ACM@affiliation@obeypunctuation\else, \fi#1\ignorespaces}
\else
  \def\position#1{\if@ACM@affiliation@obeypunctuation#1\else#1\par\fi}%
  \def\institution#1{\if@ACM@affiliation@obeypunctuation#1\else#1\par\fi}%
  \newcommand\department[2][0]{\if@ACM@affiliation@obeypunctuation
    #2\else#2\par\fi}%
%  \def\streetaddress#1{\if@ACM@affiliation@obeypunctuation#1\else#1\par\fi}%
  \let\city\@ACM@addtoaddress
  \let\state\@ACM@addtoaddress
%  \def\postcode#1{\if@ACM@affiliation@obeypunctuation#1\else\unskip\space#1\fi}%
  \let\country\@ACM@addtoaddress
\fi
```

`\@mkauthors` Typesetting 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
  \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}
\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{}}
```

`\@mkauthors@i` This is version 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\MakeTextUppercase{##1}}%
    \else
       \g@addto@macro{\@currentauthors}{\and\MakeTextUppercase{##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}%
          \@affiliationfont##2}%
     \else
       \g@addto@macro{\@currentaffiliations}{\and
         \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
         \setkeys{@ACM@affiliation@}{##1}##2}%
    \fi
  \fi
   \global\let\and\@typeset@author@line}%
 \global\setbox\mktitle@bx=\vbox{\noindent\box\mktitle@bx\par\medskip
  \noindent\addresses\@typeset@author@line
  \par\medskip}%
}
```

`\@mkauthors@ii` `\@mkauthors@iI` was version used in acmtog. No longer necessary

`\author@bx` The box to put individual author to

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

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

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

`\author@bx@sep` The separation between the 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}%
  \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 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 (`\textwidth` − `\author@bx@sep`)/N − `\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{\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}##2}%
\else
  \g@addto@macro\@currentaffiliation{\par
    \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
    \setkeys{@ACM@affiliation@}{##1}##2}%
\fi
\global\let\and\@typeset@author@bx
}%
```

Actual typesetting is done by \and macro:

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

\@mkauthors@iv The sigchia version. Now we put authors in the main text, and 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}##2}%
  \else
    \g@addto@macro\@currentaffiliation{\par
      \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
      \setkeys{@ACM@affiliation@}{##1}##2}%
  \fi
  \global\let\and\@typeset@author@bx}%
%
```

Actual typesetting is done by \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

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

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

\@authornotemark Adding footnotemark to authors. This version adds "normal" footnotemark.

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

\@@authornotemark Adding footnotemark to authors with the given number

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

\@mkteasers Typesetting 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\box\mktitle@bx\par
    \noindent\@teaserfigures\par\medskip}%
  \fi}
```

\@mkabstract Typesetting abstract

```
\def\@mkabstract{\bgroup
  \ifx\@abstract\@lempty\else
  {\phantomsection\addcontentsline{toc}{section}{Abstract}%
    \if@ACM@journal
       \small\noindent
    \else
      \section*{Abstract}%
    \fi
   \ignorespaces\@abstract\par}%
  \fi\egroup}
```

\@mkbibcitation Print bibcitation format

```
\def\@mkbibcitation{\bgroup
  \def\@pages@word{\ifnum\getrefnumber{TotPages}=1\relax page\else pages\fi}%
  \def\footnotemark{}%
  \def\\{\unskip{} \ignorespaces}%
  \def\footnote{\ClassError{\@classname}{Please do note use footnotes
      inside \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\authors. \@acmYear. \@title
  \ifx\@subtitle\@empty. \else: \@subtitle. \fi
```

```
  \if@ACM@journal
     \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
  \@formatdoi{\@acmDOI}
\par\egroup}
```

`\@printendtopmatter` End the top matter

```
\def\@printendtopmatter{\par\bigskip}
```

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

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

`\@setauthorsaddresses`

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

3.14 Headers and Footers

We use `fancyhdr` for our headers and footers:

```
\RequirePackage{fancyhdr}
```

`\ACM@linecount@bx` This is the box displayed in the 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}{%
        \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

```
\def\ACM@linecountR{%
  \if@ACM@review
  \ACM@mk@linecount
  \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%
    \the\year-\two@digits{\the\month}-\two@digits{\the\day}{ }%
    \two@digits{\theACM@time@hours}:\two@digits{\theACM@time@minutes}{ }%
    page~\thepage\ (pp. \@startPage-\pageref*{TotPages})%
    \ifx\@acmSubmissionID\@empty\relax\else
    ~Submission~ID: \@acmSubmissionID
    \fi
  }
\fi
```

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

```
\def\@shortauthors{\if@ACM@anonymous Anon.\else\shortauthors\fi}
```

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

```
\def\@headfootfont{%
  \ifcase\ACM@format@nr
  \relax % manuscript
    \sffamily
  \or % acmsmall
    \sffamily
  \or % acmlarge
    \sffamily
  \or % acmtog
    \sffamily
```

```
  \or % sigconf
    \sffamily
  \or % siggraph
    \sffamily
  \or % sigplan
    \sffamily
  \or % sigchi
    \sffamily
  \or % sigchi-a
    \sffamily
  \fi}
```

standardpagestyle The pagestyle for all pages but the first one

```
\fancypagestyle{standardpagestyle}{%
  \fancyhf{}%
  \renewcommand{\headrulewidth}{\z@}%
  \renewcommand{\footrulewidth}{\z@}%
  \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}%
    \fancyfoot[RO,LE]{\footnotesize Manuscript submitted to ACM}%
  \or % acmsmall
   \fancyhead[LE]{\ACM@linecountL\@headfootfont\@acmArticle\if@ACM@printfolios:\thepage\fi}%
   \fancyhead[RO]{\@headfootfont\@acmArticle\if@ACM@printfolios:\thepage\fi}%
    \fancyhead[RE]{\@headfootfont\@shortauthors}%
    \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
    \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
    \@acmNumber, Article \@acmArticle.  Publication date: \@acmPubDate.}%
  \or % acmlarge
    \fancyhead[LE]{\ACM@linecountL\@headfootfont
     \@acmArticle\if@ACM@printfolios:\thepage\fi\quad\textbullet\quad\@shortauthors}%
    \fancyhead[LO]{\ACM@linecountL}%
    \fancyhead[RO]{\@headfootfont
     \shorttitle\quad\textbullet\quad\@acmArticle\if@ACM@printfolios:\thepage\fi}%
    \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
    \@acmNumber, Article \@acmArticle.  Publication date: \@acmPubDate.}%
  \or % acmtog
    \fancyhead[LE]{\ACM@linecountL\@headfootfont
     \@acmArticle\if@ACM@printfolios:\thepage\fi\quad\textbullet\quad\@shortauthors}%
    \fancyhead[LO]{\ACM@linecountL}%
    \fancyhead[RE]{\ACM@linecountR}%
    \fancyhead[RO]{\@headfootfont
     \shorttitle\quad\textbullet\quad\@acmArticle\if@ACM@printfolios:\thepage\fi\ACM@linecountR}%
    \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
    \@acmNumber, Article \@acmArticle.  Publication date: \@acmPubDate.}%
  \else % Proceedings
    \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
```

```
    \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
    \fancyhead[RE]{\@headfootfont\@shortauthors\ACM@linecountR}%
    \fancyhead[LE]{\ACM@linecountL\@headfootfont\acmConference@shortname,
      \acmConference@date, \acmConference@venue}%
    \fancyhead[RO]{\@headfootfont\acmConference@shortname,
      \acmConference@date, \acmConference@venue\ACM@linecountR}%
  \fi
  \if@ACM@sigchiamode
     \fancyheadoffset[L]{\dimexpr(\marginparsep+\marginparwidth)}%
  \fi
  \if@ACM@timestamp
     \fancyfoot[LO,RE]{\ACM@timestamp}
  \fi
}
\pagestyle{standardpagestyle}
```

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

```
\newdimen\@folio@wd
\@folio@wd=\z@
\newdimen\@folio@ht
\@folio@ht=\z@
\newdimen\@folio@voffset
\@folio@voffset=\z@
\def\@folio@max{1}
\ifcase\ACM@format@nr
\relax % manuscript
\or % acmsmall
  \@folio@wd=45.75pt\relax
  \@folio@ht=1.25in\relax
  \@folio@voffset=.2in\relax
  \def\@folio@max{8}
\or % acmlarge
  \@folio@wd=43.25pt\relax
  \@folio@ht=79pt\relax
  \@folio@voffset=.55in\relax
  \def\@folio@max{10}
\fi
```

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

```
\def\@folioblob{\@tempcnta=0\@acmArticleSeq\relax
  \ifnum\@tempcnta=0\relax\else
```

First, we calculate `\@acmArticleSeq` modulo `\@folio@max`

```
  \loop
     \ifnum\@tempcnta>\@folio@max\relax
      \advance\@tempcnta by - \@folio@max
   \repeat
    \advance\@tempcnta by -1\relax
    \@tempdima=\@folio@ht\relax
    \multiply\@tempdima by \the\@tempcnta\relax
```

```
    \advance\@tempdima by -\@folio@voffset\relax
    \begin{picture}(0,0)
    \makebox[\z@]{\raisebox{-\@tempdima}{%
        \rlap{%
          \raisebox{-0.45\@folio@ht}[\z@][\z@]{%
            \rule{\@folio@wd}{\@folio@ht}}}%
        \parbox{\@folio@wd}{%
          \centering
          \textcolor{white}{\LARGE\sffamily\bfseries\@acmArticle}}}}
  \end{picture}\fi}

```

firstpagestyle The pagestyle for the first page only.

```
\fancypagestyle{firstpagestyle}{%
  \fancyhf{}%
  \renewcommand{\headrulewidth}{\z@}%
  \renewcommand{\footrulewidth}{\z@}%
  \ifcase\ACM@format@nr
  \relax % manuscript
    \fancyhead[L]{\ACM@linecountL}%
    \fancyfoot[RO,LE]{\if@ACM@printfolios\small\thepage\fi}%
    \fancyfoot[RE,LO]{\footnotesize Manuscript submitted to ACM}%
  \or % acmsmall
    \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
    \@acmNumber, Article \@acmArticle.  Publication date:
    \@acmPubDate.}%
    \fancyhead[LE]{\ACM@linecountL\@folioblob}%
    \fancyhead[LO]{\ACM@linecountL}%
    \fancyhead[RO]{\@folioblob}%
    \fancyheadoffset[RO,LE]{0.6\@folio@wd}%
  \or % acmlarge
    \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
    \@acmNumber, Article \@acmArticle.  Publication date:
    \@acmPubDate.}%
    \fancyhead[RO]{\@folioblob}%
    \fancyhead[LE]{\ACM@linecountL\@folioblob}%
    \fancyhead[LO]{\ACM@linecountL}%
    \fancyheadoffset[RO,LE]{1.4\@folio@wd}%
  \or % acmtog
    \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
    \@acmNumber, Article \@acmArticle.  Publication date:
    \@acmPubDate.}%
    \fancyhead[L]{\ACM@linecountL}%
    \fancyhead[R]{\ACM@linecountR}%
  \else % Conference proceedings
    \fancyhead[L]{\ACM@linecountL}%
    \fancyhead[R]{\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
      \footnotesize Manuscript submitted to ACM}
    \else
    \fancyfoot[LO,RE]{\ACM@timestamp}
    \fi
  \fi
}
```

\ACM@restore@pagestyle The following code by Ross Moore protects against changes by 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}
```

3.15 Sectioning

Sectioning is different for different levels

```
\renewcommand\section{\@startsection{section}{1}{\z@}%
  {-.75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
  {.25\baselineskip}%
  {\@secfont}}
\renewcommand\subsection{\@startsection{subsection}{2}{\z@}%
  {-.75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
  {.25\baselineskip}%
  {\@subsecfont}}
\renewcommand\subsubsection{\@startsection{subsubsection}{3}{10pt}%
  {-.5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
  {-3.5\p@}%
  {\@subsubsecfont\@adddotafter}}
\renewcommand\paragraph{\@startsection{paragraph}{4}{\parindent}%
  {-.5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
  {-3.5\p@}%
  {\@parfont\@adddotafter}}
\renewcommand\part{\@startsection{part}{9}{\z@}%
  {-10\p@ \@plus -4\p@ \@minus -2\p@}%
  {4\p@}%
  {\@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\MakeTextUppercase}
\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\MakeTextUppercase}
 \def\@subsecfont{\sffamily\large\section@raggedright}
\or % acmtog
 \def\@secfont{\sffamily\large\section@raggedright\MakeTextUppercase}
 \def\@subsecfont{\sffamily\large\section@raggedright}
\or % sigconf
 \def\@secfont{\bfseries\Large\section@raggedright\MakeTextUppercase}
 \def\@subsecfont{\bfseries\Large\section@raggedright}
\or % siggraph
 \def\@secfont{\sffamily\bfseries\Large\section@raggedright\MakeTextUppercase}
 \def\@subsecfont{\sffamily\bfseries\Large\section@raggedright}
\or % sigplan
 \def\@secfont{\bfseries\Large\section@raggedright}
 \def\@subsecfont{\bfseries\section@raggedright}
 \renewcommand\subsubsection{\@startsection{subsubsection}{3}{\z@}%
   {-.75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
   {.25\baselineskip}%
   {\@subsubsecfont}}
 \def\@subsubsecfont{\bfseries\section@raggedright}
 \renewcommand\paragraph{\@startsection{paragraph}{4}{\z@}%
   {-.5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
   {-3.5\p@}%
   {\@parfont\@addspaceafter}}
 \def\@parfont{\bfseries\itshape}
 \renewcommand\subparagraph{\@startsection{subparagraph}{5}{\z@}%
   {-.5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
   {-3.5\p@}%
   {\@subparfont\@addspaceafter}}
 \def\@subparfont{\itshape}
\or % sigchi
 \setcounter{secnumdepth}{1}
 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}
 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
\or % sigchi-a
 \setcounter{secnumdepth}{0}
 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}
 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
\fi
```

\@adddotafter Add punctuation after the command

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

\@addspaceafter Add space after the command

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

3.16 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}
```

3.17 Theorems

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

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

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

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

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

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

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

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

Customization of `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
\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 acmdefinition theorem style body.

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

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

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

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

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

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

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

Customization of 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
\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/is 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}
  }{}
  \newtheorem{lemma}[theorem]{Lemma}
  \@ifundefined{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 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
\fi
```

proof We want some customization of 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
}
```

3.18 Acknowledgments

\acks This is a comment-like structure

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

3.19 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}
```

3.20 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' (see http://arxiv.org/hypertex/bibstyles/).

```
\newcommand\showeprint[2][arxiv]{%
  \def\@tempa{#1}%
  \ifx\@tempa\@empty\def\@tempa{arxiv}\fi
  \def\@tempb{arxiv}%
  \ifx\@tempa\@tempb
     arXiv:\href{http://arxiv.org/abs/#2}{#2}\else arXiv:#2%
  \fi}
```

3.21 End of Class

```
\normalsize\normalfont\frenchspacing
⟨/class⟩
```

References

[1] UK TEX Users Group. UK list of TEX frequently asked questions. http://www.tex.ac.uk, 2016.

[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] Cristophe Fiorio. *algorithm2e.sty—package for algorithms*, October 2015. http://www.ctan.org/pkg/algorithm2e.

[4] Rogério Brito. *The algorithms bundle*, August 2009. http://www.ctan.org/pkg/algorithms.

[5] Carsten Heinz, Brooks Moses, and Jobst Hoffmann. *The Listings Package*, June 2015. http://www.ctan.org/pkg/listings.

[6] Simon Fear. *Publication quality tables in LATEX*, April 2005. http://www.ctan.org/pkg/booktabs.

[7] Association for Computing Machinery. *ACM Visual Identity Standards*, 2007. http://identitystandards.acm.org.

[8] Axel Sommerfeldt. *The subcaption package*, April 2013. http://www.ctan.org/pkg/subcaption.

[9] Boris Veytsman, Bern Schandl, Lee Netherton, and C. V. Radhakrishnan. *A package to create a nomenclature*, September 2005. http://www.ctan.org/pkg/nomencl.

[10] Nicola L. C. Talbot. *User Manual for glossaries.sty v4.25*, June 2016. http://www.ctan.org/pkg/subcaption.

[11] David Carlisle. *The textcase package*, October 2004. http://www.ctan.org/pkg/textcase.

Change History

v1.00

General: First released version 28

v1.01

General: Changed hyperref colors in screen mode (closes https://github.com/borisveytsman/acmart/issues/1) 28

Defined ACM colors 28

Explicitly put draft option (closes https://github.com/borisveytsman/acmart/issues/4) 31

Set headheight to 1pc for all formats (closes https://github.com/borisveytsman/acmart/issues/5) 28

v1.02

General: Added TOPS and TSC (closes https://github.com/borisveytsman/acmart/issues/12) 28

Documentation changes (closes https://github.com/borisveytsman/acmart/issues/13) 28

v1.03

\@formatdoi: Added macro 62

General: Added anonsuppress environment 28

Added authorversion option (closes https://github.com/borisveytsman/acmart/issues/9) 28

\if@ACM@authorversion: Added macro 30

\maketitle: Added special case of authorversion 65

v1.04

General: Updated bibliography for siggraph 28

\acmArticleSeq: Name change by Matthew Fluet 56

\acmDOI: Name change by Matthew Fluet 57

\acmISBN: Name change by Matthew Fluet 57

v1.05

General: Added processing doi numbers for acmsiggraph and doi numbers for sigproc.bib 28

Patched \setcitestyle command; closes https://github.com/borisveytsman/acmart/issues/19 28

v1.06

\@ACM@badge@skip: Added macro . . 57

\@ACM@badge@width: Added macro . 57

\@ACM@title@width: Added macro . 57

\@mktitle@i: Added processing badges 70

Made generic 70

\@mktitle@ii: Now this macro is obsolete 71

\@mktitle@iii: Added processing badges 71

Made more generic 71

\@mktitle@iv: Made more generic . 72

\@printtopmatter: Added processing badges 68

\@subtitlefont: Added macro 70

\@titlefont: Added macro 70

\acmBadgeL: Added macro 57

\acmBadgeR: Added macro 57

\if@ACM@badge: Added macro 57

v1.07

\maketitle: Corrected a bug with abstract footnotes 65

Corrected a bug with permssion and footnotes order 65

v1.08

General: SIGPLAN reformatting by Matthew Fluet 28

Typos corrected (Tobias Pape) . . . 28

v1.09

General: Revert SIGPLAN caption rules 28

v1.10

General: Changes of 'licensedothergov' wording 61

\maketitle: Corrected a bug with doi in manuscript and author vertsion, https://github.com/

borisveytsman/acmart/issues/36 65
standardpagestyle: Reversed folios location 81
v1.11
General: Customization of ACM theorem styles and proof environment by Matthew Fluet 28
v1.12
\@marginfigure: Now centering by default 44
\@margintable: Now centering by default 45
\@parfont: Moved to \section@raggedright 85
General: Added graceful behavior when libertine fonts are absent . . 42
Documentation updates 28
\copyrightpermissionfootnoterule: Added macro 41
\descriptionlabel: Redefined 47
\footnoterule: Made shorter 41
\if@ACM@natbib@override: Added macro 30
\if@ACM@newfonts: Added macro . . 43
\maketitle: Moved thankses to copyrightpermission box 65
\section@raggedright: Introduced macro 84
v1.13
\@mpfootnotetext: Made minipage footnotes centered 42
General: Font adjustments for acmsmall 73
Increased font size for ACM Large 32
Print bibliographic information by default for the proceedings 59
\bibliographystyle: Redefined macro 38
\bibstyle@acmauthoryear: Added macro 34
\bibstyle@acmnumeric: Added macro 35
\if@ACM@printfolios: Added macro 58
standardpagestyle: Added headers for sigs 81
Expanded headers for sigchi-a . . . 81
Suppressed folios if sig 81
v1.14
General: \citestyle updates (Matthew Fluet) 28
Patched \citestyle 33
\bibstyle@acmauthoryear: Moved def of \bibstyle@acmauthoryear before use 34
\bibstyle@acmnumeric: Moved def of \bibstyle@numeric before use . . 35
v1.15
\@ACM@addtoaddress: Added macro 72
\@mkauthors@iii: New authors system 75
\@shortauthors: Introduced macro . 80
\@typeset@author@bx: Moved to separate macro 75
\acks: Added macro 89
\affiliation: Added code for author groups 54
\author: Added code for author groups 53
\city: Added macro 72
\country: Added macro 72
\department: Added macro 72
\grantnum: Added macro 89
\grantsponsor: Added macro 89
\if@insideauthorgroup: Introduced macro 53
\institution: Added macro 72
\num@authorgroups: Renamed 53
\orcid: Introduced macro 55
\position: Added macro 72
\postcode: Added macro 72
\state: Added macro 72
\streetaddress: Added macro 72
standardpagestyle: Better handling of anonymous mode 81
v1.16
\@headfootfont: Added macro 80
General: Formatting header/footer (Matthew Fluet) 28
standardpagestyle: Customize header/footer text font 81
v1.17
\@makefnmark: Redefined 42
\@mkauthors: TOG now uses the same authors block as other journals . . 73
\@mkauthors@ii: Deleted 75
\@mkbibcitation: Added \nobreak 78
Changed format for sigs 78

General: Slightly decreased margins for sigs . . . 39
\acmArticle: The default is now numerical . . . 56
\acmMonth: The default must be numerical. Closes #50. . . . 56
\acmNumber: The default is now numerical . . . 56
\acmVolume: The default is now numerical . . . 56
\acmYear: The default is now numerical . . . 56
\description: Decreased indent . . . 47
\grantnum: Added url . . . 89
\grantsponsor: Renamed . . . 89
\if@ACM@printacmref: Renamed from \if@ACM@printbib . . . 58
standardpagestyle: Added paper title to sigs . . . 81
v1.18
\@mkauthors@i: Now we andify affiliations . . . 74
\@typeset@author@line: Added macro . . . 74
General: Natbib is now the default for all formats . . . 28
v1.19
\@mkabstract: Include 'Abstract' in PDF bookmarks (Matthew Fluet) . 78
General: Include 'Abstract', 'Acknowledgements', and 'References' in PDF bookmarks (Matthew Fluet) . 28
Include 'References' in PDF bookmarks (Matthew Fluet) . . . 33
\acks: Include 'Acknowledgements' in PDF bookmarks (Matthew Fluet) . 89
v1.20
\@mkabstract: Deleted spurious space 78
General: Bug fixes for bst . . . 28
v1.21
\showeprint: Added macro . . . 90
v1.22
General: More bibliography changes for Aptara . . . 28
v1.23
General: Add PACMPL journal option 28
v1.24
General: Add IMWUT journal option 47
v1.25
General: Updated PACMPL . . . 47
v1.26
General: Corrected \shortcite bug . 28
Documentation typos fixed (thanks to Stephen Spencer) . . . 28
v1.27
\if@ACM@printccs: Typo corrected . 58
v1.28
General: Corrected option natbib behavior . . . 35
Got rid of warnings in pdf keywords 37
\ccsdesc@parse: Change from \to to \textrightarrow (Matteo Riondato) . . . 60
v1.29
\@mkabstract: Removed spurious indentation (John Wickerson) . . . 78
General: Increased head to 13pt . . . 39
\ccsdesc@parse: Add spacing after bullet and around rightarrow; semicolon separators no longer in bold/italic (John Wickerson) . . . 60
standardpagestyle: Corrected printfolios (Matthew Fluet) . . . 81
v1.30
General: Added \frenchspacing . . . 90
Bibtex style now recognizes https:// in doi . . . 28
Switched to T1: looks like libertine has problems with \l in OT1 . . . 43
Updated IMWUT and PACMPL . . 47
\department: Added optional parameter . . . 72
v1.31
\@additionalaffiliation: Added macro . . . 55
\@mkbibcitation: Disabled linebreak 78
\@startsection: Added \tochangmeasure . . . 35
Rededined macro . . . 37
\@textbottom: Redefined . . . 42
General: Documentation changes . . . 28
\acmMonth: The default now is the current month (Matteo Riondato) . . . 56
\acmYear: The default now is the current year (Matteo Riondato) . . . 56
\additionalaffiliation: Added macro . . . 55
\l@subsection: Redefined macro . . 37
\l@subsubsection: Redefined macro 37

v1.32
\@formatdoi: New doi format 62
General: Added POMACS journal option 28
Format siggraph is now obsolete . 28
v1.33
\@ACM@addtoaddress: Added obeypunctuation code 72
\@mkauthors@i: Added obeypunctuation code 74
\@mkauthors@iii: Added obeypunctuation code 75
\@mkauthors@iv: Added obeypunctuation code 76
\@subtitlefont: Added \normalsize 70
General: Added acmart-preload-hook 28
Added cmap and glyphtounicode . 42
BibTeX comma before articleno bug corrected 28
BibTeX crossref bug corrected . . . 28
BibTeX numpages bug corrected . 28
Documentation updates 28
Moved \citename definition for non-natbib bibliography, so a package may redefine it 38
Switched to Type 1 fonts for libertine even if OTF-capable engine is used (Kai Mindermann) 43
\ACM@linecountL: Renamed macro . 79
\ACM@linecountR: Added macro . . . 80
\ACM@timestamp: Added current page number 80
Added macro (Michael D. Adams) . 80
Added submission id 80
\acmSubmissionID: Added macro . . 57
\city: Added obeypunctuation code 72
\country: Added obeypunctuation code 72
\department: Added obeypunctuation code 72
\if@ACM@affiliation@obeypunctuation: Added macro 54
\if@ACM@authordraft: Added macro 30
\if@ACM@natbib@override: Deleted macro 30
\if@ACM@timestamp: Added macro (Michael D. Adams) 30
\institution: Added obeypunctuation code 72
firstpagestyle: Added right linecount for two column formats 83
Added timestamp (Michael D. Adams) 83
\maketitle: Fixed the bug with figures on top and bottom of the title page, thanks to David Epstein 65
\position: Added obeypunctuation code 72
\postcode: Added obeypunctuation code 72
\state: Added obeypunctuation code 72
\streetaddress: Added obeypunctuation code 72
standardpagestyle: Added right linecount for two column formats 81
Added timestamp (Michael D. Adams) 81
v1.34
\@mkbibcitation: Deleted DOI from doi numbers 78
\ACM@linecount@bx: Rulers now are continuous 79
\ACM@linecountL: Rulers now are continuous 79
\ACM@linecountR: Rulers now are continuous 80
\maketitle: Added date to the bibstrip in conf proceedings 65
Deleted 'DOI' from doi numbers . 65
Rearranged bibstrip 65
The \terms command is now obsolete 65
\terms: The \terms command now just produces a warning 58
v1.35
General: BibTeX bug fixed: et al. . . . 28
If the copyright is set to usgov or rigtsretained, the price is suppressed 61
\bibstyle@acmauthoryear: Square brackets for author-year style . . . 34
v1.36
\@ACM@authorsperrow: Added macro 59
\@mkauthors@iii: Added authorsperrow overrride 75
\@mkauthors@iv: Added authorsperrow overrride 76
General: Added PACMHCI journal options 47

Added the possibility to adjust number of author boxes per row in conference formats 28
\if@ACM@authordraft: Corrected typo, thanks to bargteil 30
v1.37
General: Reduce list indentation (Matthew Fluet) 46
Set \normalparindent; Reduce list indentation (Matthew Fluet) 28
\description: Reduce list indentation (Matthew Fluet) 47
\descriptionlabel: Reduce list indentation (Matthew Fluet) 47
\normalparindent: Set \normalparindent (Matthew Fluet) 41
v1.38
General: Increase default font size for SIGPLAN 28, 32
v1.39
\@@authornotemark: Added macro . 78
\authornotemark: Added macro . . . 56
v1.40
\@copyrightowner: Added new copyright version: licensedcagov 62
\@copyrightpermission: Added new copyright version: licensedcagov . 62
\@mkauthors@i: Switched to MakeTextUppercase 74
\@parfont: Switched to MakeTextUppercase 85
General: Added 'textcase' package . . 33
Added heightrounded to geometry 39
Added new copyright version: licensedcagov 28
Added package cleveref 28
Added Ross Moore code for glyphtounicode 42
Bibliography changes 28
\ACM@linecount@bx: Work around a bug in xcolor: looks like cmyk colors in boxes do not work 79
\ccdesc@parse@finish: Added macro 60
\city: We now do not print this even in SIG 72
\country: Fixed bugs with extra spaces 72
\l@subsection: Redefined macro . . 37
\postcode: We now do not print this even in SIG 72
\state: We now do not print this even in SIG 72
\streetaddress: We now do not print this even in SIG 72
v1.41
General: Added new badges 28
v1.42
General: Deleted ACM badges 28
v1.43
\@startsection: Added \makeatletter 37
\country: Added comma before country for journals 72
v1.44
\@acmBooktitle: Added macro 53
\@acmEditors: Added macro 53
\@editorsAbbrev: Added macro . . . 53
\@folioblob: Suppress the blob if acmArticleSeq is empty 82
\@mkbibcitation: If the paper has just one page, use 'page' instead of 'pages' 78
General: Added package refcount . . . 28
Deleted package cleveref 28
Put theorem defs in a separate style 28
\ACM@restore@pagestyle: Added macro 84
\acmArticle: The default is now empty 56
\acmArticleSeq: Now acmArticle might be empty 56
\acmBooktitle: Added macro 53
\editor: Added macro 53
\if@ACM@acmthm: Added macro 29
\maketitle: Empty DOI or ISBN are not printed (by Michael Ekstrand) 65
v1.45
\@folioblob: Switched \bfeseries\sffamily to \sffamily\bfseries 82
\@parfont: Switched \bfeseries\sffamily to \sffamily\bfseries 85
\@titlefont: Switched \bfeseries\sffamily to \sffamily\bfseries 70
v1.46
\@mkauthorsaddresses: Introduced macro 78
\@mkbibcitation: Added subtitle . . 78

\@printendtopmatter: Made it \par\bigskip uniformly 79
\@printtopmatter: Deleted rule . . . 68
\@setauthorsaddresses: Introduced macro 79
General: Added etoolbox 28
Bst file bug fixes: label width is calculated correctly 28
Delayed hypersetup since journal options may change screen mode 37
PACM now set screen to true 47
Restore theorem defs to class file . 28
\ACM@linecount@bx: Rearranged the code to get rid of spurious underfull messages (Benjamin Byholm) 79
\author: Started counting authors . . 53
\authorsaddresses: Introduced macro 55
\country: T 72
\if@ACM@acmthm: Modified description 29
\liningnums: Workaround for compatibility with fontspec 43
\maketitle: Added authors' addresses 65
Thankses go before authors' addresses 65
\num@authors: Introduced macro . . 53
v1.47
General: New journal: THRI 28

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

\$ 1572, 1576
\@ 1441, 1462, 1475
\@@authornotemark 1153, 2024
\@@par 316, 373
\@ACM@addtoaddress . 1803, 1826, 1827, 1829
\@ACM@authorsperrow 1224, 1934, 1935, 1983, 1984
\@ACM@badge@skip 1184, 1666, 1743, 1747, 1753, 1762, 1772, 1778, 1787
\@ACM@badge@width 1181, 1665, 1670, 1742, 1746, 1752, 1764, 1771, 1773, 1776, 1788, 1791
\@ACM@badgefalse . . . 1180
\@ACM@badgetrue 1186, 1191
\@ACM@commabox 1803, 1807, 1808
\@ACM@journalfalse . 148, 150, 152, 154, 156
\@ACM@journaltrue 140, 142, 144, 146
\@ACM@labelwidth . . . 710, 713, 721, 726, 752
\@ACM@manuscriptfalse 135
\@ACM@manuscripttrue 133
\@ACM@newfontsfalse 616, 618, 621
\@ACM@newfontstrue . 613
\@ACM@reviewtrue . . . 109
\@ACM@screentrue 826, 855, 861, 867
\@ACM@sigchiamodefalse 137
\@ACM@sigchiamodetrue 157
\@ACM@timestamptrue 108
\@ACM@title@width 1183, 1740, 1742, 1743, 1746, 1747, 1755, 1769, 1771, 1772, 1780
\@DeclareACMFormat . . . 38, 39, 40, 41, 42, 43, 44, 45, 46, 47
\@M 316, 355, 373, 382
\@abstract 1203, 2033, 2040
\@acmArticle 1159, 1162, 1571, 2049, 2050, 2152, 2153, 2157, 2160, 2163, 2165, 2168, 2172, 2174, 2229, 2243, 2251, 2259
\@acmArticleSeq 1161, 2212
\@acmBadgeL@image 1193, 1195, 1663, 1665, 1741, 1750, 1752, 1774, 1776
\@acmBadgeL@url . 1192, 1194, 1664, 1751, 1775
\@acmBadgeR@image 1188, 1190, 1668, 1670, 1745, 1761, 1764, 1789, 1791
\@acmBadgeR@url . 1187, 1189, 1669, 1763, 1790
\@acmBooktitle 1043, 1562, 2059
\@acmDOI . . 1177, 1564, 1567, 1573, 1577, 2066
\@acmEditors 1048, 1048, 1049, 1052, 2060, 2061
\@acmISBN 1175, 1575
\@acmMonth 1165, 1167, 1571
\@acmNumber 1157, 2056, 2157, 2165, 2174, 2243, 2251, 2259
\@acmPrice 1171, 1572, 1576
\@acmPubDate . . . 1167, 2056, 2157, 2165, 2174, 2244, 2252, 2260
\@acmSubmissionID 1173, 2113, 2114
\@acmVolume 1155, 2056, 2156, 2164, 2173, 2242, 2250, 2258
\@acmYear 1163, 1170, 1483, 1571, 2052
\@acmdefinitionbodyfont . . . 2389, 2401, 2413
\@acmdefinitionheadfont . . . 2391, 2403, 2415
\@acmdefinitionindent . . . 2390, 2402, 2414
\@acmdefinitionnotefont . . . 2392, 2404, 2418
\@acmownedfalse 1303, 1306, 1309, 1315, 1319, 1322, 1325, 1328, 1334
\@acmownedtrue 1290, 1299, 1331
\@acmplainbodyfont . . . 2359, 2371, 2383
\@acmplainheadfont . . . 2361, 2373, 2385
\@acmplainindent 2360, 2372, 2384
\@acmplainnotefont . . . 2362, 2374, 2388
\@adddotafter 2296, 2300, 2356
\@additionalaffiliation 1107, 1108
\@addpunct 2069, 2070, 2356, 2357, 2467
\@addspaceafter 2340, 2345, 2357
\@affiliationfont . . 1856, 1861, 1865, 1868, 1871, 1874, 1877, 1880, 1908, 1926
\@afterheading . 347, 1611

\@afterindentfalse 293, 1610
\@afterindenttrue . . 291
\@article@string 2049, 2056, 2064
\@author . . 1068, 1071, 1076, 1894, 1953, 1996
\@authorfont 1855, 1860, 1864, 1867, 1870, 1873, 1876, 1879, 1896, 1926
\@authornotemark 1145, 1151, 2023
\@authornotes 1142, 1146, 1516
\@authorsaddresses 1523, 2070
\@auxout 452
\@begindocumenthook 448
\@botnum 1506
\@citestyle 225
\@classname 25, 27, 35, 51, 53, 54, 59, 61, 62, 67, 69, 70, 75, 77, 78, 83, 85, 86, 91, 93, 94, 99, 101, 102, 107, 111, 112, 123, 128, 181, 614, 617, 619, 827, 856, 862, 868, 1023, 1025, 1106, 1198, 1208, 1210, 1211, 1214, 1216, 1217, 1220, 1222, 1223, 1225, 1226, 2046
\@clubpenalty 361
\@concepts 1261, 1271, 1585, 1587, 1607
\@copyrightowner 1338, 1548
\@copyrightpermission 1370, 1540
\@copyrightyear 1482, 1548, 1550
\@currbox . . . 691, 692, 693
\@currentaffiliation 1927, 1930, 1952, 1959, 1960, 1962, 1964, 1965, 1969, 1995, 2002, 2003, 2005, 2007, 2008, 2012
\@currentaffiliations 1885, 1886, 1887, 1889, 1892, 1904, 1905, 1910
\@currentauthors 1883, 1884, 1891, 1895, 1896, 1898, 1926, 1929, 1951, 1953, 1954, 1956, 1994, 1996, 1997, 1999, 2023, 2024
\@currentlabel . 576, 590
\@dblarg 302
\@dblfloat 675
\@department . . 1111, 1112
\@dotsep 2358
\@editorsAbbrev 1047, 1051, 2061
\@empty 159, 306, 1038, 1048, 1066, 1081, 1086, 1087, 1093, 1242, 1243, 1249, 1256, 1261, 1519, 1523, 1564, 1572, 1575, 1576, 1577, 1585, 1590, 1635, 1663, 1668, 1741, 1745, 1750, 1758, 1761, 1774, 1782, 1789, 1799, 1885, 1895, 1903, 1904, 1953, 1959, 1964, 1996, 2002, 2007, 2026, 2049, 2053, 2060, 2113, 2362, 2392, 2480, 2497
\@endfloatbox 677
\@endpefalse 2469
\@endwidefloatbox 677, 685
\@finalstrut . . . 581, 594
\@float 679
\@flushglue 2305
\@fnsymbol 1503
\@folio@ht 2192, 2219, 2225, 2226
\@folio@max 2192, 2215, 2216
\@folio@voffset 2192, 2221
\@folio@wd 2192, 2226, 2227, 2248, 2256
\@folioblob 2212, 2245, 2247, 2253, 2254
\@footnotemark . 395, 1501
\@footnotemark@nolink 395, 1501
\@footnotetext 396, 572, 1502
\@footnotetext@nolink 396, 1502
\@for 201
\@formatdoi 1369, 1567, 1573, 1577, 2066
\@fps 678
\@fpsadddefault 678
\@gobble 223, 267
\@hangfrom 315, 372
\@headfootfont 2119, 2152, 2153, 2154, 2155, 2159, 2162, 2167, 2171, 2177, 2178, 2179, 2181
\@ifnextchar 1111
\@ifnotempty 1488
\@ifnum 239, 241
\@ifstar 300
\@ifundefined 2423, 2426, 2429, 2433, 2434, 2438, 2441
\@iiiparbox 570
\@input 384
\@insideauthorgroupfalse 1101
\@insideauthorgrouptrue 1064
\@journalCode . . 758, 827, 856, 862, 868, 1023
\@journalCode@nr 758, 812, 1028
\@journalName . . 814, 818, 822, 829, 833, 837, 841, 845, 849, 850, 852, 853, 858, 859, 864, 865, 870, 874, 878, 880, 884, 888, 890, 892, 894, 898, 902, 906, 910, 914, 918, 922, 926, 930, 934, 938, 942,

946, 950, 954, 955, 958, 962, 963, 966, 971, 975, 979, 983, 987, 991, 995, 999, 1003, 1007, 1011, 1015, 1019, 1029, 1030, 1560, 2156, 2164, 2173, 2242, 2250, 2258
\@journalNameShort . . . 815, 819, 824, 830, 834, 838, 842, 846, 871, 875, 881, 885, 895, 899, 903, 907, 911, 915, 919, 923, 927, 931, 935, 939, 943, 947, 951, 959, 964, 967, 972, 976, 980, 984, 988, 992, 996, 1000, 1004, 1008, 1012, 1016, 1020, 1030, 2055
\@keywords 1200, 1590, 1596, 1608
\@latex@error 269
\@lempty 1205, 2033
\@listI 734, 738
\@listi 731, 738
\@listii 739
\@listiii 742
\@listiv 744
\@listv 746
\@listvi 748
\@m 304
\@makefnmark . . . 571, 596, 1508, 1513, 1517
\@makefntext 571, 580, 593, 1518
\@marginfigure . 667, 668
\@margintable . . 670, 671
\@minipagefalse . 567, 687
\@minus . . . 2286, 2290, 2294, 2298, 2302, 2333, 2338, 2343, 2380, 2382, 2410, 2412
\@mkabstract . . 1583, 2032
\@mkauthors 1509, 1511, 1831
\@mkauthors@i . . 1835, 1837, 1839, 1841, 1890
\@mkauthors@ii 1920
\@mkauthors@iii . 1843, 1845, 1847, 1849, 1931
\@mkauthors@iv 1851, 1980
\@mkauthorsaddresses 2022
\@mkbibcitation 1603, 2042
\@mkteasers . . . 1509, 2025
\@mktitle 1509, 1675
\@mktitle@i 1678, 1680, 1682, 1684, 1739
\@mktitle@ii 1767
\@mktitle@iii . . 1686, 1688, 1690, 1692, 1767
\@mktitle@iv . . 1694, 1795
\@mpargs 570
\@mparswitchfalse . . 532
\@mpfootins 562, 563, 565, 585, 586
\@mpfootnotetext . . . 584
\@ne . 227, 231, 235, 237, 438, 2076, 2081, 2085
\@nil 246
\@nobreakfalse . 349, 389
\@noskipsecfalse . . . 353
\@noskipsectrue 350
\@pages@word 2043, 2057, 2064
\@par 1521, 1527
\@parboxrestore 589
\@parfont . 2300, 2304, 2309
\@permissionCodeOne 816, 820, 825, 831, 835, 839, 843, 847, 854, 860, 866, 872, 876, 882, 886, 896, 900, 904, 908, 912, 916, 920, 924, 928, 932, 936, 940, 944, 948, 952, 956, 960, 968, 973, 977, 981, 985, 989, 993, 997, 1001, 1005, 1009, 1013, 1017, 1021, 1031, 1571
\@permissionCodeTwo 969, 1032
\@plus . . 382, 390, 597, 2286, 2290, 2294, 2298, 2302, 2333, 2338, 2343, 2379, 2381, 2409, 2411, 2464
\@printcopyrightfalse 1302, 1314
\@printcopyrighttrue 1286, 1298
\@printendtopmatter 1609, 2068
\@printpermissionfalse 1301
\@printpermissiontrue . . . 1288, 1297, 1313
\@printtopmatter 1510, 1634
\@proofindent 2448, 2458, 2466
\@proofnamefont 2447, 2457, 2467
\@received . 1240, 1243, 1244, 1246, 1249, 1250, 1252, 1256, 1257
\@rightskip . . . 2305, 2306
\@saveabstract 1202, 1203
\@saveteaser . . 1485, 1486
\@seccntformat . 309, 366
\@secfont 2288, 2309
\@secpenalty 298
\@sect 302, 303
\@setaddresses 2022
\@setauthorsaddresses 1527, 2070
\@setthanks . . . 1521, 2069
\@shortauthors 2118, 2148, 2154, 2160, 2168, 2178
\@sidebar 664, 665
\@specialsection . . . 1586, 1592, 1594, 1613
\@ssect 301, 367
\@startPage 1196, 1635, 1636, 1638, 2112
\@startsection 287, 379, 2285, 2289, 2293, 2297, 2301, 2332, 2337, 2342
\@starttoc 379
\@subparfont . . 2345, 2346
\@subsecfont . . 2292, 2309
\@subsubsecfont 2296, 2309
\@subtitle . 1054, 1134, 1758, 1759, 1782, 1783, 1799, 1800, 2053

\@subtitlefont 1718, 1759, 1783, 1800
\@subtitlenotes 1132, 1136, 1139, 1515
\@svsec . 306, 309, 315, 330
\@svsechd . . . 328, 356, 376
\@teaser 1486, 2027
\@teaserfigures 1484, 1486, 2026, 2030
\@tempa 201, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 249, 251, 253, 255, 257, 259, 1085, 1086, 1241, 1242, 1903, 2480, 2496, 2497, 2499
\@tempb 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 249, 251, 253, 255, 257, 259, 2498, 2499
\@tempboxa 570
\@tempc . 247, 248, 250, 252, 254, 256, 258, 260
\@tempcnta . 2212, 2213, 2215, 2216, 2218, 2220
\@tempdima 2219, 2220, 2221, 2223
\@tempskipa 290, 292, 293, 298, 311, 312, 343, 344, 346, 358, 359, 368, 369
\@textbottom 597
\@textsuperscript 596, 1508, 1513
\@texttop 598
\@thefnmark . 577, 591, 596, 1508, 1513, 1517
\@title . . . 1125, 1606, 1757, 1781, 1798, 2052
\@titlefont 1697, 1749, 1756, 1768, 1780, 1796
\@titlenotes 1123, 1127, 1130, 1514
\@tochangmeasure 320, 333
\@toclevel 304
\@tocline . . . 392, 393, 394
\@topnum 1504
\@typeset@author@bx 1924, 1973, 1979, 2016, 2021
\@typeset@author@line 1882, 1893, 1915, 1917
\@undefined 448, 628
\@width 551, 558
\@xp 386, 387
\@xsect 341, 342, 378
\@z 233
\\ 468, 1548, 1553, 1568, 1572, 1576, 2045, 2080
\{ 209
\} 209

\␣ . . . 1046, 1267, 1277, 1548, 1550, 1572, 2049, 2050, 2062, 2112

A

\abstract 1202
abstract (environment) *18*
\acks 2471
acks (environment) *22*
\acm@copyrightinput 1292
\acm@copyrightmode . 1292, 1300, 1305, 1308, 1312, 1318, 1321, 1324, 1327, 1330, 1333, 1339, 1371
\ACM@fontsize 115, 159, 162, 164, 166, 168, 170, 172, 174, 176, 178, 181, 182
\ACM@format 32, 123
\ACM@format@nr 32, 123, 127, 132, 138, 160, 405, 472, 537, 643, 695, 1614, 1642, 1676, 1698, 1719, 1833, 1857, 2120, 2144, 2199, 2236, 2269, 2314, 2363, 2393, 2449
\ACM@linecount 2075, 2076, 2080, 2081, 2084, 2085
\ACM@linecount@bx 2072, 2091, 2098
\ACM@linecount@bxht 2074, 2079, 2082, 2083
\ACM@linecountL 2087, 2146, 2149, 2152, 2155, 2159, 2161, 2167, 2169, 2177, 2179, 2238, 2245, 2246, 2254, 2255, 2261, 2264
\ACM@linecountR 2094, 2170, 2172, 2178, 2182, 2262, 2265
\ACM@mk@linecount . . . 2077, 2089, 2096
\ACM@ps@headings 2279, 2283
\ACM@ps@myheadings 2278, 2282
\ACM@ps@plain . 2277, 2281
\ACM@restore@pagestyle 2277
\ACM@timestamp 2101, 2188, 2270, 2273
\acmArticle *14*, 1159
\acmArticleSeq . *15*, 1161
\acmBadgeL *15*, 1191
\acmBadgeR *15*, 1186
\acmBooktitle . . . *8*, 1043
\acmConference . . *8*, 1033
\acmConference@date 1036, 1544, 2180, 2182
\acmConference@name . . . 1035, 1044, 1045
\acmConference@shortname 1034, 1038, 1039, 1045, 1046, 1544, 2179, 2181
\acmConference@venue 1037, 1544, 2180, 2182
\acmdefinition 2408
\acmDOI *15*, 1177
\acmISBN *15*, 1175
\acmJournal *8*, 1027

\acmMonth *14*, 1165
\acmNumber *14*, 1157
\acmplain 2378
\acmPrice *15*, 1171, 1310, 1316
\acmSubmissionID *15*, 1173
\acmVolume *14*, 1155
\acmYear *14*, 1163
\addcontentsline 197, 322, 335, 2034, 2474
\additionalaffiliation *11*, 1107
\addpenalty 298
\addresses . 1066, 1068, 1071, 1076, 1103, 1121, 1145, 1151, 1153, 1917, 1979, 2021
\addtolength . . . 719, 720, 721, 725, 726, 2082
\addvspace 298, 390
\advance 735, 740, 743, 745, 747, 749, 1061, 1063, 1742, 1743, 1746, 1747, 1771, 1772, 1933, 1950, 1982, 1993, 2081, 2085, 2216, 2218, 2221
\affiliation *10*, 1100, 1902, 1964, 2007
\and 1052, 1076, 1077, 1090, 1096, 1893, 1898, 1900, 1910, 1915, 1924, 1958, 1973, 1979, 2001, 2016, 2021
\andify 1598, 1599, 1883, 1886, 2061
anonsuppress (environment) *22*
\AtBeginDocument 441, 449, 711, 2284
\AtEndDocument 1255
\AtEndPreamble 418, 629, 2420, 2481
\author *10*, 1060, 1497, 1498, 2047
\author@bx 1920, 1925, 1928
\author@bx@sep 1922, 1928, 1933, 1950, 1982, 1993
\author@bx@wd 1921, 1924, 1932, 1933, 1935, 1941, 1943, 1945, 1947, 1950, 1981, 1982, 1984, 1990, 1993
\authornote *14*, 1107, 1143, 2048
\authornotemark . *14*, 1149
\authors 1069, 1072, 1077, 1598, 1600, 1605, 2052
\authorsaddresses *14*, 1123

B

\baselineskip 1538, 1751, 1763, 1775, 1790, 2082, 2286, 2287, 2290, 2291, 2294, 2298, 2333, 2334, 2338, 2343, 2379, 2380, 2381, 2382, 2409, 2410, 2411, 2412
\begin . 20, 2090, 2097, 2222
\begingroup 313, 356, 370, 379, 437, 1500, 1831, 2472
\bfseries . . 750, 1533, 1700, 1702, 1704, 1708, 1710, 1712, 1714, 1716, 1876, 1879, 2051, 2229, 2309, 2310, 2324, 2325, 2327, 2328, 2330, 2331, 2336, 2341, 2349, 2350, 2353, 2354, 2373, 2403
\bgroup 665, 668, 671, 676, 1108, 1585, 1590, 1924, 2018, 2027, 2032, 2042
\bibfont 199
\bibliofont 199
\bibliographystyle . 447
\bibsection 195
\bibstyle 223, 225, 267, 452
\bibstyle@acmauthoryear 273
\bibstyle@acmnumeric 279
\bigskip . . 1257, 1660, 1766, 1794, 1802, 1979, 2021, 2027, 2068
\box 692, 1644, 1646, 1648, 1650, 1652, 1654, 1656, 1658, 1660, 1916, 1928, 1977, 2029

C

\c@footnote 1503
\c@secnumdepth 305, 319, 323, 332, 336
\captionsetup 635, 637, 639, 641, 650, 652, 655, 658, 665, 668, 671, 2028
\ccdesc@parse@finish 1284
\ccsdesc *16*, 1262
\ccsdesc@parse 1263, 1264
\ccsdesc@parse@end 1263, 1284
\ccsdesc@parse@finish 1283, 1284
CCSXML (environment) . . *16*
\centering 383, 467, 592, 669, 672, 1768, 1780, 1925, 1978, 2228
\cite . . . 429, 430, 442, 446
\citeA 436
\citealt 435
\citeANP 431
\citeauthor 431
\citeN 429
\citename 443
\citeNN 432
\citeNP 435
\citep 430
\citestyle . . . *23*, 265, 285
\citeyear . . . 433, 434, 446
\citeyearNP 433
\citeyearpar . . . 432, 434
\city *11*, 1114, 1811
\ClassError 35, 1025, 1106, 1211, 1217, 1223, 2046
\ClassInfo 123, 181, 1023,

1208, 1210, 1214, 1216, 1220, 1222, 1225
\ClassWarning 27, 128, 614, 617, 619, 1198, 1226
\cleaders 1808
\clubpenalty . . . 355, 361
\CodelineIndex 17
\Collect@Body . . 664, 667, 670, 1202, 1485
\color . . . 1536, 2080, 2084
\color@begingroup 579, 592
\color@endbox 690
\color@endgroup 568, 582, 595
\columnwidth . . . 551, 588, 676, 1981, 2018
\contentsnamefont . . 383
\copy 1808
\copyright 1548
\copyrightpermissionfootnoterule 550
\copyrightyear . *18*, 1482
\country . . . *11*, 1117, 1811
\csname . 267, 318, 320, 324, 331, 333, 337, 366, 386, 387, 577, 591, 1266, 1267, 1269, 1270, 1271, 1272, 1273, 1276, 1278
\CurrentOption . 116, 117, 118, 119, 120, 121

D

\day 2110
\DeclareNewFootnote 554, 556
\DeclareOptionX 38, 116, 117, 118, 119, 120, 121
\DeclareRobustCommand 436
\DeclareTextFontCommand 630
\def 25, 38, 115, 162, 164, 166, 168, 170, 172, 174, 176, 178, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 238, 240, 242, 244, 245, 249, 251, 253, 255, 257, 259, 287, 303, 328, 342, 366, 367, 376, 379, 392, 393, 394, 399, 400, 401, 402, 447, 550, 557, 559, 571, 573, 584, 596, 597, 665, 668, 671, 676, 678, 682, 685, 703, 704, 705, 706, 734, 739, 742, 744, 746, 748, 814, 815, 816, 818, 819, 820, 822, 824, 825, 829, 830, 831, 833, 834, 835, 837, 838, 839, 841, 842, 843, 845, 846, 847, 849, 850, 852, 853, 854, 858, 859, 860, 864, 865, 866, 870, 871, 872, 874, 875, 876, 878, 880, 881, 882, 884, 885, 886, 888, 890, 892, 894, 895, 896, 898, 899, 900, 902, 903, 904, 906, 907, 908, 910, 911, 912, 914, 915, 916, 918, 919, 920, 922, 923, 924, 926, 927, 928, 930, 931, 932, 934, 935, 936, 938, 939, 940, 942, 943, 944, 946, 947, 948, 950, 951, 952, 954, 955, 956, 958, 959, 960, 962, 963, 964, 966, 967, 968, 969, 971, 972, 973, 975, 976, 977, 979, 980, 981, 983, 984, 985, 987, 988, 989, 991, 992, 993, 995, 996, 997, 999, 1000, 1001, 1003, 1004, 1005, 1007, 1008, 1009, 1011, 1012, 1013, 1015, 1016, 1017, 1019, 1020, 1021, 1027, 1028, 1029, 1030, 1031, 1032, 1043, 1047, 1048, 1054, 1085, 1107, 1108, 1109, 1110, 1111, 1112, 1123, 1124, 1132, 1133, 1142, 1143, 1155, 1157, 1159, 1161, 1163, 1165, 1167, 1171, 1173, 1175, 1177, 1187, 1188, 1189, 1190, 1192, 1193, 1194, 1195, 1196, 1198, 1200, 1203, 1205, 1228, 1240, 1241, 1265, 1284, 1336, 1338, 1369, 1370, 1482, 1484, 1486, 1495, 1508, 1513, 1521, 1527, 1613, 1634, 1675, 1697, 1718, 1739, 1767, 1795, 1804, 1811, 1812, 1814, 1815, 1816, 1817, 1819, 1821, 1822, 1825, 1828, 1831, 1855, 1856, 1860, 1861, 1864, 1865, 1867, 1868, 1870, 1871, 1873, 1874, 1876, 1877, 1879, 1880, 1882, 1884, 1889, 1890, 1891, 1892, 1894, 1901, 1902, 1903, 1924, 1931, 1953, 1959, 1964, 1980, 1996, 2002, 2007, 2022, 2023, 2024, 2025, 2027, 2032, 2042, 2043, 2044, 2045, 2046, 2049, 2068, 2069, 2070, 2077, 2087, 2094, 2118,

2119, 2198, 2205, 2210, 2212, 2280, 2305, 2309, 2310, 2311, 2312, 2318, 2319, 2321, 2322, 2324, 2325, 2327, 2328, 2330, 2331, 2336, 2341, 2346, 2349, 2350, 2353, 2354, 2356, 2357, 2359, 2360, 2361, 2362, 2371, 2372, 2373, 2374, 2389, 2390, 2391, 2392, 2401, 2402, 2403, 2404, 2447, 2448, 2457, 2458, 2478, 2480, 2496, 2497, 2498
\define@boolkey 49, 57, 65, 73, 81, 89, 97, 105, 1105, 1206, 1212, 1218
\define@choicekey 32, 758, 1291
\define@cmdkey 1224
\definecolor 455, 456, 457, 458, 459, 460, 461, 462
\department . *11*, 1111, 1811
\description 751
\descriptionlabel 750, 753
\dimexpr . . 674, 692, 2185
\divide 1935, 1941, 1943, 1945, 1947, 1984, 1990
\do 201
\DocInput 21
\documentclass 9
\dots 1576

E

\edef 116, 117, 118, 119, 304
\editor *8*, 1048
\egroup 569, 666, 669, 672, 683, 689, 1118, 1587, 1596, 1927, 2021, 2028, 2041, 2067
\else . . . 52, 60, 68, 76, 84, 92, 100, 110, 134, 247, 268, 297, 304, 307, 319, 323, 327, 332, 336, 348, 360, 375, 425, 440, 446, 448, 562, 640, 1045, 1050, 1062, 1070, 1074, 1075, 1084, 1089, 1092, 1095, 1102, 1120, 1129, 1138, 1144, 1152, 1209, 1215, 1221, 1232, 1235, 1245, 1248, 1251, 1256, 1275, 1279, 1280, 1491, 1509, 1519, 1523, 1524, 1539, 1542, 1543, 1549, 1554, 1561, 1566, 1569, 1572, 1574, 1575, 1576, 1577, 1585, 1590, 1593, 1637, 1663, 1668, 1741, 1745, 1750, 1758, 1761, 1774, 1782, 1789, 1799, 1805, 1806, 1819, 1820, 1821, 1822, 1824, 1825, 1828, 1885, 1897, 1903, 1909, 1925, 1936, 1946, 1955, 1961, 1968, 1985, 1989, 1998, 2004, 2011, 2026, 2033, 2037, 2043, 2049, 2053, 2058, 2060, 2113, 2118, 2175, 2213, 2263, 2272, 2480, 2485, 2492, 2500
\email *10*, 1119, 1901, 1959, 2002
\emph 1560, 1562
\EnableCrossrefs 19
\end . . . 22, 2092, 2099, 2230
\end@dblfloat 681
\end@float 683
\endcsname 266, 267, 318, 320, 324, 331, 333, 337, 366, 386, 387, 577, 591, 1266, 1267, 1269, 1270, 1271, 1272, 1273, 1276, 1278
\enddescription 757
\endgroup 317, 356, 374, 389, 1581, 1853, 2476
\endlist 755, 757
\endminipage 559
\endtrivlist 2469
\enspace 2357
environments:
abstract *18*
acks *22*
anonsuppress *22*
CCSXML *16*
marginfigure *21*
margintable *21*
printonly *21*
screenonly *21*
sidebar *21*
teaserfigure *18*
\everypar . . . 296, 351, 362
\excludecomment . 1260, 2484, 2486, 2490, 2491
\ExecuteOptionsX 48, 56, 64, 72, 80, 88, 96, 104, 114
\expandafter 246, 248, 449, 570, 1266, 1267, 1269, 1270, 1276, 1278

F

\familydefault 632
\fancyfoot 2150, 2156, 2164, 2173, 2176, 2188, 2239, 2240, 2242, 2250, 2258, 2266, 2270, 2273
\fancyhead . 2146, 2147, 2148, 2149, 2152, 2153, 2154, 2155, 2159, 2161, 2162, 2167, 2169, 2170, 2171, 2177, 2178, 2179, 2181, 2238, 2245, 2246, 2247, 2253, 2254, 2255, 2261, 2262, 2264, 2265
\fancyheadoffset 2185, 2248, 2256

\fancyhf 2141, 2233
\fancypagestyle 2140, 2232
\fi . . . 54, 62, 70, 78, 86, 94, 102, 112, 131, 136, 158, 179, 180, 191, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 250, 252, 254, 256, 258, 260, 261, 270, 272, 286, 288, 294, 299, 304, 310, 321, 325, 334, 338, 340, 363, 364, 377, 388, 417, 427, 444, 446, 450, 453, 470, 534, 548, 566, 583, 610, 627, 633, 660, 661, 680, 684, 709, 1022, 1040, 1046, 1053, 1065, 1073, 1078, 1079, 1083, 1091, 1097, 1098, 1099, 1104, 1122, 1131, 1141, 1148, 1154, 1170, 1211, 1217, 1223, 1237, 1238, 1247, 1253, 1254, 1258, 1274, 1281, 1282, 1304, 1307, 1311, 1317, 1320, 1323, 1326, 1329, 1332, 1335, 1368, 1481, 1493, 1498, 1499, 1509, 1511, 1522, 1528, 1529, 1530, 1537, 1540, 1541, 1545, 1546, 1551, 1563, 1568, 1572, 1576, 1577, 1578, 1579, 1580, 1588, 1589, 1595, 1597, 1604, 1633, 1639, 1667, 1671, 1672, 1673, 1695, 1717, 1738, 1744, 1748, 1754, 1760, 1765, 1777, 1779, 1784, 1792, 1793, 1801, 1809, 1819, 1821, 1822, 1824, 1825, 1828, 1830, 1852, 1881, 1888, 1899, 1913, 1914, 1925, 1948, 1949, 1957, 1963, 1972, 1991, 1992, 2000, 2006, 2015, 2031, 2039, 2041, 2043, 2050, 2053, 2062, 2065, 2086, 2093, 2100, 2115, 2117, 2118, 2139, 2146, 2147, 2152, 2153, 2160, 2163, 2168, 2172, 2176, 2183, 2186, 2189, 2211, 2230, 2239, 2266, 2267, 2274, 2275, 2355, 2377, 2407, 2444, 2461, 2480, 2488, 2494, 2497, 2501
\firstpagestyle 2232
\floatname 663
\footnote 2046
\footnotemark 402, 1125, 1134, 2023, 2024, 2044
\footnoterule 557
\footnotesep . . . 581, 594
\footnotesize 587, 2109, 2150, 2156, 2164, 2173, 2176, 2240, 2242, 2250, 2258, 2266, 2271
\footnotetext . . 1128, 1130, 1137, 1140, 1147
\footnotetextauthorsaddresses 1520, 1526
\footnotetextcopyrightpermission 1531
\footrulewidth 2143, 2235
\format 32
\frenchspacing 2502
\fulltextwidth 673, 676, 692

G

\g@addto@macro 1052, 1076, 1077, 1090, 1096, 1103, 1121, 1125, 1127, 1130, 1134, 1136, 1139, 1145, 1146, 1151, 1153, 1246, 1252, 1271, 1278, 1486, 1490, 1492, 1898, 1910, 1956, 1962, 1969, 1999, 2005, 2012, 2023, 2024
\gdef 1034, 1035, 1036, 1037, 1039, 1043, 1049, 1051, 1068, 1069, 1071, 1072, 1082, 1088, 1094, 1203, 1227, 1244, 1250, 1267, 1269, 1270, 1276, 1636, 1896, 1900, 1905, 1929, 1930, 1951, 1952, 1954, 1958, 1960, 1965, 1994, 1995, 1997, 2001, 2003, 2008
\geometry 474, 477, 484, 491, 498, 505, 512, 519, 526
\getrefnumber 2043
\global 350, 353, 389, 585, 691, 1061, 1063, 1064, 1101, 1504, 1506, 1600, 1601, 1893, 1915, 1916, 1925, 1973, 1976, 2016, 2029, 2081, 2085
\grantnum *22*, 2479
\grantsponsor . . *22*, 2478

H

\hbox . 596, 1508, 1513, 1807
\headrulewidth 2142, 2234
\hfill 1797, 2084
\href . 1664, 1669, 1751, 1763, 1775, 1790, 2500
\hrule 551, 558, 1797

\hsize 588, 1507, 1739, 1740, 1767, 1769, 1795, 1832, 1924, 1975, 2018
\hskip 315, 329, 359, 372, 376, 1666, 1753, 1762, 1778, 1787, 1808, 2466
\hspace 1381, 1392, 1401, 1426, 1438, 1459, 1928, 1978
\Huge 1706, 1708, 1710, 1712, 1714, 1716
\hypersetup 420, 426, 1605

I

\if 247
\if@ACM@acmthm . 57, 2421
\if@ACM@affiliation@obeypunctuation 1105, 1806, 1819, 1821, 1822, 1823, 1825, 1828
\if@ACM@anonymous 89, 1067, 1075, 1080, 1102, 1120, 1126, 1135, 1144, 1489, 1496, 1524, 2118, 2489
\if@ACM@authordraft 105, 463, 1532
\if@ACM@authorversion 73, 1539, 1555
\if@ACM@badge 1179, 1661, 1770, 1786
\if@ACM@journal . 125, 636, 1233, 1525, 1543, 1559, 1570, 1591, 1813, 2035, 2054
\if@ACM@manuscript 124, 188, 1230, 1542, 1552
\if@ACM@natbib 81, 193, 284, 428
\if@ACM@natbib@override 81
\if@ACM@newfonts 612, 622
\if@ACM@printacmref 1212, 1602
\if@ACM@printccs 1206, 1584
\if@ACM@printfolios 1218, 2146, 2147, 2152, 2153, 2160, 2163, 2168, 2172, 2176, 2239, 2266
\if@ACM@review 65, 2072, 2088, 2095
\if@ACM@screen 49, 419, 2482
\if@ACM@sigchiamode 126, 572, 631, 675, 681, 1509, 1511, 1925, 2184
\if@ACM@timestamp . . . 97, 2101, 2187, 2268
\if@acmowned 1289
\if@filesw 385, 451
\if@insideauthorgroup 1060, 1062
\if@nobreak 295
\if@noskipsec . . 288, 352
\if@printcopyright 1285, 1547
\if@printpermission 1287, 1540
\ifcase 138, 160, 405, 472, 537, 643, 695, 812, 1167, 1339, 1371, 1614, 1642, 1676, 1698, 1719, 1833, 1857, 1937, 1986, 2120, 2144, 2199, 2236, 2314, 2363, 2393, 2449
\ifcsname 266
\ifdim 292, 312, 344, 369, 2083
\IfFileExists 614, 617, 619
\IfInteger 1225
\ifNAT@numbers 446
\ifnum 127, 132, 304, 305, 319, 323, 332, 336, 1279, 1280, 1300, 1305, 1308, 1312, 1318, 1321, 1324, 1327, 1330, 1333, 1498, 1934, 1983, 2043, 2213, 2215, 2269
\ifPDFTeX 600
\ifvmode 1805
\ifvoid 562
\ifx 159, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 249, 251, 253, 255, 257, 259, 448, 1038, 1045, 1048, 1066, 1081, 1086, 1087, 1093, 1150, 1242, 1243, 1249, 1256, 1266, 1275, 1519, 1523, 1564, 1572, 1575, 1576, 1577, 1585, 1590, 1635, 1663, 1668, 1741, 1745, 1750, 1758, 1761, 1774, 1782, 1789, 1799, 1885, 1895, 1903, 1904, 1953, 1959, 1964, 1996, 2002, 2007, 2026, 2033, 2049, 2053, 2060, 2113, 2480, 2497, 2499
\ignorespaces . . 365, 581, 594, 1109, 1110, 1112, 1811, 1812, 1814, 1815, 1816, 1817, 1818, 1819, 2040, 2045, 2467
\immediate 387, 452
\includecomment 2483, 2487, 2493
\includegraphics 1665, 1670, 1752, 1764, 1776, 1791
\indent 2448
\input 601
\InputIfFileExists . . 26
\institution *11*, 1110, 1811
\interfootnotelinepenalty 575
\interlinepenalty 316, 373, 575
\item 2466
\itshape . . 1544, 2311, 2312, 2341, 2346, 2359, 2371, 2391, 2457

J

\jobname 384, 387

K

\kern 550, 551, 557, 558, 1797
\keywords *16*, 1200

L

\l@section 392
\l@subsection . . 392, 393
\l@subsubsection . . . 394
\labelenumi 703
\labelenumii 704
\labelenumiii 705
\labelenumiv 706
\labelsep 712, 720, 725, 735, 740, 743, 745, 747, 749, 2466
\labelwidth . 735, 740, 743, 745, 747, 749, 752
\LARGE 1700, 1702, 1704, 1727, 1729, 1731, 1733, 1735, 1864, 1867, 2229
\Large 1855, 1873, 2324, 2325, 2327, 2328, 2330
\large 1533, 1860, 1865, 1868, 2318, 2319, 2321, 2322
\lastbox 354
\leaders 1797
\leavevmode 288, 1797, 1977
\leftmargin 734, 739, 742, 744, 746, 748
\leftmargini . . . 718, 719, 720, 721, 734, 735
\leftmarginii . . 724, 725, 726, 727, 739, 740
\leftmarginiii 727, 728, 742, 743
\leftmarginiv 728, 729, 744, 745
\leftmarginv 729, 730, 746, 747
\leftmarginvi 730, 748, 749
\leftskip . 1796, 2019, 2307
\let 223, 225, 237, 239, 241, 267, 306, 395, 396, 429, 430, 431, 432, 433, 434, 435, 438, 442, 598, 628, 677, 738, 753, 757, 1113, 1114, 1115, 1116, 1117, 1261, 1501, 1502, 1517, 1518, 1521, 1527, 1600, 1601, 1826, 1827, 1829, 1893, 1915, 1973, 1979, 2016, 2021, 2277, 2278, 2279, 2281, 2282, 2283
\libertineLF 630
\lineskip 1978, 2020
\linespacing . . . 382, 383
\liningnums 628
\list 751
\listisep . . . 732, 733, 737
\listparindent 736
\LoadClass 182
\long 573, 584, 665, 668, 671, 1203, 1205, 1486, 2069
\loop 2080, 2214

M

\makeatletter 379
\makebox 1533, 2223
\makelabel 753
\MakeTextUppercase 1896, 1898, 2309, 2318, 2321, 2324, 2327, 2349, 2353
\maketitle *19*, 1495
\marginfigure 667
marginfigure (environment) *21*
\marginpar 573, 666, 669, 672, 1662
\marginparsep . . 674, 2185
\marginparwidth . 674, 2185
\margintable 670
margintable (environment) *21*
\mbox 245
\mdseries 1721, 1723, 1725, 1729, 1731, 1733, 1735, 1737, 1877, 1880
\medskip . . 1616, 1618, 1620, 1622, 1916, 1918, 1977, 2030, 2051
\mktitle@bx 1494, 1644, 1646, 1648, 1650, 1652, 1654, 1656, 1658, 1660, 1749, 1768, 1796, 1916, 1976, 1977, 2029
\month 1166, 2110
\moveleft 691
\multiply 2220

N

\NAT@@setcites 263
\NAT@aysep 254
\NAT@citetp 438
\NAT@close 203, 205, 207, 209, 252
\NAT@cmprs . . 231, 233, 235
\NAT@cmt 258
\NAT@ctype 438
\NAT@find@eq 246
\NAT@fullfalse 438
\NAT@longnamestrue . 243
\NAT@merge . . 237, 239, 241
\NAT@nmfmt 245
\NAT@numbersfalse . . 217
\NAT@numberstrue 219, 221
\NAT@open 203, 205, 207, 209, 250, 438
\NAT@partrue 438
\NAT@rem@eq 248
\NAT@sep 211, 213, 215, 260
\NAT@sort . . . 227, 229, 235
\NAT@superfalse 219
\NAT@supertrue 221
\NAT@swafalse 437
\NAT@up 245
\NAT@yrsep 256
\NeedsTeXFormat 1
\newblock 439
\newbox . . 1494, 1803, 1920
\newcommand . 273, 279, 445, 1033, 1100, 1149, 1186, 1191, 1241, 1262, 1818, 1823, 2108, 2479, 2495
\newcount . 1056, 1058, 2075
\newcounter . . . 2104, 2106

\newdimen . . . 673, 710, 1921, 2192, 2194, 2196
\newenvironment 667, 670, 1485
\newfloat 662
\newif 124, 125, 126, 612, 1179, 1285, 1287, 1289
\newlength 1181, 1183, 1184, 2074
\newsavebox 2073
\newskip 732, 1922
\newtheorem 2424, 2427, 2430, 2432, 2435, 2439, 2442
\newtheoremstyle 2378, 2408
\newwrite 386
\nobreak 345, 2051
\noindent . . 571, 1257, 1518, 1616, 1618, 1620, 1622, 1641, 1662, 1749, 1756, 1759, 1783, 1797, 1798, 1800, 1883, 1916, 1917, 1976, 2020, 2029, 2030, 2036, 2051, 2052, 2458
\nolinkurl 1960, 1962, 2003, 2005
\normalcolor 564
\normalfont 596, 1257, 1513, 1856, 1861, 1870, 1871, 1873, 1874, 2374, 2389, 2401, 2404, 2464, 2502
\normalparindent . . . 549
\normalsize 1718, 1856, 1870, 1871, 1874, 2502
\num@authorgroups . . 1056, 1063, 1498, 1937, 1941, 1943, 1986
\num@authors . . 1058, 1061
\number 304
\numberline 324, 337
\numexpr . 2103, 2105, 2107

O

\onehalfspacing 190
\openout 387
\or 141, 143, 145, 147, 149, 151, 153, 155, 163, 165, 167, 169, 171, 173, 175, 177, 407, 408, 409, 410, 411, 412, 414, 415, 476, 483, 490, 497, 504, 511, 518, 525, 539, 540, 541, 543, 544, 545, 546, 547, 645, 646, 647, 648, 649, 651, 654, 657, 697, 698, 699, 700, 701, 702, 707, 708, 817, 821, 828, 832, 836, 840, 844, 848, 851, 857, 863, 869, 873, 877, 879, 883, 887, 889, 891, 893, 897, 901, 905, 909, 913, 917, 921, 925, 929, 933, 937, 941, 945, 949, 953, 957, 961, 965, 970, 974, 978, 982, 986, 990, 994, 998, 1002, 1006, 1010, 1014, 1018, 1167, 1168, 1169, 1340, 1342, 1345, 1347, 1348, 1350, 1352, 1354, 1357, 1360, 1363, 1365, 1372, 1383, 1394, 1402, 1408, 1414, 1428, 1440, 1447, 1461, 1468, 1474, 1617, 1619, 1621, 1623, 1625, 1627, 1629, 1631, 1645, 1647, 1649, 1651, 1653, 1655, 1657, 1659, 1679, 1681, 1683, 1685, 1687, 1689, 1691, 1693, 1701, 1703, 1705, 1707, 1709, 1711, 1713, 1715, 1722, 1724, 1726, 1728, 1730, 1732, 1734, 1736, 1836, 1838, 1840, 1842, 1844, 1846, 1848, 1850, 1859, 1862, 1863, 1866, 1869, 1872, 1875, 1878, 1939, 1940, 1942, 1944, 1988, 2123, 2125, 2127, 2129, 2131, 2133, 2135, 2137, 2151, 2158, 2166, 2201, 2206, 2241, 2249, 2257, 2316, 2317, 2320, 2323, 2326, 2329, 2347, 2351, 2365, 2366, 2367, 2368, 2369, 2370, 2375, 2376, 2395, 2396, 2397, 2398, 2399, 2400, 2405, 2406, 2451, 2452, 2453, 2454, 2455, 2456, 2459, 2460
\orcid *10*, 1123
\outer@nobreak 688

P

\p@ 390, 535, 542, 550, 551, 557, 558, 2286, 2290, 2294, 2295, 2298, 2299, 2302, 2303, 2333, 2338, 2339, 2343, 2344, 2464
\PackageError . 54, 62, 70, 78, 86, 94, 102, 112
\PackageInfo 51, 53, 59, 61, 67, 69, 75, 77, 83, 85, 91, 93, 99, 101, 107, 111, 827, 856, 862, 868
\PageIndex 16
\pageref 2112
\pagestyle 2191
\par . 289, 345, 381, 560, 686, 1257, 1521, 1527, 1540, 1544, 1587, 1596, 1616, 1618, 1620, 1622, 1644, 1646, 1648,

1660, 1759, 1766, 1783, 1794, 1797, 1800, 1802, 1821, 1822, 1824, 1825, 1883, 1887, 1916, 1918, 1924, 1926, 1954, 1956, 1962, 1969, 1977, 1979, 1997, 1999, 2005, 2012, 2019, 2021, 2027, 2028, 2029, 2030, 2040, 2051, 2067, 2068, 2069, 2462
\paragraph 1628, 2297, 2337
\parbox 467, 1755, 1773, 1780, 1788, 2078, 2227
\parindent 535, 549, 719, 1521, 1527, 1538, 2297, 2308, 2360, 2390
\parskip 535, 1538
\part 2301
\PassOptionsToClass 120, 121
\pdfgentounicode . . . 609
\pdfglyphtounicode 602, 603, 604, 605, 606, 607, 608
\pdfstringdefDisableCommands 398
\phantomsection 197, 2034, 2474
\popQED 2469
\position *11*, 1109, 1113, 1114, 1115, 1116, 1117, 1811
\postcode . . . *11*, 1116, 1811
printonly (environment) *21*
\ProcessOptionsX . . . 122
\proof 2462
\proofname 2462
\protect 324, 337
\protected@edef 309, 576, 590
\providecommand 439, 443, 2358
\ProvidesClass 5
\ProvidesFile 3
\ps@headings . . 2279, 2283
\ps@myheadings 2278, 2282
\ps@plain 2277, 2281
\pushQED 2463
\put 2091, 2098

Q

\qed 2463
\quad 366, 2160, 2163, 2168, 2172, 2270

R

\raggedright 1755, 1796, 2019
\raisebox 1533, 1751, 1763, 1775, 1790, 2223, 2225
\received *18*, 1241
\RecordChanges 18
\ref 2057, 2064
\refname 196, 197
\refstepcounter 308
\relax . . 127, 132, 139, 161, 246, 247, 290, 309, 311, 315, 329, 343, 358, 368, 376, 387, 406, 473, 538, 598, 644, 696, 813, 1057, 1059, 1061, 1063, 1149, 1150, 1266, 1275, 1300, 1305, 1308, 1312, 1318, 1321, 1324, 1327, 1330, 1333, 1339, 1371, 1517, 1615, 1643, 1677, 1699, 1720, 1834, 1858, 1923, 1932, 1933, 1934, 1935, 1938, 1941, 1943, 1945, 1947, 1950, 1978, 1981, 1982, 1983, 1984, 1987, 1990, 1993, 2023, 2043, 2076, 2105, 2107, 2113, 2121, 2145, 2200, 2202, 2203, 2204, 2207, 2208, 2209, 2212, 2213, 2215, 2218, 2219, 2220, 2221, 2237, 2269, 2315, 2364, 2394, 2450, 2464
\removelastskip 381
\renewcommand . . 195, 199, 200, 203, 205, 207, 209, 211, 213, 215, 265, 632, 750, 1060, 1119, 1487, 1503, 2142, 2143, 2234, 2235, 2285, 2289, 2293, 2297, 2301, 2332, 2337, 2342
\renewenvironment . . . 664, 751, 1202, 2462
\repeat 2083, 2217
\RequirePackage . . 30, 31, 183, 184, 185, 186, 187, 189, 192, 194, 397, 454, 464, 471, 552, 599, 611, 623, 624, 625, 626, 634, 1259, 1264, 2071
\reset@font 574, 587
\reversemarginpar . . 533
\rightskip 2306
\rlap 2224
\rule 581, 594, 2226

S

\savebox 2078
screenonly (environment) *21*
\scriptsize . . . 2080, 2084
\scshape 2361, 2447
\section 196, 1624, 1626, 1630, 1632, 2038, 2285, 2473
\section@raggedright 2305, 2309, 2310, 2318, 2319, 2321, 2322, 2324, 2325, 2327, 2328, 2330, 2331, 2336, 2349, 2350, 2353, 2354
\SelectFootnoteRule 553, 555
\setbox 354, 585, 691, 1749, 1768, 1796, 1807, 1916, 1925, 1976, 2029
\setcitestyle *23*, 200, 274, 280

\setcopyright .. *17*, 1336
\setcounter 1512, 1582, 1638, 2105, 2107, 2313, 2348, 2352
\setkeys 38, 130, 1027, 1228, 1336, 1906, 1907, 1911, 1912, 1966, 1967, 1970, 1971, 2009, 2010, 2013, 2014
\setlength 535, 536, 542, 549, 712, 713, 718, 724, 727, 728, 729, 730, 1182, 1185, 2079
\settopmatter *18*, 1228, 1229, 1231, 1234, 1236, 1239
\setTrue 380
\SetWatermarkColor . 466
\SetWatermarkFontSize 465
\SetWatermarkText .. 467
\sfdefault 632
\sffamily .. 1700, 1702, 1704, 1706, 1708, 1710, 1714, 1855, 1860, 1864, 2122, 2124, 2126, 2128, 2130, 2132, 2134, 2136, 2138, 2229, 2309, 2310, 2311, 2318, 2319, 2321, 2322, 2327, 2328, 2349, 2350, 2353, 2354
\shortauthors *19*, 1081, 1082, 1087, 1088, 1090, 1093, 1094, 1096, 1599, 1601, 2118
\shortcite 442, 445
\shorttitle 2149, 2155, 2163, 2172, 2177
\showeprint 2495
\sidebar 662
sidebar (environment) . *21*
\skip 563
\small .. 574, 666, 669, 672, 1257, 1616, 1618, 1620, 1622, 1861, 2036, 2051, 2239
\smallskipamount ... 733
\space 333, 1828, 2480
\specialcomment 2471
\standardpagestyle . 2140
\startPage *16*, 1196
\state *11*, 1115, 1811
\stepcounter ... 1128, 1130, 1137, 1140, 1147
\streetaddress *11*, 1113, 1811
\string 452, 1198, 2047, 2048
\strut 1773, 1788
\strutbox 581, 594
\subparagraph 2342
\subsection 2289
\subsubsection 2293, 2332
\subtitle *10*, 1054
\subtitlenote .. *14*, 1133

T

\teaserfigure 1485
teaserfigure (environment) *18*
\terms *16*, 1198
\textbf 1268, 1279
\textbullet 400, 1267, 2160, 2163, 2168, 2172
\textcolor 2229
\textheight 2083
\textit 1280, 2055, 2059, 2060, 2061
\textrightarrow . 401, 1277
\textwidth 674, 692, 693, 1507, 1739, 1767, 1795, 1832, 1932, 1975
\thanks *13*, 1487, 2069
\thankses 1490, 1492, 1519, 2069
\the 1164, 1166, 2080, 2084, 2110, 2220
\theACM@time@hours 2107, 2111
\theACM@time@minutes 2111
\theenumi 703
\theenumii 704
\theenumiii 705
\theenumiv 706
\thefootnote 1503
\theoremstyle 2419, 2422, 2437, 2445
\thepage .. 2112, 2146, 2147, 2152, 2153, 2160, 2163, 2168, 2172, 2176, 2239, 2266
\thispagestyle 1640
\thmname 2388, 2418
\thmnote 2388, 2418
\thmnumber 2388, 2418
\thr@@ 241
\time 2102, 2105, 2107
\title *8*, 2047
\titlenote .. *14*, 1124, 2048
\topsep ... 737, 741, 2464
\trivlist 2465
\tw@ 239
\two@digits ... 2110, 2111
\twocolumn 1650, 1652, 1654, 1656, 1658

U

\unskip 357, 399, 561, 1112, 1118, 1808, 1811, 1812, 1814, 1815, 1816, 1817, 1818, 1828, 1887, 2045, 2064, 2070
\unvbox 565, 570, 586
\upshape 750
\url 1369, 2480
\urlstyle ... 404, 413, 416
\usebox 2091, 2098
\usepackage 10, 11, 12, 13, 14, 15

V

\vbox 585, 691, 1749, 1768, 1796, 1916, 1976, 2029
\vskip 346, 381, 563, 597, 686
\vtop 1925

W

\wd 693, 1808
\write 452

X

\xdef 250, 252, 254, 256, 258, 260

Y

\year 1164, 2110

Z

\z@ 229, 292, 312, 344, 354, 369, 382, 536, 581, 594, 597, 638, 642, 653, 718, 724, 736, 1504, 1506, 1521, 1527, 1533, 1538, 1751, 1763, 1775, 1790, 2019, 2142, 2143, 2193, 2195, 2197, 2223, 2225, 2234, 2235, 2285, 2289, 2301, 2308, 2332, 2337, 2342, 2372, 2402

\z@skip 381, 686, 741, 2307